CORAZÓN VERDE DEL CHACO PROJECT

A GROUPED REDD+ PROJECT

Document Prepared by James Eaton of Ostrya Conservation and Marcel van Heesewijk, Christian Nielsen and Gabriela Viñales of Quadriz

Project Title	Corazón Verde del Chaco Project
Version	2.3
Date of Issue	28-February-2023
Project Location	Paraguay, Presidente Hayes Department
Project Proponent(s)	Quadriz Paraguay S.A. Marcel van Heesewijk Asunción office: Avda. Aviadores del Chaco 2581, SkyPark, Torre 2, Piso 12, Asunción, Paraguay Chaco office: Estancia Sta. Rosanna, Carmelo Peralta, Alto Paraguay, Paraguay Phone: +33 6 48 58 12 88 Email: Marcel.van.Heesewijk@Quadriz.com Website: https://quadriz.com/
Prepared By	Ostrya Conservation, Inc. James Eaton PO Box 153, Scottsville VA 24590, United States Phone: +1-708-703-2552 Email: James.Eaton@OstryaConservation.com Website: www.ostryaconservation.com

Validation Body	Aster Global Environmental Solutions Shawn McMahon, Lead Auditor Email: info@asterglobal.com Phone: +1 (330) 294-1242
Project Lifetime	1 July 2020 – 30 June 2050; 30-year Project Lifetime with option to extend.
GHG Accounting Period	1 July 2020 – 30 June 2050; 30-year GHG Accounting Period with option to extend.
History of CCB Status	This is the original CCB-VCS Project Description.
Gold Level Criteria	The Biodiversity Gold Level criteria is used. The Corazón Verde del Chaco Project is an avoided deforestation project and thus, protects important habitat for a wide-range of species including the vulnerable giant anteater (*Myrmecophaga tridactyla*), the vulnerable lowland tapir (*Tapirus terrestris*), and the near threatened and iconic jaguar (*Panthera onca*).
Expected Verification Schedule	September 2022

Table of Contents

1 SUMMARY OF PROJECT BENEFITS

1.1 Unique Project Benefits

Quadriz plans to implement a large-scale, VCS-CCB avoided planned deforestation REDD+ project to alleviate pressure on natural forest habitat in the Chaco Region in Paraguay. Quadriz's actions will:

1) Reduce greenhouse gas (GHG) emissions from the agricultural conversion process;

2) Sustain local and regional water quality by limiting nutrient and sediment inputs to local waterways which result from conversion of forest land to agriculture;

3) Conserve fast disappearing stream, wetland, and forest ecosystems;

4) Undertake local consultations and develop community projects; and

5) Protect local fauna and flora.

Quadriz's project is the first, large-scale carbon project in the Chaco region. The Corazón Verde del Chaco Project is a unique and high-impact REDD+ project, which conserves tropical forest under immediate threat of deforestation.

The Paraguayan Chaco consists of mainly privately owned land, and very few legally protected natural reserves. The Chaco is one of the largest carbon sinks; nonetheless, it ranks as one of the most deforested forest areas on earth.

Cattle ranching and soybean production are the primary drivers of deforestation in the Chaco and charcoal production provides a lucrative incentive to justify the upfront costs of clearing forest for cattle.

Through the latest technology, careful management, and on-the-ground monitoring, the Corazón Verde del Chaco Project protects the tropical forest of the Chaco, a true biodiversity hotspot, and home to endemic and endangered animal species who heavily rely on the forest for their existence. The area covered by the Corazón Verde del Chaco Project contains vital wildlife corridors that allow animals to move freely around their territories, without interaction with external threats from humans. The Chaco ecoregion has been described by Sir David Attenborough as "one of the last great wilderness areas in the world."[1]

On the social level, the Corazón Verde del Chaco Project aims to have the greatest benefit for local communities in the vicinity of the Project Areas. This is primarily achieved by increasing the incomes of locals through new, well-paid job opportunities and secure employment that are required to manage the Project. These jobs cover a range of skills, from employing and training local forest rangers to hiring employees to work in a planned visitor center.

[1] World Land Trust, "Defending the Chaco: What's at Stake?" Available: https://www.worldlandtrust.org/news/2014/04/defending-chaco-what-is-at-stake/

The following are a few, brief summaries of expected benefits of the Project not captured by the standardized CCB benefit metrics in Section 1.2, below.

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) Chaco Med Flights: Chaco Med flights are estimated to impact the local communities through providing improved access to health facilities, life-saving medicine, and medical professionals.	2.1.11
2) Visitors to the Visitor Center: The Project Proponent is in discussions on establishing a visitor center in the future, which would help expand awareness of the Project, along with awareness of the region's unique cultures and biodiversity.	2.1.11
3) Wildlife Cameras Deployed: The deployment of wildlife cameras throughout the Project Area is expected to demonstrate the impact of the conservation activities on wildlife, including the effect of conserved forest canopy and wildlife corridors.	5

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	Not Applicable.	N/A
	Net estimated emission reductions in the project area, measured against the without-project scenario	5,861,365 tCO_2e	3
Forest[2] cover	For REDD[3] projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	20,515.0 ha	3

[2] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)
[3] 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*)

	For ARR[4] projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	Not Applicable.	N/A
Improved land management	Number of hectares of existing production forest land in which IFM[5] practices are expected to occur as a result of project activities, measured against the without-project scenario	Not Applicable.	N/A
	Number of hectares of non-forest land in which improved land management practices are expected to occur as a result of project activities, measured against the without-project scenario	Not Applicable.	N/A
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	5-10 community members (for instance, training will be provided for forest guards, staff for visitor center and/or Chaco Med, etc.)	2.1.11
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	2-5 community members	2.1.11
Employment	Total number of people expected to be employed in project activities,[6] expressed as number of full-time employees[7]	5-10 community members	2.1.11
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	2-5 women	2.1.11

[4] 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*)
[5] 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*)
[6] 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.
[7] 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])

Livelihoods	Total number of people expected to have improved livelihoods[8] or income generated as a result of project activities	25-50 community members	2.1.11
	Number of women expected to have improved livelihoods or income generated as a result of project activities	10-25 women	2.1.11
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	25-50 community members	2.1.11
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	10-25 women	2.1.11
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	5-10 community members (for instance, education will be provided via the Project's visitor center and via providing scholarships)	2.1.11
	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	2-5 women	2.1.11
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	N/A
	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.	N/A

[8] 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.

Well-being	Total number of community members whose well-being[9] is expected to improve as a result of project activities	25-50 community members	2.1.11
	Number of women whose well-being is expected to improve as a result of project activities	10-25 women	2.1.11
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,[10] measured against the without-project scenario	31,858.6 ha	3
	Expected number of globally Critically Endangered or Endangered species[11] benefiting from reduced threats as a result of project activities,[12] measured against the without-project scenario	5+: Endangered Chacoan peccary (*Catagonus wagneri*), the endangered Crowned solitary eagle (*Buteogallus coronatus*), endangered Chaco side-necked turtle (Acanthochelys pallidipectoris), and endangered marsh seedeater (*Sporophila palustris*).	5

[9] 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.
[10] 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
[11] Per IUCN's Red List of Threatened Species
[12] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

Quadriz B.V., based in the Netherlands, and local affiliate Quadriz Paraguay S.A. and teaming with Atenil S.A., a large landowner in the Paraguayan Chaco to undertaking a Verified Carbon Standard and Climate, Community & Biodiversity Standards (VCS – CCBS) avoided planned deforestation project, known as the Corazón Verde del Chaco ("Green Heart of the Chaco") Project. The Paraguayan Chaco consists of mainly privately owned land, and very few legally protected natural reserves. The scenario existing prior to the implementation of the Project is that many private lands are being deforested for cattle ranching or soybean production and Atenil was seeking such a buyer for their land.

While the initial project property is approximately 31,858.6 hectares (ha), it is the intention to scale this grouped project to over 300,000 ha of privately owned land. The conditions under which grouped project eligibility is being established are: the baseline agent of deforestation will be similar large agribusinesses implement industrial scale cattle ranch, each additional project instance will meet the applicability conditions of each VM0007 module used to develop this Initial Project Instance, and quantification of baseline, with-project, and leakage will follow the equations outlined in this Project Document.

The total estimated ERs over the initial project instance's first ten years of crediting is 5,601,376 ERs and the annual average is 560,138 ERs.

By undertaking this conservation initiative, Quadriz Paraguay S.A. and Atenil S.A. will alleviate pressure on natural forest habitat in the Chaco Region in Paraguay. The Corazón Verde del Chaco Project will mitigate deforestation pressures and the associated greenhouse gas emissions in the region, which is the main climate objective of the Project. The main community objective of the Project is to provide social programs to improve the livelihoods of community members living in the vicinity of the Project. The main biodiversity objective of the Project is the preservation of biodiversity, particularly medium-to-large mammals in the project areas.

Over the Project Lifetime, the Corazón Verde del Chaco Project will implement the following project activities:

- Forego Selling of Property, Then Clearing and Conversion of the Project Areas;
- Provide Healthcare Services;
- Raise Project Awareness;
- Patrol and Monitor Deforestation;
- Establish a Project Headquarters; and
- Monitor Medium-to-Large Mammals in the Project Areas.

Foregoing the sale of the property and the subsequent clearing and conversion of the Project Areas (i.e., to pasture and/or agriculture), along with patrolling and monitoring for deforestation, will directly align with the Project's climate objective. Improving the livelihoods of community members living in the vicinity of the Project (i.e., the community objective) will be accomplished through providing healthcare services, raising project awareness, and through establishing a project headquarters. To preserve the Project's

biodiversity, particularly medium-to-large mammals in the project areas (i.e., the biodiversity objective), the Project will monitor medium-to-large mammals in the Project Areas and reduce deforestation.

2.1.2 Project Scale

The Corazón Verde del Chaco Project is considered to be a "Large Project", as the estimated annual emission reductions for the first baseline period for the initial project instance is 560,138tCO_2e per year, greater than the 300,000 tons of CO_2 per year which indicates a "Large Project".

Project Scale	
Project	N/A
Large Project	X

2.1.3 Project Proponent (G1.1)

Organization name	Quadriz Paraguay S.A.
Contact person	Marcel van Heesewijk
Title	CEO
Address	Avda. Aviadores del Chaco 2581, SkyPark, Torre 2, Piso 12, Asunción, Paraguay
Telephone	+33 6 48 58 12 88
Email	Marcel.van.Heesewijk@quadriz.com

2.1.4 Other Entities Involved in the Project

Organization name	ATENIL S. A.
Contact person	Kiantar Betancourt and Diego Puente
Title	Kiantar is Chairman of Atenil S.A. and Diego is the CEO of Atenil S.A.
Address	R.I. 3 Corrales 659, Barrio, Mariscal Estigarribia, Asunción, Paraguay
Telephone	+595 (21) 623857 / 9
Email	Kiantar Betancourt: kbetancourt@victoria.com.py; Diego Puente: dpuente@victoria.com.py
Role in the Project	Passive Landowner

Organization name	Ostrya Conservation Inc
Contact person	James Eaton
Title	Director
Address	Post Office Box 153 Scottsville, Virginia, 24590 – United States
Telephone	+1 (708) 703-2552
Email	James.Eaton@OstryaConservation.com
Role in the Project	Advisor and implementation partner responsible for VCS and CCBS project development and ongoing monitoring, reporting and verification of the project over the crediting period.

Organization name	The Universidad Nacional de Asunción (National University of Asuncion)
Contact person	Andrea Weiler
Title	Independent Consultant; FACEN Post Grade Director and General Coordinator of the Nucleo de Investigación en Biodiversidad (NIB)
Address	Campus Universitario, San Lorenzo, Paraguay
Telephone	N/A
Email	andreaweiler1@gmail.com
Role in the Project	Andrea Weiler is a wildlife biologist and implementation partner conducting the biodiversity impact monitoring plan with the use of motion-sensitive, wildlife cameras over the crediting period.

2.1.5 Physical Parameters (G1.3)

Project Location and Geographic Boundaries

The Corazón Verde del Chaco Project is located in the Departments of Presidente Hayes, Alto Paraguay, and Boquerón, with the initial project instance located in the Department of Presidente Hayes. The Corazón Verde del Chaco Project's initial project instance is 160 kilometers (km) east of Filadelfia and 330 km north northeast of Asuncion. The initial Project Area (i.e., forested area of the property as of the project start date, and 10 years prior) is 20,515.0 hectares. This represents approximately 64% of the initial project property which totals 31,858.6 hectares. The remainder of the property is not eligible as a REDD+ project as it is protected as a riparian area, a set aside green reserve (i.e., 25% of the mesoxerophytic semi-deciduous forested area), or nonforest. Delineation of the initial Project Area is discussed in detail in Section 3.2.1 in the Section on the Legal Permissibility for Deforestation.

For clarification, throughout this PD:

- The "Initial Project Area" is the 20,515.0 ha hectare Project Area;
- The "Initial Project Instance" is the same as the "Initial Project Area";
- The "Initial Project Property" is the total 31,858.6 hectares;
- The "Initial Project Zone" is the 20km buffer around the "Initial Project Property";
- The "Project Zone" is the 20km buffer around each project property; and
- The "Corazón Verde del Chaco Project" or "Project" is the Initial Project Area and the potential future expansion areas, to over 300,000 hectares total.

Detailed project instance boundaries for all sites will be archived as GIS files located in the Project's database. Google Earth files (i.e., KML files) are available for both the Project Area and grouped project boundary and can be found in the Project's database.

Figure 2.1. Map of the Corazón Verde del Chaco Project's Initial Project Area and Project Region.

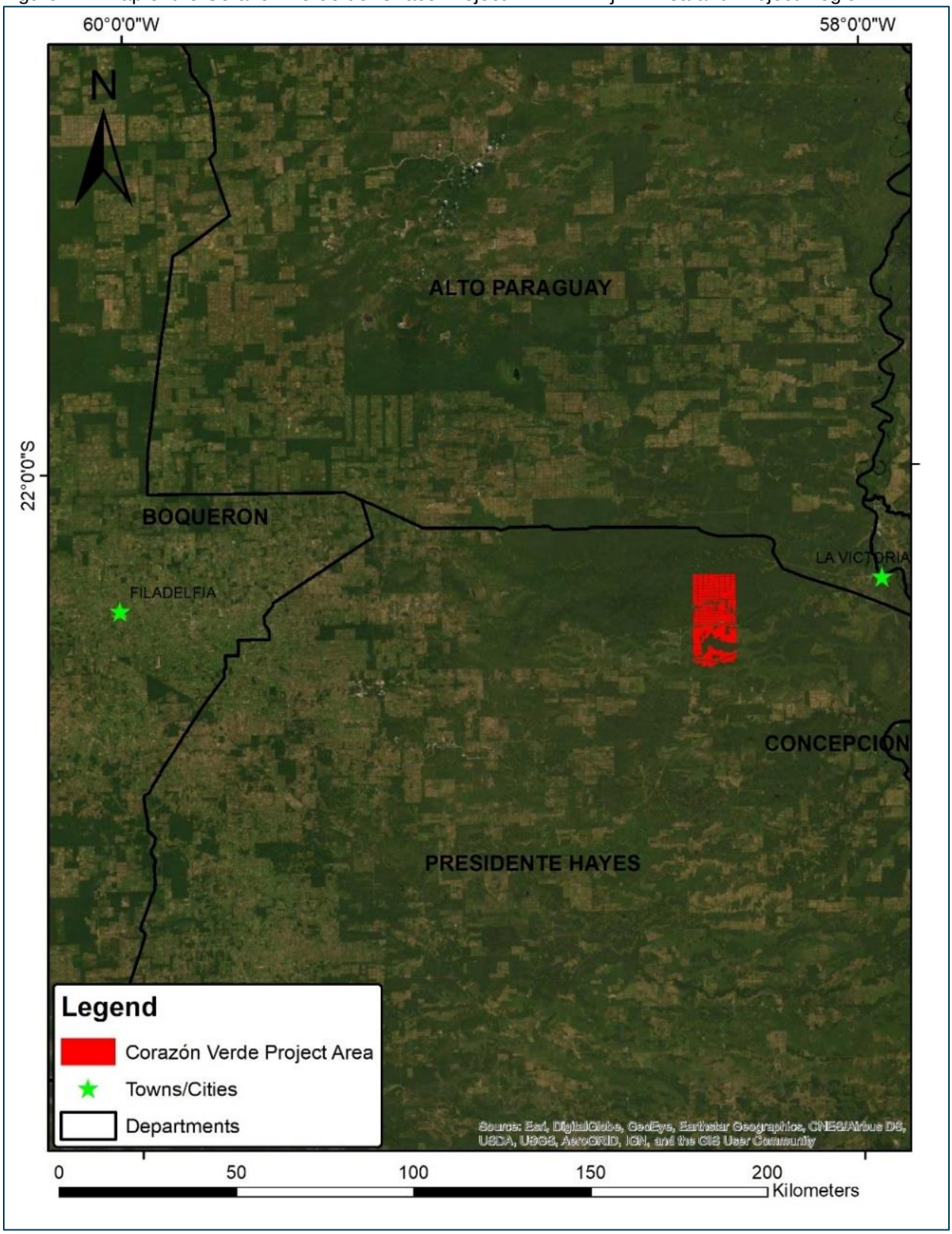


Figure 2.2. Map of the Corazón Verde del Chaco Project's Initial Project Area.

Figure 2.3. 2014 Forest Cover Map (Green = Forest; Red = Nonforest).

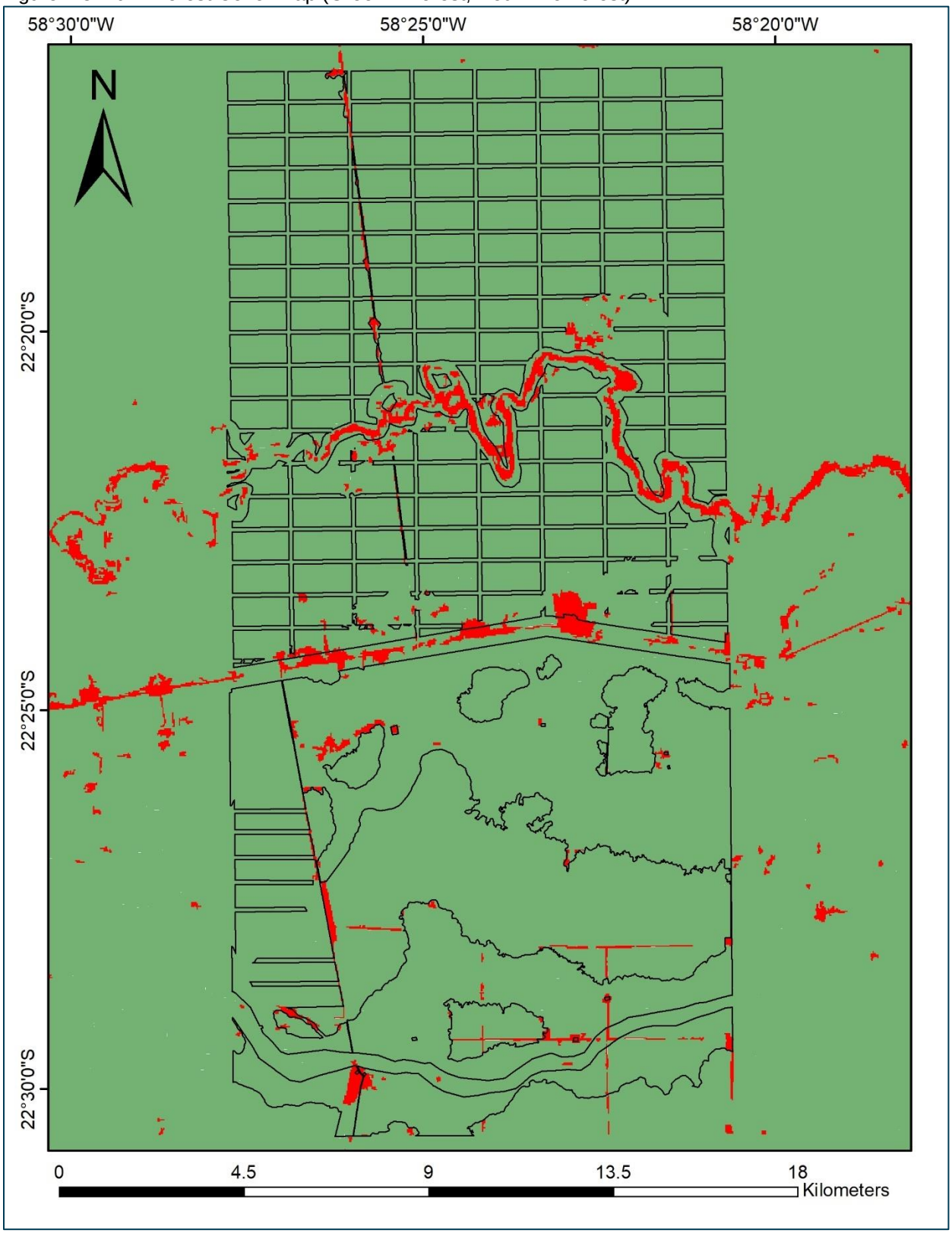
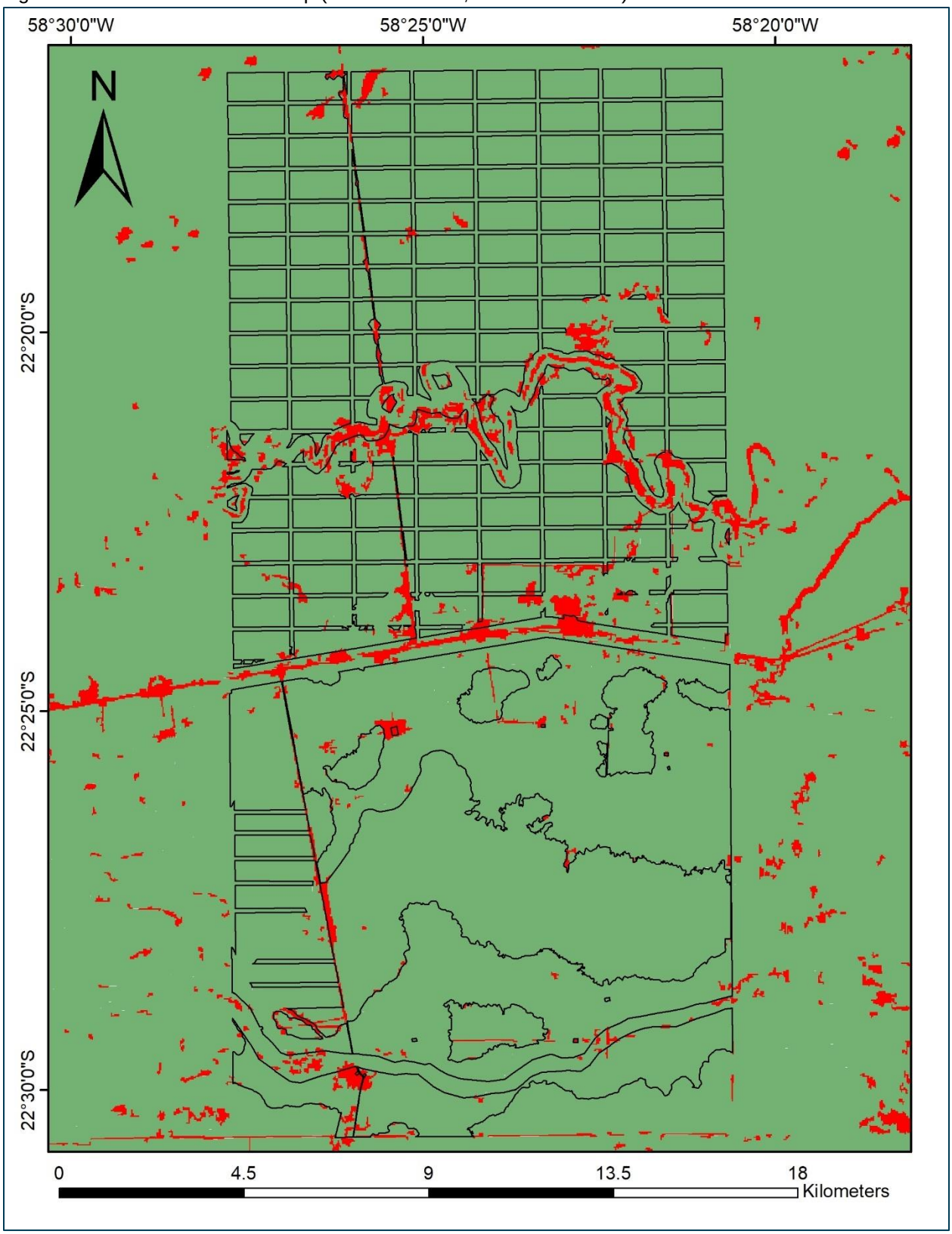


Figure 2.4. 2019 Forest Cover Map (Green = Forest; Red = Nonforest).



Topography

The Paraguayan zone of the Gran Chaco, and particularly where the conservation activities will take place, is a flat sedimentary plain, located in front of the Andes Mountains, with little drop from the Northwest to the Southeast. The relief can be designated as extremely flat, in such a way that in most of the Paraguayan Chaco there are no hills or undulations of the terrain.

Climate

According to the Köppen Climate Classification, the Gran Chaco region is mostly considered tropical savannah climate (Aw), with a small portion classified as warm semi-arid climate (BSh).[13] With a mean annual temperature in the range of 27°C, the geographic region in which the Project takes place is considered to have a "Tropical Dry" climate as determined using Intergovernmental Panel on Climate Change (IPCC) guidance.[14] The average annual rainfall in the area of the initial project instance is 1,000-1,200 millimeters per year (mm/yr). In general, the rainy season extends from December to May.

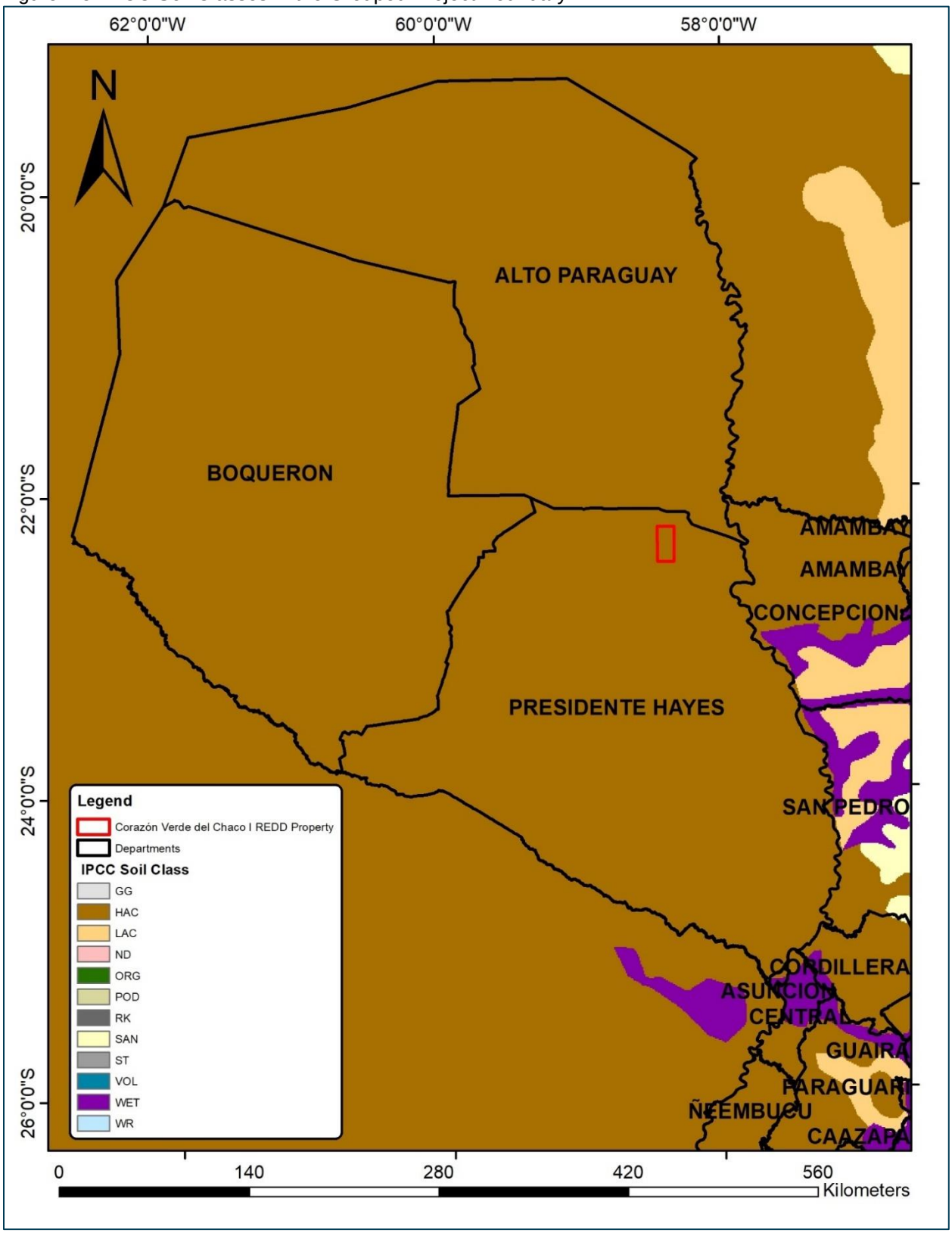
Soil

The Chaco is an epicontinental basin that was filled in the course of the Earth's historical development with different sediments. The lowest layer is made up of marine sediments over 2,000 meters thick, deposited during the Silurian and Devonian, above which follows reddish continental sediments of 500 to 2,500 meters thick called Red Beds. On top of these Red Beds, there are young semi or non-compacted continental stones from the Neozoic, with a thickness of up to 500 meters, that represents the current base material of the Chaco soil. According to Mereles & Degen (1995), the Chaco soils gradually change as one descends from the Northwest to the Southeast.

According to the Harmonized World Soil Database,[15] the grouped Project Area/region is dominated by the following soil types: Solonetz, Fluvisols, Regosols, and Cambisols. Each of these soil types can be classified as High Activity Clays (HACs) using the default IPCC soil types.[16] IPCC default soil classes were derived using GIS by overlaying the project region over a spatially explicit map of IPCC soil types (See Figure 2.5). There are no organic soils (i.e., histosols) in or around the Project Area.

[13] Encyclopedia Britannica. "Köppen climate classification." Available: https://www.britannica.com/science/Koppen-climate-classification
[14] Figure 3A.5.2, IPCC 2006 Guidelines for National Greenhouse Gas Inventories and IPCC Good Practice Guidance.
[15] Batjes NH 2009. IPCC default soil classes derived from the Harmonized World Soil Data Base (Ver. 1.0). Report 2009/02, Carbon Benefits Project (CBP) and ISRIC – World Soil Information, Wageningen (with dataset).
[16] Batjes, N.H. 2010. IPCC default soil classes derived from the Harmonized World Soil Data Base (Ver. 1.1). Report 2009/02b, Carbon Benefits Project (CBP) and ISRIC- World Soil Information, Wageningen.

Figure 2.5. IPCC Soil Classes in the Grouped Project Boundary.

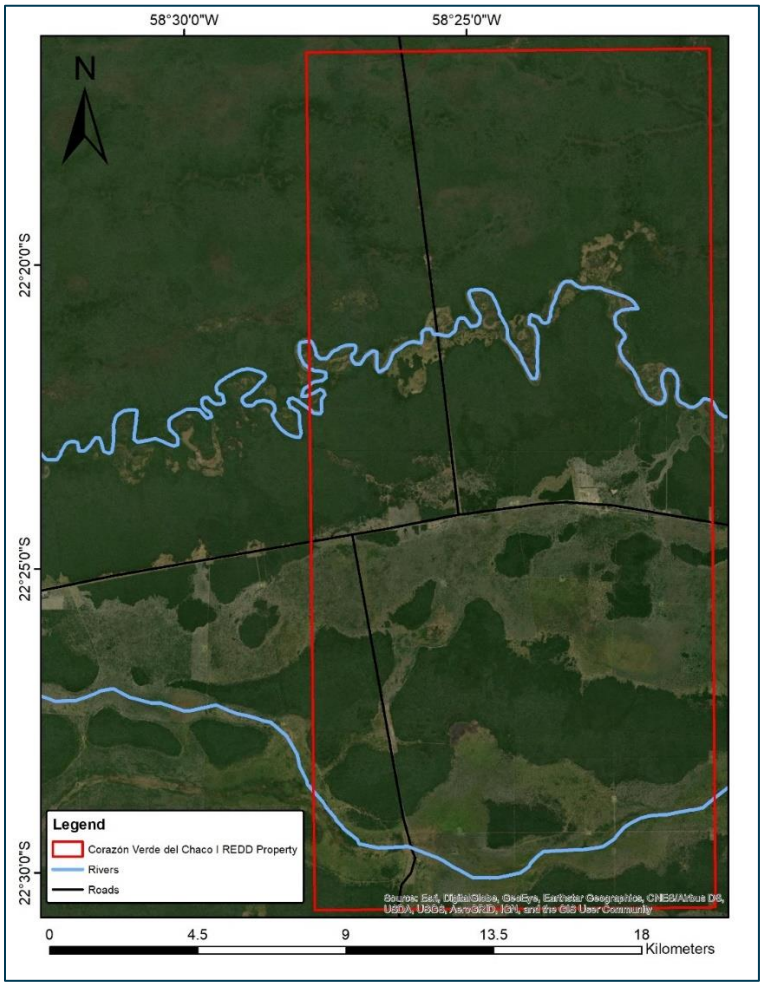


Hydrology

The dominant drainage system in Paraguay is the Paraguay River, which provides the eastern border of the geographic boundary for approximately 520 kilometers. Numerous streams and rivers flow into the Paraguay River, including the Periquito, Yacaré, San Carlos Alegre Nabilique, and Mosquito. There are also large lagoons in the region, including the Imakata, General Díaz, Carlos A. López and Morocha, most of which are salty. To the Northeast, the Negro River serves as a boundary with the Republic of Bolivia. The Lagerenza River to the Northwest and the Melo River to the South, are also found in the Chaco, but neither are navigable.

The initial project instance contains two rivers which are intermittent in the dry season (see Figure 2.6). During the rainy season, which runs from approximately November to May, there are small lakes, seasonal flooding and small streams at the initial project instance. These seasonally wet areas are spread throughout the initial project instance. There is a larger small lake that forms in the North of the initial project area and the seasonal flooding is more in the South of the initial project area, particularly in the palm savanna area. During the dry season, which runs from approximately June to October, there are no small lakes, no seasonal flooding, or small streams in the initial project instance.

Figure 2.6. Rivers in the vicinity of the initial project area.



Vegetation

The native forest within the geographic boundary of the grouped project is a mosaic of mesoxerophytic semi-deciduous forests and palm savannah forest. *Schinopsis balansae*, *Cesalpinea paraguayensis*, and *Aspidosperma quebracho-blanco* are often found in the mesoxerophytic semi-deciduous forests, although their relative abundance varies according to a west (400 mm/yr) to east (1000 mm/yr) precipitation gradient. The savannahs are dominated by *Copernicia alba* which does well in the seasonally flooded lowland areas adjacent to the Rio Paraguay.

Specific to the initial project instance, there are:

- Paleo-Drainage areas totalling approximately 548.2 hectares, which is open forest associated with historic river channels often dominated with *Copernicia alba* palms;
- Palm Savanna areas totalling approximately 7,470.5 hectares, which is palm savannah forest dominated by *Copernicia alba*; and
- Forest areas totalling approximately 12,496.3 hectares, which is mesoxerophytic semi-deciduous forest.

2.1.6 Social Parameters (G1.3)

The Project is located in both the Alto Paraguay and Presidente Hayes Departments, which have the lowest and third lowest population densities in Paraguay. As of 2017, Alto Paraguay had 0.2 inhabitants per square kilometer and Presidente Hayes had 1.7 inhabitants per square kilometer.[17]

The closest town to the initial project instance is La Victoria, which is located in the district of Puerto Casado, within the Alto Paraguay Department. Specific to the Corazón Verde del Chaco Project's initial project instance, there are no communities living within the initial Project Area. Within 20 kilometers of the initial Project Area, there are two small indigenous communities known as the Maria Auxiliadora and San Isidro. Maria Auxiliadora has 20 families and San Isidro has 14 families.[18] The Maria Auxiliadora indigenous community do not use the land within the initial project instance and it is assumed, due to distance and difficult access, that the San Isidro indigenous community also do not use the land within the initial project instance. Outside of the 20-kilometer buffer, neither people living in the nearest city of La Victoria, nor those people living in the community known as Estancia Km. 11, are allowed access to this privately owned property.

Land Use and Economic Activities

Cattle ranching is a large economic sector in Paraguay with an estimated 13.8 million head of cattle in 2017.[19] The vast majority of land use and economic activity in the region surrounding the Project is cattle ranching. The main crops in Paraguay are soy and maize, with soy clearly the dominant crop with nearly

[17] General Directorate of Statistics, Surveys and Censuses. "2.4. Country area and density, according to department. Year 2017." Available: https://www.dgeec.gov.py/assets/documento/63819Cuadro-2.4.xlsx
[18] Federation for Self-Determination of Indigenous Peoples. "Map." Available: https://www.tierrasindigenas.org/Mapa
[19] General Directorate of Statistics, Surveys and Censuses. "7.1. Number of head of cattle, depending on the year. Period 2013-2017." Available: https://www.dgeec.gov.py/assets/documento/5720cCuadro-7.1.xlsx

3.5 million hectares under cultivation in 2017.[20] There are few permanent crops in the Departments of Alto Paraguay and Presidente Hayes.[21] This said, the largest area under cultivation with crops in Alto Paraguay, as of 2017, was soy (with 344 hectares), while the largest area under cultivation in Presidente Hayes in 2017 was sorghum for grain (3,513 hectares) and peanuts (2,633 hectares).[22] Yerba Mate and citrus fruits were the largest permanent crops in Paraguay as of 2015-2017.[23]

At the initial project instance, the current land use and economic activities are minimal, because the property was intended to be sold. This said, there is limited cattle ranching infrastructure present on the initial project property such as fencing, some basic housing, and Australian water tanks to provide water for both cattle and people.

Socio-Cultural Information

With 6.2 (Alto Paraguay) and 7.5 (Presidente Hayes) average years of schooling of the population aged 10 and over, Alto Paraguay has the lowest and Presidente Hayes is tied for sixth lowest average years of schooling in Paraguay.[24]

With unemployment rates of 11.2% (Alto Paraguay) and 9.7% (Presidente Hayes) in 2017, Alto Paraguay and Presidente Hayes had the two highest rates of unemployment in Paraguay.[25] In 2017, a total of 28.5% of the population in Presidente Hayes lived in poverty (with 5.4% in extreme poverty) and a total of 46.5% of the population in Alto Paraguay lived in poverty (with 8.9% in extreme poverty).[26]

Access to healthcare is limited in Alto Paraguay and Presidente Hayes Department. As of 2017, Alto Paraguay had the fewest number of doctors (48), tied for fewest (with Boquerón) number of dentists, and the fewest licensed nurses. Similarly, Presidente Hayes had the fourth fewest doctors and the third fewest licensed nurses.[27]

[20] General Directorate of Statistics, Surveys and Censuses. "6.1. Main temporary crops: Cultivated area and production per agricultural year, according to cultivation. Period 2015/2016-2016/2017." Available: https://www.dgeec.gov.py/assets/documento/98ab7Cuadro-6.1.xlsx
[21] General Directorate of Statistics, Surveys and Censuses. "2.3.4 AREA OF PERMANENT CULTURES (hectares), DEPENDING ON YEAR AND DEPARTMENT. PERIOD 2008-2017." Available: https://www.dgeec.gov.py/assets/documento/9b81bCuadro%202.3.4_2017_OK.xlsx
[22] General Directorate of Statistics, Surveys and Censuses. "2.3.2 AREA OF TEMPORARY CULTURES (hectares), DEPENDING ON YEAR AND DEPARTMENT. PERIOD 2008-2017." Available: https://www.dgeec.gov.py/assets/documento/00c90Cuadro%202.3.2_2017_OK.xlsx
[23] General Directorate of Statistics, Surveys and Censuses. "6.2. Permanent crops: Area and production per agricultural year, according to cultivation. Period 2015/2016-2016/2017." Available: https://www.dgeec.gov.py/assets/documento/7ba83Cuadro-6.2.xlsx
[24] General Directorate of Statistics, Surveys and Censuses. "Population per year of the survey, according to department and main indicators of education. Period 1997/98-2018." Available: https://www.dgeec.gov.py/assets/documento/2cc46Educacion_dpto_EPH%201997-98_2018.xls
[25] General Directorate of Statistics, Surveys and Censuses. "Population per year of the survey, according to department and main employment indicators. Period 1997/98-2018." Available: https://www.dgeec.gov.py/assets/documento/326ccEmpleo_dpto_EPH%201997-98_2018.xls
[26] General Directorate of Statistics, Surveys and Censuses." Population per year of the survey, according to department and main indicators of poverty. Period 1997/98-2018." Available: https://www.dgeec.gov.py/assets/documento/3916cPobreza_dpto_EPH%201997-98_2018.xls
[27] General Directorate of Statistics, Surveys and Censuses. "4.1. Health personnel by occupation category, according to Health Region. Year 2017." Available: https://www.dgeec.gov.py/assets/documento/00ff5Cuadro-4.1.xlsx

With respect to drinking water, Alto Paraguay and Presidente Hayes have amongst the fewest number of providers and the fewest number of connections throughout Paraguay.[28] As of 2017, there were no reported providers (or connections) for sanitary sewer services.[29] Yet, in 2017 in Presidente Hayes, it was reported that 63.3% of the population had access to improved sanitation, 90.5% of the population had access to improved water, and 90.8% of the households had access to electricity. Similarly, in Alto Paraguay, it was reported that 26.5% of the population had access to improved sanitation, 78.3% of the population had access to improved water, and 94.2% of the households had access to electricity.[30]

Relevant Historic Conditions

The nearest town to the initial Project Area, Puerto Casado, is important from a historical perspective. According to the Paraguayan Government:

> Founded in 1889 at the time of President Patricio Escobar, previously known as Ángeles Custodios. It was the headquarters of the Carlos Casado Tanning Company. It was elevated to a district in 1973.
>
> This port was used as a dock for the embarkation and disembarkation of the Paraguayan troops who were going to fight during the Chaco War.
>
> The Carlos Casado company had more than 6,500,000 hectares in the Paraguayan Chaco, today the factory is paralyzed. From where the Mennonites and Paraguayan soldiers went to enter the Central Chaco with the narrow gauge railway that reached 145 km from the Paraguay River.
>
> In Puerto Casado there are historical places from the time of the Chaco War, the first Mennonite settlers settled here in 1920.
>
> The Galván hill of 325 meters above sea level is located 15 km south of the so-called “Kilometer 11”, the old railway station that leaves from Puerto Casado. The Aquidabán boat stops here, part of Concepción.
>
> On Cerro Galván you can still see the old railroad tracks. Here Emiliano R. Fernández composed his poem "La Moda" in 1926. This is the first important station of the Casado railway.
>
> The railway was built by the company for the extraction of wood, with almost 150 km of narrow gauge into the center of the Chaco. The same railroad track was extended until km 160, which allowed Paraguayan troops in the field to access the forts to stop the advance of the Bolivians in the extensive territory during the Chaco War.
>
> During the Chaco War, the railroad was of vital importance for the transport of soldiers, weapons, ammunition, provisions, vehicles, fuel, medicine and the wounded.

[28] General Directorate of Statistics, Surveys and Censuses. “2.2.5 NUMBER OF DRINKING WATER PROVIDERS AND CONNECTIONS, ACCORDING TO DEPARTMENT. YEAR 2017.” Available: https://www.dgeec.gov.py/assets/documento/9d859Cuadro%202.2.5%20_2017_OK.xlsx
[29] General Directorate of Statistics, Surveys and Censuses. “2.2.6 NUMBER OF SANITARY SEWER PROVIDERS AND CONNECTIONS, ACCORDING TO DEPARTMENT. YEAR 2017.” Available: https://www.dgeec.gov.py/assets/documento/9961bCuadro%202.2.6_2017_OK.xlsx
[30] General Directorate of Statistics, Surveys and Censuses. “Population, households per survey year, according to department and access to basic services. Period 1997/98-2018.” Available: https://www.dgeec.gov.py/assets/documento/af5d4Vivienda%20y%20Hogar_servicios%20basicos_dpto_EPH%201997-98_2018.xls

> The old Kilometer 11 station, an old mansion that is part of the old railway station of the Carlos Casado company, is one of the historical sites that still stand in the town.
>
> With the sale of public lands at the end of the 19th century, the company Carlos Casado Ltda. Was established, which in 1886 acquired more than 3,900 square leagues, about 6,500,000 ha, dedicated to forest exploitation and tannin production. Tannin is a substance extracted from the "quebracho" tree; it is used to tan hides. The founder's son, José Casado, came to manage the firm in 1929 and lived there until 1945.
>
> During the Chaco War, the facilities were used as workshops for all kinds of machinery, weapons, especially motorized vehicles, before being sent into battle. It was also used as a place for artificial insemination of cattle.
>
> In 1931 the Infantry Division Command settled in the port, José Félix Estigarribia accepted the post of Commander proposed by the then President José P. Guggiari and at the end of July 1931 Estigarribia was already installed in that place. In order for the new commander to settle in the place, the family that owns the factory gave a house, "la Chaqueña", a spacious and comfortable residence located in the center of the city.
>
> Emiliano R. Fernández, popular musician and poet, often called the "northern poet", around 1923 was in Puerto Casado, where he performed various tasks, his works are often signed in Alto Paraguay.
>
> As for handicrafts, at the beginning of the 80s a former worker of the company had the idea of making a guampa for his own use with pieces of stainless steel, a material that was used to store tannin. The idea was very well accepted and it began to receive orders and the manufacturer improved the technique, creating new models of guampa de mate and tereré. Today they are manufactured in various designs and models on special orders for gifts or as souvenirs from Puerto Casado.[31]

Specifically, regarding the initial project instance and its brief history, the area was historically forested and used during Paraguay's first war, known as the War of the Triple Alliance, from 1864 to 1870. The Casado company then acquired lands, including the initial project instance, in 1886 to make tannins, which became a very important industry. Then, there was the Chaco War from 1932 to 1935, which took place in the region, including at the initial project instance. More recently, the current landowner acquired the land in the 2000s. The palm savannah and Chaco Forest within the initial project instance likely did not differ much from the historical carbon stocks. Likewise, the initial project instance was probably not widely used (i.e., not extensive logging, land clearing, etc.) based off the species diversity and the current biomass/carbon stocks.

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

The extent of the initial project instance was determined as the area of the property as defined in Quadriz's contract with Atenil. An Alternative Use Map was then prepared for this property to indicate which areas of the property are eligible for clearing in the baseline (see Figure 2.10). The resulting area was further limited to include only existing forest at the time of the project start. Finally, a buffer along the primary road was generated and removed from the eligible initial project instance area. The extent of the

[31] Portal of Governments and Municipalities Republic of Paraguay. "Puerto Casado, Welcome!" Available: https://www.municipios.gov.py/puertocasado/

project zone for the initial project area is a 20km buffer around the initial project property. The extent of the grouped project zone will be the combination of 20km buffers around each project property.

As previously mentioned, there are no local communities who live in, or who are reliant, on the initial project instance (Figure 2.8). The two Indigenous communities that live within twenty kilometers of the initial Project Area are the communities of San Isidro and Maria Auxiliadora, as identified in Figure 2.8a.

The main High Conservation Value (HCV) identified by the community at Maria Auxiliadora through the Participatory Rural Assessment is the Chaco Forest, and particularly the Chaco Forest within their 30,113 hectare community lands (i.e., Riacho Mosquito),[32] which provides both food and fuel for the community. The San Isidro community would like more time to decide whether they want to participate in the Project, but it is believed the San Isidro community would also identify the Chaco Forest within their community lands as an HCV for food and fuel (see Figure 2.8b). Further, the Chaco Forest, particularly the Chaco Forest within the initial project instance, is a biodiversity HCV and please see Section 5.1.2. for additional details.

Furthermore, many of the other stakeholders, such as government officials at Ministerio del Ambiente y Desarrollo Sostenible (MADES; The Ministry of Environment and Sustainable Development) and the Instituto Forestal Nacional (INFONA; The National Forestry Institute), are located in the capital city of Asunción (see Figure 2.7 for a regional map of Paraguay).

[32] According to the Atlas de Comunidades de Pueblos Indígenas en Paraguay, DGEEC, 2012- page 260 (document based on the last census of 2012). The communities Boquerón Cué, Machete Vaina, María Auxiliadora, Castilla, and San Isidro Km 39 share titled lands. These lands are titled in the name of Riacho Mosquito which has 30,113 ha of the legal area that is consistent to the registry of Riacho Mosquito.

Figure 2.7. Map of Paraguay (Source: Geology.com)[33].

[33] Geology.com, "Paraguay Map and Satellite Image," Available: https://geology.com/world/paraguay-satellite-image.shtml

Figure 2.8a. Map of the Project Zone and location of Maria Auxiliadora and San Isidro communities in relation to the initial Project Area.

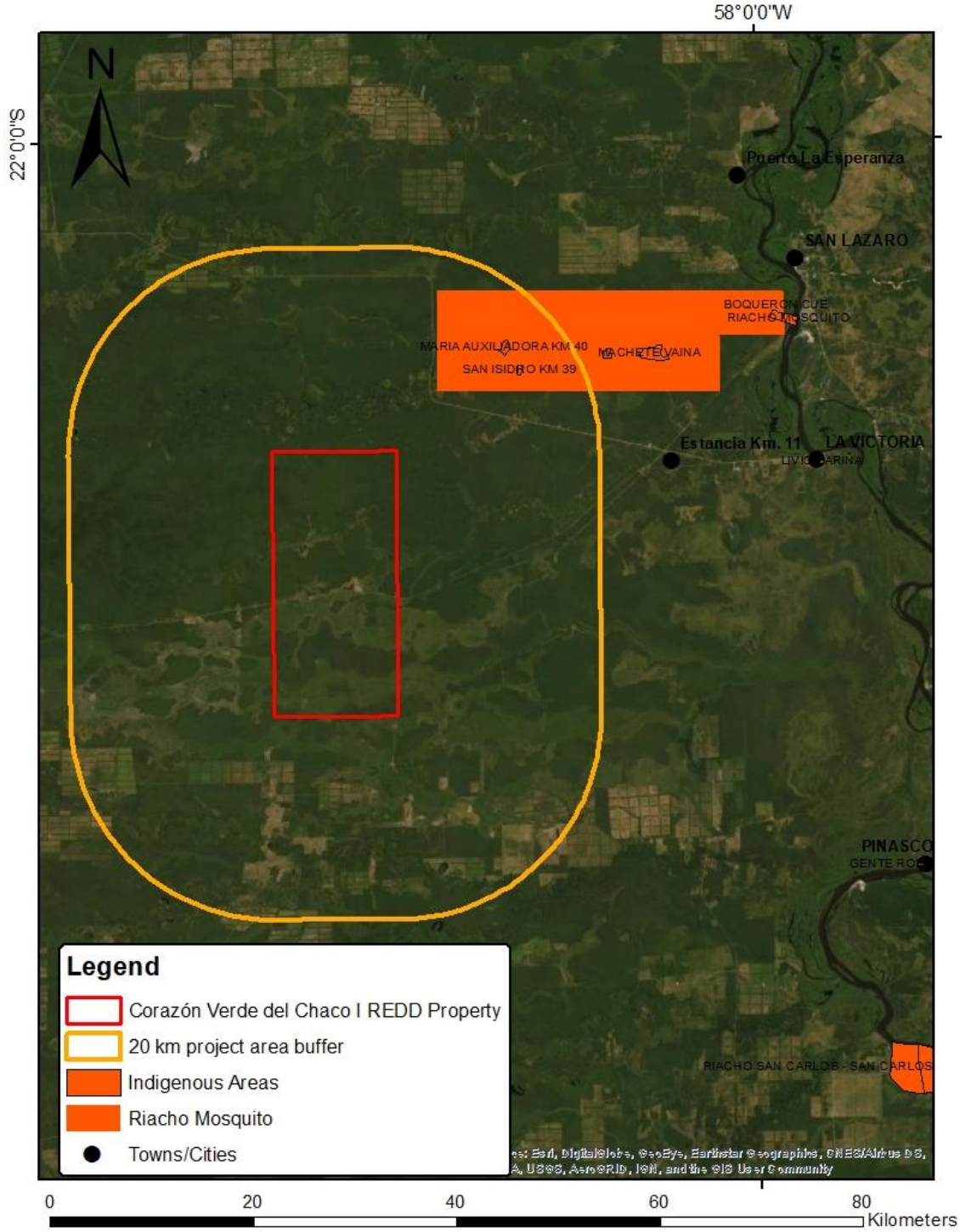
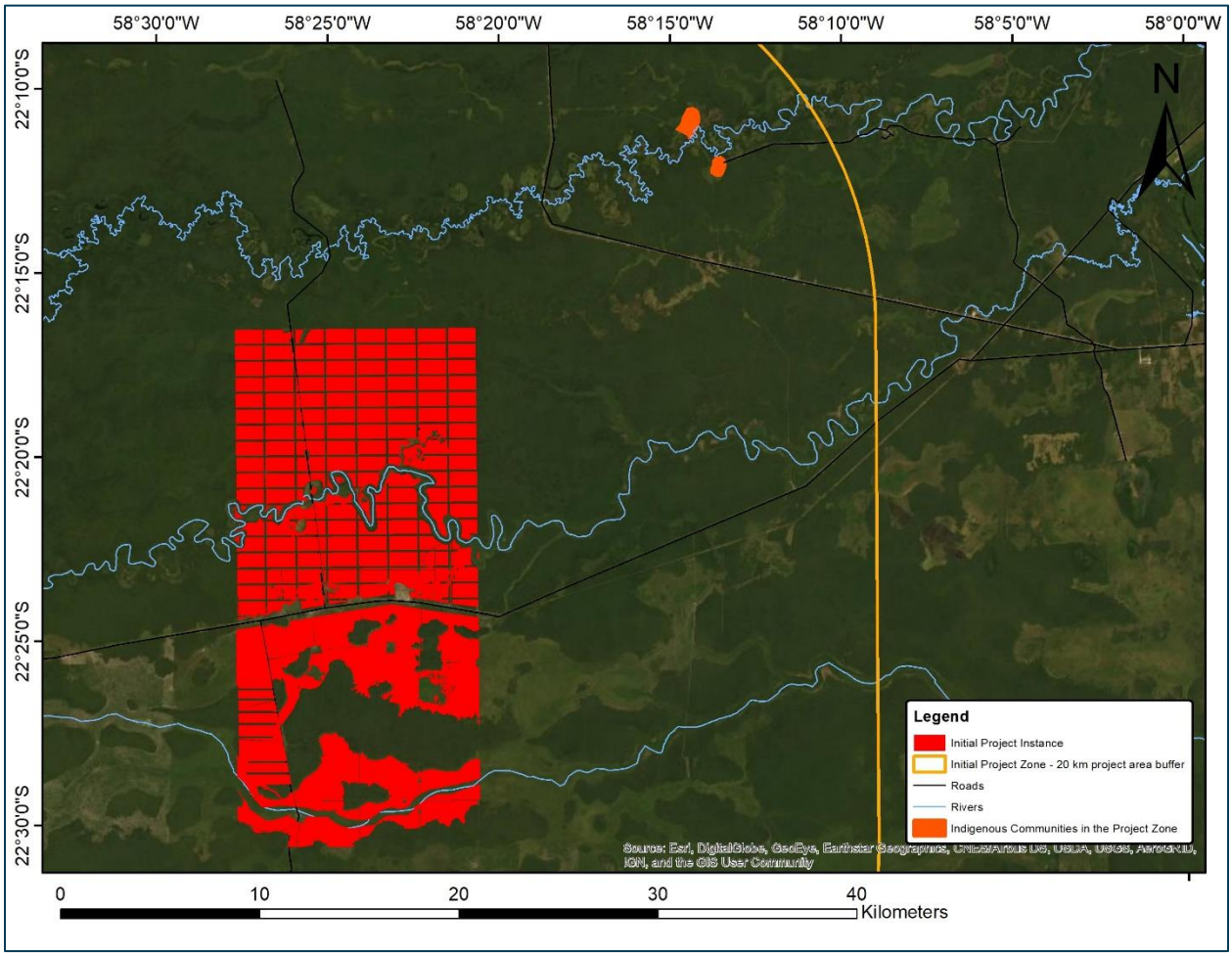


Figure 2.8b. Map of the Maria Auxiliadora and San Isidro communities' land and their HCV in the initial Project Zone.



Below is a map identifying the location of the Project's regional Chaco headquarters at Santa Rosana, the Project's local headquarters, and the visitor center, along with the location of the two guard houses.

Figure 2.8c. Map of the Project's Activities

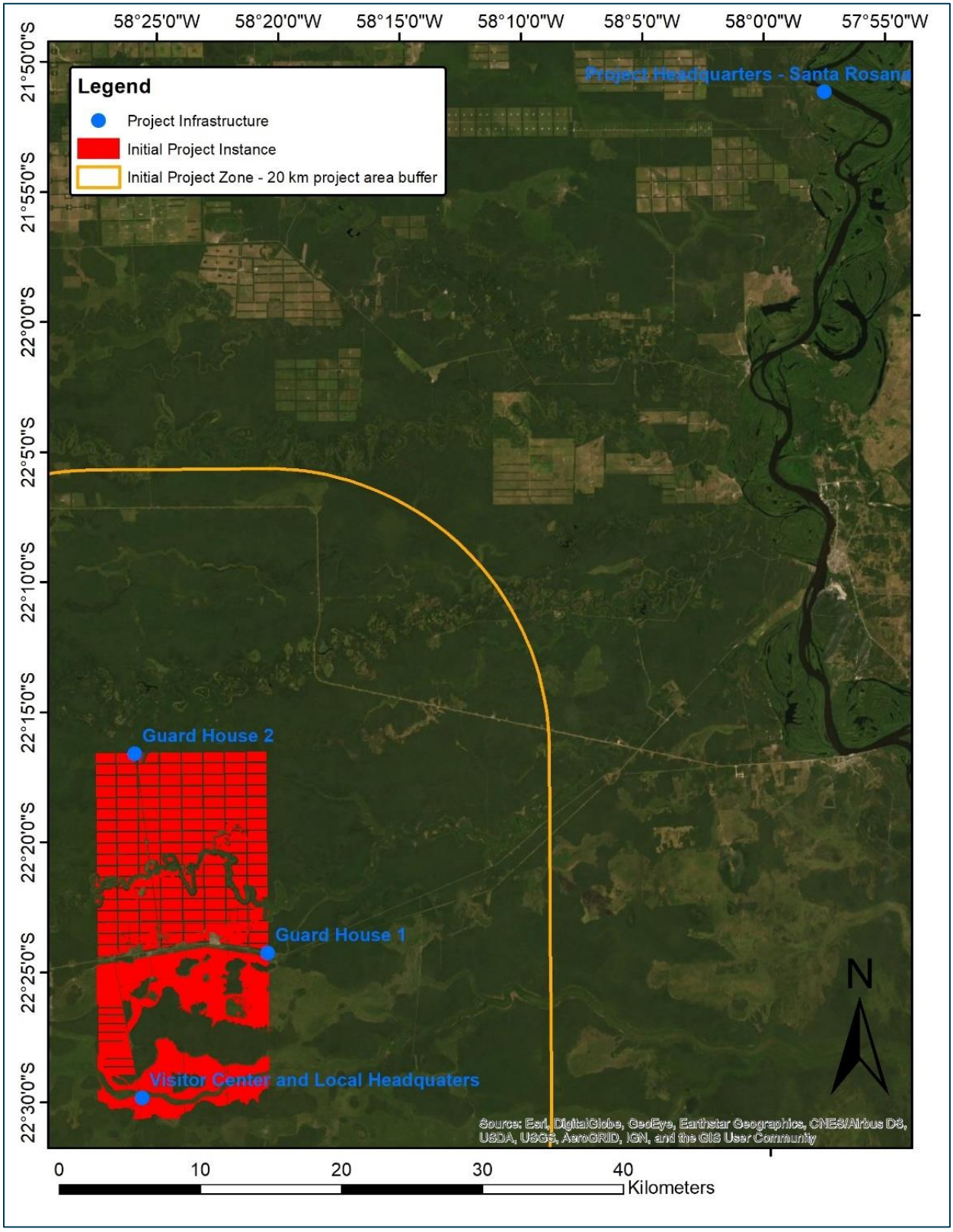


Figure 2.9. Map of the grouped project boundary.

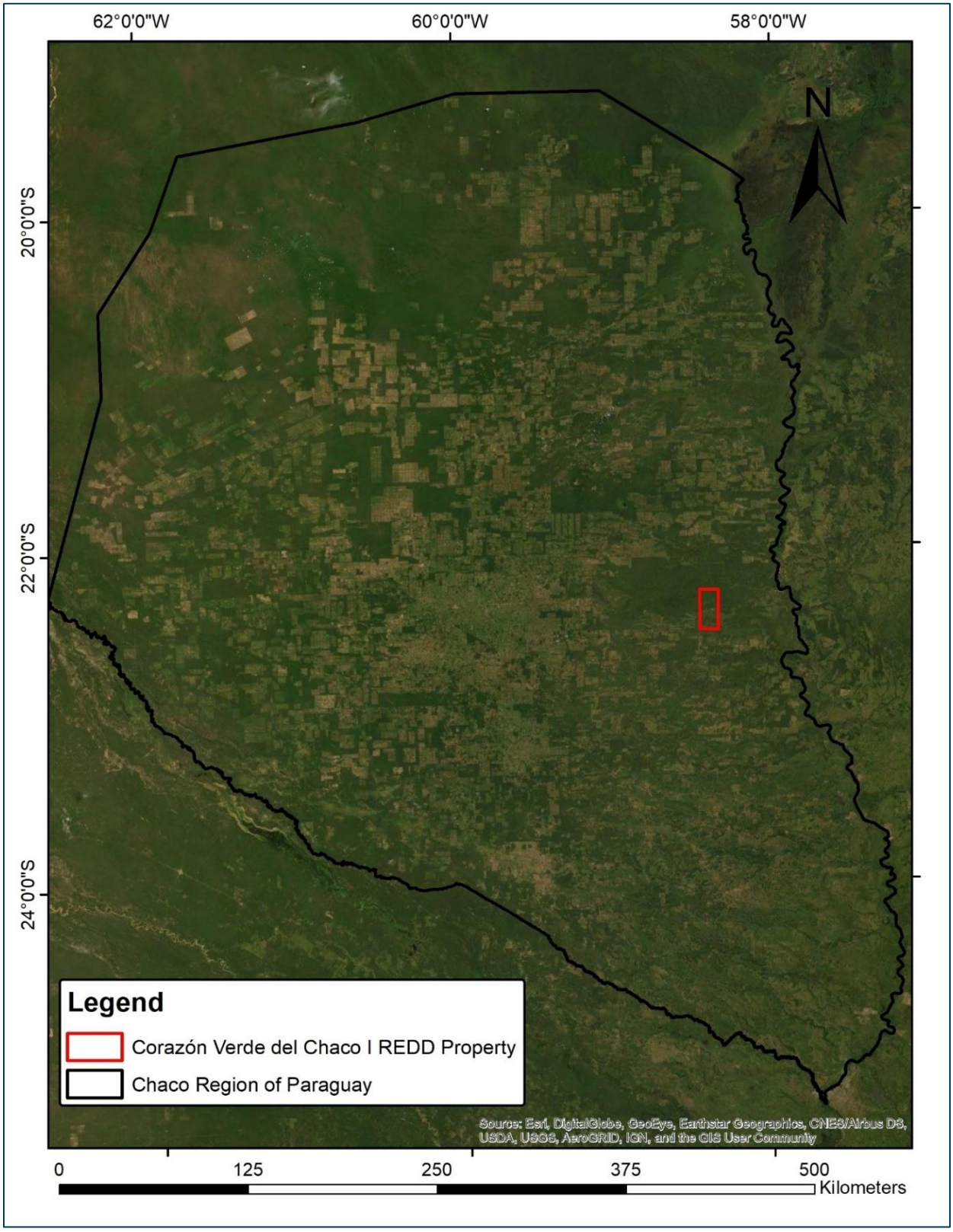
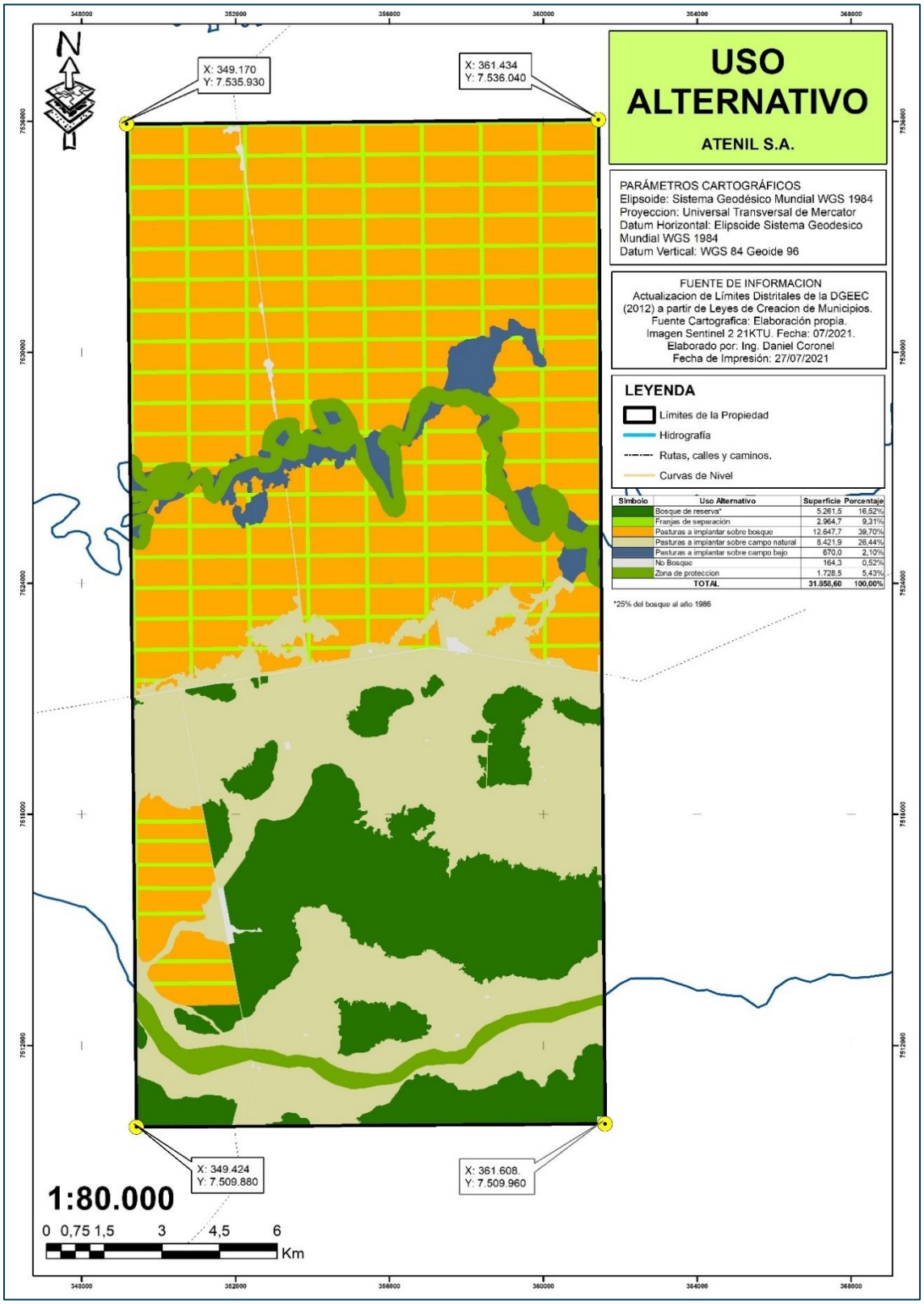


Figure 2.10. Alternative use map submitted to MADES for approval, including geodetic coordinates of the property limits.



Simbolo	Uso Alternativo	Superficie	Porcentaje
	Bosque de reserva*	5.261,5	16,52%
	Franjas de separacion	2.964,7	9,31%
	Pasturas a implantar sobre bosque	12.647,7	39,70%
	Pasturas a implantar sobre campo natural	8.421,9	26,44%
	Pasturas a implantar sobre campo bajo	670,0	2,10%
	No Bosque	164,3	0,52%
	Zona de proteccion	1.728,5	5,43%
	TOTAL	31.858,60	100,00%

*25% del bosque al año 1986

Figure 2.11. Map of the forest strata on the initial project property.

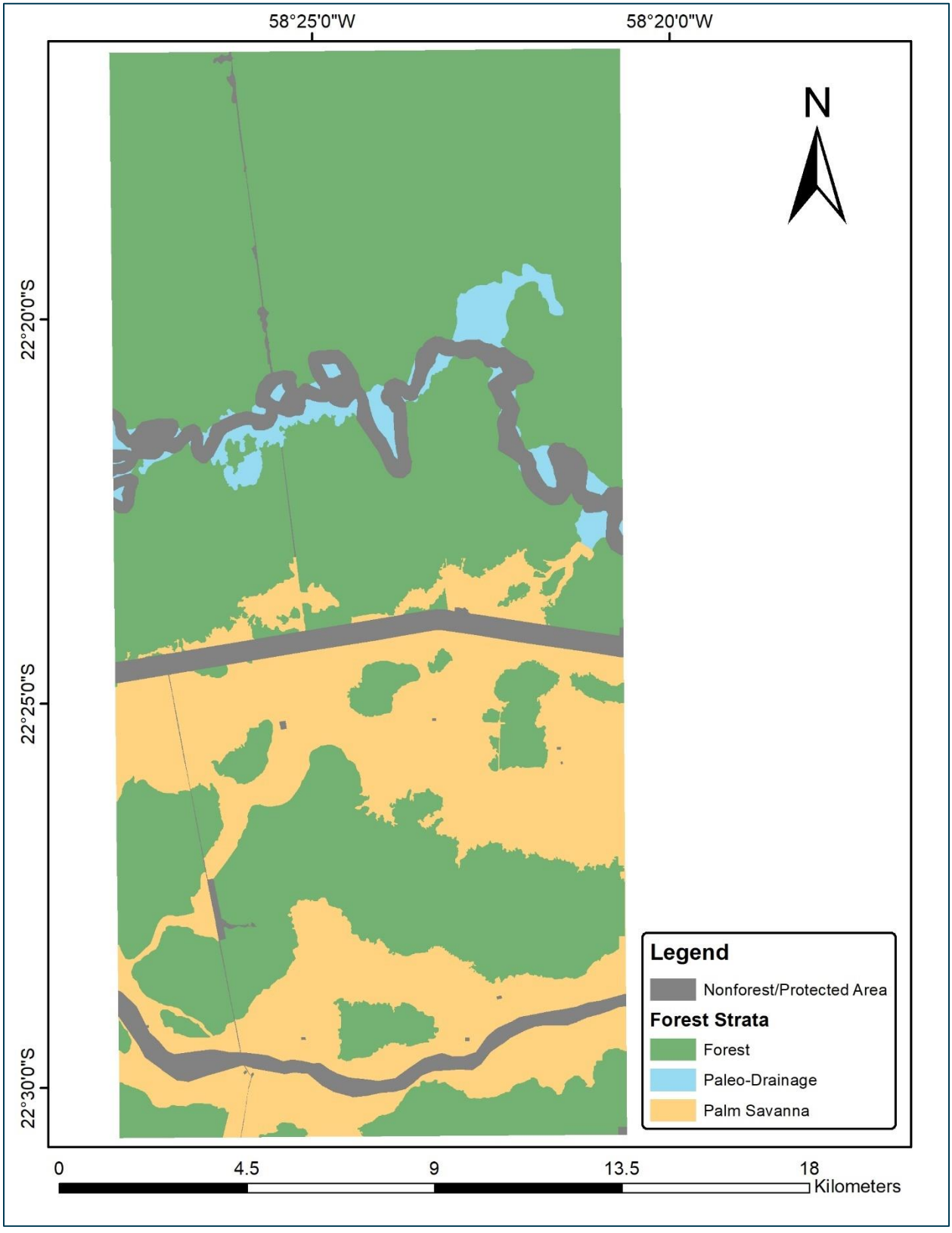
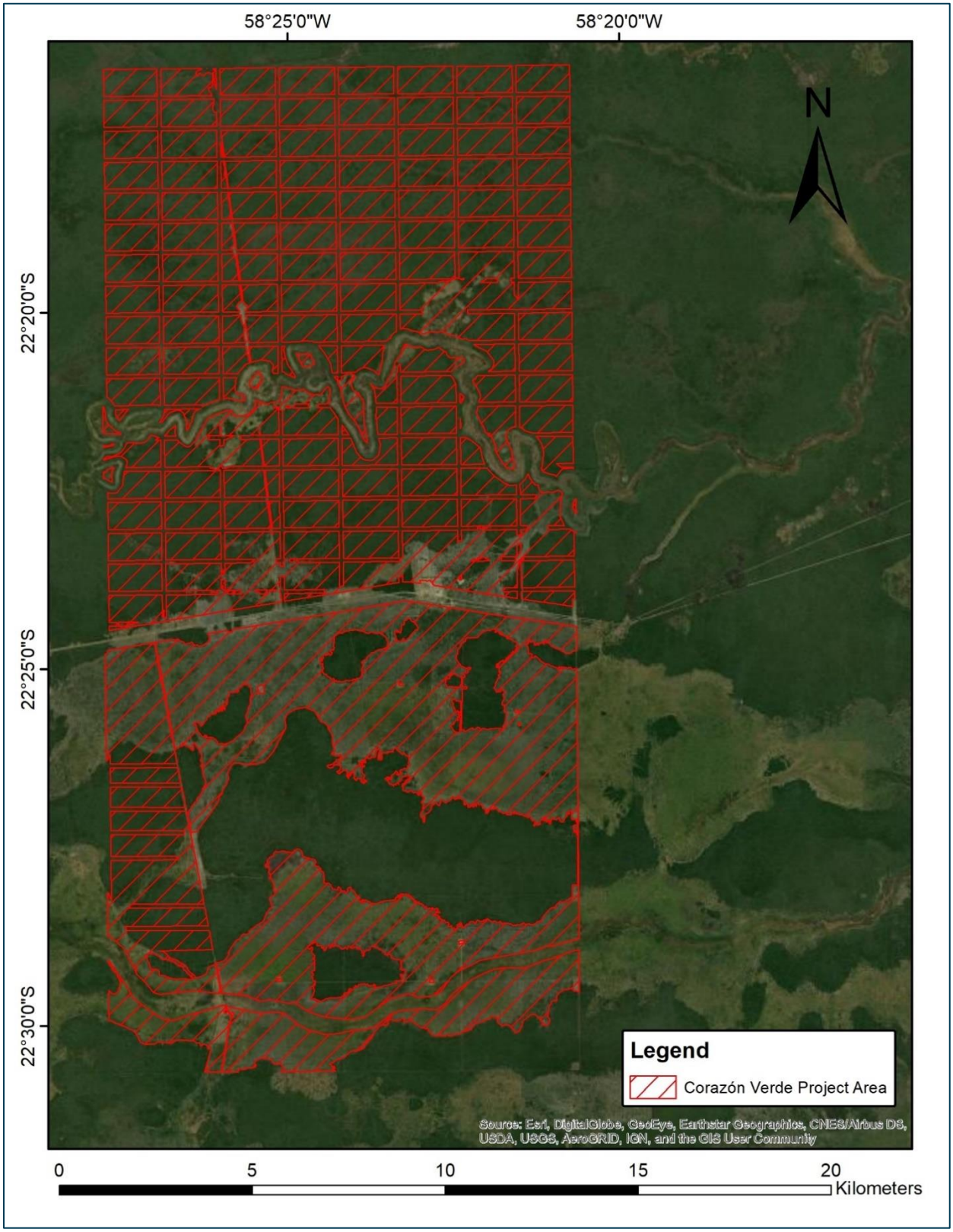


Figure 2.12. Map of the Project Area for the initial project instance.



2.1.8 Stakeholder Identification (G1.5)

The Project Proponent has conducted a detailed stakeholder identification and engagement process.

First, Quadriz, with assistance from Ostrya Conservation, brainstormed all of the potential stakeholders related specifically to the initial project instance as well as hypothetical future stakeholders for future project instances. This includes using Quadriz's local and national expertise in Paraguay, using Ostrya Conservation's extensive experience with forest carbon projects, reviewing other VCS AFOLU projects in Paraguay, and by reviewing maps. For the initial project instance, these potential stakeholders were:

- Local communities within 20-kilometers of the initial project instance;
- Local landowner(s);
- MADES;
- INFONA;
- Livieres Guggiari;
- United Nations Development Programme (UNDP);
- Inter-American Development Bank;
- Verra;
- WWF Paraguay;
- Solidaridad Network; and
- Guyra Paraguay / BirdLife International.

Please see Section 2.3.7, *Stakeholder Consultations*, for a brief writeup of the engagements with each of the stakeholders.

Stakeholders were then categorized according to: Project Proponent(s), Other Entities, Community, Primary Stakeholders, Secondary Stakeholders, and Other Stakeholders based off CARE's "Relative Influence and Importance of Key Stakeholders" framework. This Framework categorizes stakeholders based off their influence and importance, along with their rights, interests and relevance to the Project.

Table 2.1. Relative Influence and Importance of Key Stakeholders (Credit: CARE 2002)[34]

Influence of Stakeholder	**Importance of Stakeholder to Project Achievement**				
	Unknown	Low	Moderate	Significant	Critical
Low	Other	Other	Other	Secondary	Secondary
Moderate	Other	Other	Other	Secondary	Secondary
Significant	Secondary	Secondary	Secondary	Secondary	Secondary
Highly Influential	Secondary	Secondary	Secondary	Secondary	Primary

Please see Appendix 1 for more details on the stakeholder mapping including an assessment of the rights, interests and relevance of these stakeholders to the initial project instance. This approach, including the use of this Framework, will be used for additional project instances to assess communities and other stakeholders.

It is important to note, that all communities located within 20-kilometers of a project instance will be considered stakeholders. The process of identification and analysis of community groups within each community will be done through community engagement, community consultations, and via the Participatory Rural Assessment (PRA). For instance, the community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – were identified through community engagement, community consultations, and via the PRAs. These community groups are not being considered independently of each other because these community groups are harmonious and all these community groups are considered community members of Maria Auxiliadora.

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

In addition to the lead Project Proponent and the Other Entities, please see Appendix 1 for a list and description of additional stakeholders which were identified and likely have an interest in the success of the initial project instance.

These stakeholders include the two local indigenous communities known as Maria Auxiliadora and San Isidro. Neither community uses the initial Project Area. The community at San Isidro have been visited twice by Quadriz, but the community would like more time to decide whether to participate in the Project. The Maria Auxiliadora community did not foresee any costs or risks attributable to the Project for their community and appreciated the proposed benefits by the Project. Quadriz will continue to try to engage with the San Isidro community to understand whether they foresee any potential costs or risks of the Project to their community and Quadriz will offer to provide the Project's benefits to their community (if desired) and to the Maria Auxiliadora community.

For the grouped project, communities that may join the Project include all communities living within the Project Areas and all communities living within 20 kilometers of the future project instances. For the

[34] Richards, M. 2011. Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 2 – Social Impact Assessment Toolbox. Climate, Community & Biodiversity Alliance and Forest Trends with Rainforest Alliance and Fauna & Flora International. Washington, DC. https://www.profor.info/sites/profor.info/files/ForestTrends-SBIA-Part2_0.pdf. Page 29.

grouped project's future project instances, distinct community groups within a community may be considered if such distinctions are made by the community. As previously mentioned, the community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – are not being considered as distinct community groups because these community groups are all considered as harmonious community members of Maria Auxiliadora.

2.1.10 Sectoral Scope and Project Type

This Project is to be registered under the Verified Carbon Standard (VCS) as a Reducing Emissions from Deforestation and forest Degradation (REDD+) project and is being developed in compliance with the Verified Carbon Standard,[35] which contains all the Agriculture, Forestry and Other Land Use (AFOLU) specific requirements. Further, the Project is also being developed under the Climate, Community & Biodiversity Standards (CCBS), Third Edition.

Project Scope 14: Agriculture, Forest and other Land Use (AFOLU)

Project Category: Reduction Emission from Deforestation and Degradation (REDD)

Type of Activity: Avoided Planned Deforestation (APD)

Grouped Project: Yes

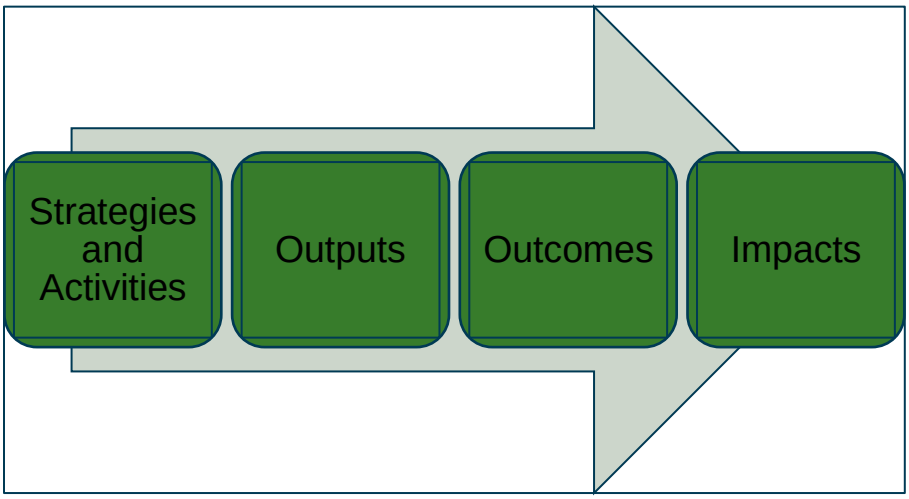
2.1.11 Project Activities and Theory of Change (G1.8)

As of 2022, there is no Jurisdictional REDD+ program operating in Paraguay. In a letter entitled "Nota Respuesta DNCC Nº 206 respuesta de apoyo registro y anidación CVCH.pdf" from Ulises Lovera at the Departamento de Mitigación, Dirección Nacional de Cambio Climático, Ministerio del Ambiente y Desarrollo Sostenible (MADES), MADES states: that it is aware of the REDD+ Projects that carried out by QUADRIZ and that the Corazón Verde del Chaco Project will be registered in the National Registry and nested in the National Program once MADES consolidates these instruments.

This Project utilizes the Theory of Change Methodology. As noted in the Social Impact Assessment Toolbox, in simple terms the Theory of Change is a roadmap drawn up by the Project Proponent and stakeholders of how the Project plans to get from Point A (project strategy and activities) to Point Z (project impacts).[36] Thus, the Project's strategies and activities will lead to outputs, these outputs are followed by outcomes, and ultimately by net positive climate, community and biodiversity impacts.

[35] Verra. 2019. Verified Carbon Standard. Version 4.0, 19 September 2019. Verra, Washington, D.C.
[36] Richards, M. and Panfil, S.N. 2011. Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 1 – Core Guidance for Project Proponents. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International, and Rainforest Alliance. Washington, DC., Page 13.

Figure 2.13. Progression from Project Strategies and Activities through Community Impacts.



To clearly define activities, outputs, outcomes and impacts, the following definitions were utilized.

Project activities are the physical or implemented activities on the ground which aim to achieve emission reductions and removals.

Project outputs are the tangible short-term results of project activities and normally take the form of products or services provided during the project lifetime and as a direct result of project funding.

Project outcomes are the direct intended results stemming from the outputs. These are short term and medium term changes experienced by project stakeholders and/or by the physical environment and are less tangible and easy to measure than outputs.

Project impacts are the end results sought by the project, especially as regards net social changes. These may occur as a direct or indirect result of project outcomes.[37]

The Corazón Verde del Chaco Project will mitigate deforestation pressures and the associated greenhouse gas emissions in the region, which is the main climate objective of the Project. The main community objective of the Project is to provide social programs to improve the livelihoods of community members living in the vicinity of the Project. The main biodiversity objective of the Project is the preservation of biodiversity, particularly medium-to-large mammals in the project areas.

The main project activities include:

- Forego Selling of Property, Then Clearing and Conversion of the Project Areas;
- Provide Health Services;
- Raise Project Awareness;

[37] Sources: Based on GEF Evaluation Office and Conservation Development Centre 2009; Schreckenberg et al. 2010.

- Patrol and Monitor Deforestation;
- Establish a Project Headquarters; and
- Monitor Medium-to-Large Mammals in the Project Areas.

Foregoing the sale of the property and the subsequent clearing and conversion of the Project Areas (i.e., to pasture and/or agriculture), along with patrolling and monitoring for deforestation, will directly align with the Project's climate objective. Improving the livelihoods of community members living in the vicinity of the Project (i.e., the community objective) will be accomplished through providing healthcare services, raising project awareness, and through established a project headquarters. To preserve the Project's biodiversity, particularly medium-to-large mammals in the project areas, (i.e., the biodiversity objective), the Project will monitor medium-to-large mammals in the Project Areas and reduce deforestation. Additional details on the main project activities can be found below.

Forego Clearing and Conversion of the Project Areas

The Project's main aim is to forego clearing and conversion of the Project Areas to pasture or commercial agriculture. The Project is undertaking a variety of measures to mitigate deforestation, from working directly with the private landowner to patrolling and monitoring for deforestation.

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Negotiate with landowner(s) to forego forest clearing for forest conservation	Signed agreement with local landowners	Validated and verified REDD+ project; generation of VCUs; local community projects	Mitigation of GHG emissions; forest conservation; and community development	Mitigating global climate change and forest conservation are essential objectives of the Project

Provide Health Services

The Project Proponent will organize "Chaco Med" and Chaco Med will be expanded as additional project instances are added to help spread the costs over a larger project. Quadriz will create a centrally located accommodation with housing and supplies for doctors, dentists and nurses with a nearby landing strip for a small ambulance aircraft to support local medical services. Regarding the landing strip, Quadriz has no plans to construct any new landing strips. Rather, Quadriz will utilize the landing strips at Loma Plata and Filadelfia, Paraguay, both of which currently exist and are well lit. In addition, Quadriz can utilize the landing strips located on most farms throughout the Chaco. It is important to note, there are no associated landing fees, rental fees, or construction costs associated with these landing strips.

Quadriz will establish a Chaco Med hub in the middle of the Projects for medical treatment and this service will be available to all Indigenous Peoples, to all local communities, and for people working on the Project. The Project Proponent is currently looking into where to house the medical services.

Chaco Med will initially be accessed by Maria Auxiliadora by contacting Quadriz which will facilitate and provide local transport to the Chaco Med Facility. This may include transport to the airstrip nearest the Maria Auxiliadora community, namely "Pista Municipal de Puerto Casado" which is located in Barrio Don Bosco (Coordinates: 22°17'13.8"S 57°55'57.7"W).

To staff the hub, the Project Proponent will set up a list of medical doctors, dentists, etc. that are retired in Europe and the United States. These retired professionals will become members and will be asked to commit to working in the Chaco for one month in their area of medical specialty. The Project will pay for their flights and the medical professionals will volunteer their time. Further, the Project will work with the Ministry of Health to make sure, that when the medical professions arrive to Paraguay, they are allowed to work (volunteer) in Paraguay and to determine how insurance works (i.e., do temporary permits need to be acquired or not). As of March 2021, two such medical professionals have been approached: Jan Cleyndert, a dentist in Monschau, Germany and JPM van Heesewijk, a radiologist in Nieuwegein, The Netherlands. It is the Project's hope that local medical professionals from Paraguay will also participate and be paid for their services.

In time, the Project would like to purchase a small plane, which in addition to conducting surveillance for deforestation, will also be used as an emergency plane taxi.

The high-level benefits of these health services are:

- It will provide much-needed services to underserved local communities;
- Chaco Med is scalable and can potentially be set up in more than one location; and
- Chaco Med will be highly visible and as such, will provide the opportunity to provide healthcare and environmental education to rural communities.

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Chaco Med	Chaco Med idea designed; Initial outreach to communities and medical professionals	Chaco Med established; Awareness of Chaco Med promoted; Chaco Med life-saving medicine / procedures administered	Increased life quality of rural communities; Increased awareness / appreciation of the Project	Helping local communities is an essential objective of the Project.

Raise Project Awareness

The Project will raise project awareness through active engagement with local communities and stakeholders, along with developing a visitor center. The Project Proponent will establish a visitor center in Puerto Casado or at the Project Property to educate local school children and tourists. In addition, the visitor center may also couple as the Project's onsite headquarters and serve as one of the bases for local forest guards. The Project Proponent has discussed working with the Ministry of Tourism for assistance with developing a small tourism hub in the Chaco. This said, there are no ecolodges, decent hotels, or visitor centers in the Chaco. The visitor center will educate visitors about:

- The pivotal role the region and adjacent train line played in the Chaco Wars between Bolivia and Paraguay;
- Global climate change, the REDD+ Project, and the importance of forest conservation;

- Biodiversity of the Chaco, with additional focus on jaguar conservation; and
- Local cultures, including Indigenous Peoples of the Chaco.

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Raise Project Awareness	Ongoing meetings with stakeholders, agendas shared, meeting notes taken, follow up items created	Education about REDD+, the Chaco, the importance of forest conservation, the carbon markets, etc.	Increased awareness and appreciation for the Chaco; Financial and nonfinancial support for the Project	Increased Project awareness is critical to generating support for the Project
Establish Visitor Center	Identify location for visitor center, decide on design features, start building or undertake renovations	Visitor center constructed, staffed, and decorated (i.e., historical maps, pictures of local wildlife, etc.)	Increased awareness and appreciation of the Chaco; education provided to local school children and tourists	Improving the livelihoods of community members living in the vicinity of the Project (i.e., such as through education) is the community objective.

Patrol and Monitor Deforestation

The Project Proponents will undertake surveillance via plane, if available, and via on-the-ground monitors. Further, the Project will regularly monitor deforestation via the periodic analysis of satellite imagery. The Project Proponent will establish several small guard houses at potential entry points to the property. Guards will be hired from the local community, if possible, and the guard houses will allow the guards to spend the night while on patrol. The guards will help minimize the risk of encroachment along with preventing illegal access and poaching. Guard houses will also serve as a visual reminder that the area is a managed conservation project, and each house will contain a sign with information on the goals of the REDD+ project.

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Hiring of local guards	Identification of potential local guards; hiring and training of guards	Initiation and continuation of monitoring for deforestation with local guards	Reduced deforestation due to early identification of deforestation threats	Reduced deforestation, and the associated mitigation of the associated GHGs, is an essential objective of the Project
Purchase of plane	Identification of plane model; Purchase or lease of plane	Initiation and continuation of monitoring for deforestation with local guards	Reduced deforestation due to early identification of deforestation threats	Reduced deforestation, and the associated mitigation of the associated GHGs, is an essential objective of the Project

Establish a Project Headquarters

Construction of the Project's regional Chaco headquarters was initiated in October 2015 at Estancia Santa Rosanna in Carmelo Peralta, Alto Paraguay, along the Paraguay River.

Photo 2.1. Picture of the Project's Chaco headquarters.

The headquarters has running water, electricity, internet connection, and provides a place for staff and visitors to hold meetings, conduct trainings, sleep, and enjoy home-cooked meals. The headquarters is adjacent to the Paraguay River, a major navigable river, and has an onsite landing strip which provides access to all the nearby project areas.

In the future, the Project will establish a secondary headquarters located closer to the Project site. To date, the Project Proponent has identified potential areas for this secondary headquarters and have started to think about the headquarters' design features.

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Choose location, purchase land for headquarters	Sites identified; negotiation for land purchase	Sale closed; land purchased	See below	See below

Design and build initial, regional headquarters	Designs / blueprints for headquarters prepared; final design determined; supplies purchased	Initial, regional headquarters built	Dedicated place for ongoing engagement with stakeholders	Increased Project awareness
Design and build secondary headquarters	Designs / blueprints for secondary headquarters prepared; final design determined; supplies purchased	Secondary headquarters built;	Dedicated place for ongoing engagement with stakeholders	Improving the livelihoods of community members living in the vicinity of the Project (i.e., the community objective) will be accomplished in part by raising project awareness (i.e., such as about the benefits offered from Chaco Med),

In 2021, Quadriz established its registered headquarters in Asuncion in order to facilitate meetings and provide a workspace for staff based in Asuncion.

Monitor Medium-to-Large Mammals in the Project Areas

The main biodiversity objective of the Project is the preservation of biodiversity, particularly medium-to-large mammals in the project areas. To preserve the Project's biodiversity, the Project will reduce deforestation by working with the private landowners to forego the sale and conversion of the project's forests and by patrolling and monitoring for deforestation. Further, the Project will monitor medium-to-large mammals in the Project Areas using motion-sensitive wildlife cameras.

The Gran Chaco Region, where the Project is located, is one of the unique ecoregions in Paraguay. The World Wildlife Fund (WWF) estimates the Gran Chaco has approximately "3,400 species of plants, 500 species of bird, 150 species of mammals, along with 220 species of reptiles and amphibians.[38] The International Union for the Conservation of Nature (IUCN) Red List is a classification of the global conservation status of plant and animal species. The IUCN Red List contains 35 results for the Chaco Region as a whole,[39] and 30 results for Paraguay.[40] These results include the endangered Chacoan peccary (*Catagonus wagneri*) and the vulnerable Chaco tortoise (*Chelonoidis chilensis*).

Activity description	Expected climate, community, and/or biodiversity			Relevance to project's objectives
	Outputs (short term)	Outcomes (medium term)	Impacts (long term)	
Reduce deforestation and monitor medium-to-large mammals	Identify camera models; identify local biologist; design study using wildlife cameras	Photographs of medium-to-large mammals; ongoing studies of Project's biodiversity	Increased awareness of and appreciation for the Project area's biodiversity	Reducing deforestation is critical to preserving the area's biodiversity.

[38] World Wildlife Fund, "Paraguay," Available: https://www.worldwildlife.org/places/gran-chaco
[39] IUCN, "Search: Chaco," Available: https://www.iucnredlist.org/search
[40] IUCN, "Search: Paraguay," Available: https://www.iucnredlist.org/search

2.1.12 Sustainable Development

Paraguay aims to achieve the 17 Sustainable Development Goals (SDGs). The following SDGs are those that are most likely to be achieved by the Corazón Verde del Chaco Project:

1) No poverty - The Project is working to increase the communities' incomes by providing access to good paying jobs, such as local forest monitors (i.e., forest guards or rangers).
2) Zero hunger - The Project is working to increase the communities' incomes which will also help reduce hunger.
3) Good health and well-being - The Project is working to provide good paying jobs which will improve workers' health and well-being. Further, Chaco Med will provide an invaluable service to the remote communities throughout the Chaco.
4) Quality education - The Project will provide training and education to workers about workers' rights and workplace safety. The visitor center will also provide educational opportunities about the importance of forest conservation.
5) Gender equality - The Project has hired both men and women with advancement opportunities available to everyone.
6) Clean water and sanitation - Access to clean water and sanitation facilities are provided to all guests and workers. In addition, the Project's activities will reduce erosion and water runoff, including runoff from cattle ranches.
7) Affordable and clean energy - The Project's electricity is primarily supplied from the Foz Iguazu Hydroelectric Plant. In the future, solar panels might be installed throughout the Project's remote areas, such as at the guard stations and the visitor center.
8) Decent work and economic growth - The Project is providing work to local communities and is developing a sustainable economic model for the region.
9) Industry, innovation and infrastructure - The Project is developing a new, innovative industry for the region which is focused on giving financial value to standing forests.
10) Reduced inequalities - The Project is seeking to reduce inequalities by providing, amongst many things, good paying jobs.
11) Sustainable cities and communities - The Project is seeking to protect the Chaco Forest and safeguard this important cultural and natural heritage. The Chaco Forest is under grave threat from deforestation and the surrounding area of Puerto Casado and La Victoria are important historical sites.
12) Responsible consumption and production - The Project, as a forest conservation project, is promoting sustainable management and efficient use of the area's natural resources.
13) Climate action - One of the main goals of the Project is to reduce deforestation and its associated GHG emissions.
14) Life below water - The conservation activities will reduce erosion and water runoff, including runoff from cattle ranches, which will benefit local waters and the adjacent river ecosystems.
15) Life on land - One of the main goals of the Project is to reduce deforestation and to conserve the rich biodiversity of the surrounding Chaco forests, including jaguars.
16) Peace, justice and strong institutions - The Project will encourage strong institutions, including the rule of law.
17) Partnerships for the goals - The Project is the result of strong international and domestic partnerships including amongst the Project Proponent, local communities, local landowners, a local university, and government officials.

2.1.13 Implementation Schedule (G1.9)

Below are some of the key dates and milestones in the Project's development and implementation.

Date	Milestone(s) in the Project's development and implementation
2013, January	Investancia Paraguay S.A. is established.
2013, May	Investancia Holding B.V. is established in the Netherlands.
2015, October	Construction of the local Chaco headquarters at Estancia Santa Rosanna is initiated.
2019, February	Quadriz B.V. is established in the Netherlands.
2020, February to April	Ostrya Conservation undertakes REDD+ feasibility study in Paraguay
2020, April 29	Development Agreement signed between Ostrya Conservation and Investancia
2020, July 1	Quadriz Paraguay S.A. and ATENIL S.A. agreed to terms for the development of a planned REDD+ forest conservation project.
2020, September 28	Letter of Agreement for Verified Carbon Unit Credits, signed between Quadriz Paraguay S.A. and ATENIL S.A
2021, March	Quadriz conducts initial community survey, known as a Degradation Survey, around Corazón Verde del Chaco I.
2021, March	Quadriz Paraguay S.A. officially registered on March 12, 2021.
2021, June	Quadriz Paraguay S.A., in conjunction with Andrea Weiler, installs the first round of wildlife cameras as part of the biodiversity impact monitoring plan.
2021, August	Quadriz conducts followed up community surveys, known as a Participatory Rural Assessment (PRA), around Corazón Verde del Chaco I.
2021, November 18	Signature of updated Letter Agreement with DRSF between Atenil and Quadriz called "Acuerdo para créditos por unidades verificadas de carbono ATENIL – QUADRIZ":
2022 (anticipated)	Expected validation of grouped REDD+ project
2022 (anticipated)	Expected registration of grouped REDD+ project
2022	Initial monitoring and verification undertaken, with subsequent verifications to take place at least every five years thereafter.
2023 (anticipated)	The tentative, second round of community surveys to take place. The plan is to undertake the community surveys approximately every two years.
2026 (anticipated)	The tentative, second round of using wildlife cameras to take place. The plan is to undertake the biodiversity impact monitoring plan using wildlife cameras approximately every five years.
2027 (anticipated)	Second monitoring and verification undertaken, if not sooner.
2030 (anticipated)	Project's baseline revision to take place.

2.1.14 Project Start Date

The Corazón Verde del Chaco Project has a project start date of July 1, 2020. On this day, Quadriz Paraguay S.A. and ATENIL S.A. agreed to terms for the development of a planned REDD+ forest conservation project. This start date is supported by a 9 July 2020 email from Marcel van Heesewijk to the law firm Livieres Guggiari stating an agreement has been reached between the parties for undertaking a REDD project in the project area and requesting Livieres Guggiari draw up a contract. GHG reduction/removal activities began on this date such that the project property will no longer be considered for conversion to a cattle ranching enterprise. This understanding was documented in the Letter of Agreement for Verified Carbon Unit Credits, signed on September 28th, 2020, between Quadriz Paraguay S.A. and ATENIL S.A.

2.1.15 Benefits Assessment and Crediting Period (G1.9)

Table 2.2. Benefit Assessment and Crediting Period details for the Corazón Verde del Chaco Project.

Period	Start Date	End Date	Total Number of Years
Initial Baseline Period	1-Jul-2020	30-Jun-2030	10
Project Crediting Period **	1-Jul-2020	30-Jun-2050	30
Benefits Assessment Period**	1-Jul-2020	30-Jun-2050	30
Project Lifetime**	1-Jul-2020	30-Jun-2050	30

**The agreement with the landowner may be renewed, thus potentially extending the Project Crediting Period, Benefits Assessment Period, and Project Lifetime.

Changes in climate change adaptive capacity and resilience, biodiversity and community well-being resulting from project activities are monitored throughout the project crediting period.

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

As noted above, there are no differences between the Benefits Assessment Period and Project Crediting Period.

2.1.17 Estimated GHG Emission Reductions or Removals

Post-2030 emission reductions results are associated with the delayed decay of belowground biomass and deadwood associated with the clearing of the project area in line with the VM0007 methodology. These emissions have been included in the Table below to inform interested parties of the full scope of baseline emissions.

Years	Estimated GHG emission reductions (tCO_2e) for the first crediting period	Estimated GHG emission reductions (tCO_2e) for the first and second crediting period
2020	247,504	247,504
2021	614,766	614,766
2022	1,101,944	1,101,944
2023	1,486,702	1,486,702
2024	1,168,781	1,168,781
2025	473,252	473,252
2026	112,983	112,983
2027	112,983	112,983
2028	112,983	112,983
2029	112,983	112,983
2030	56,492	107,867
2031	0	94,920
2032	0	69,752
2033	0	35,074
2034	0	8,868
2035	0	0
2036	0	0
2037	0	0
2038	0	0
2039	0	0
Total estimated ERs	5,601,376	5,861,365

Total number of crediting years	10	20
Average annual ERs	560,138	293,068

2.1.18 Risks to the Project (G1.10)

The Project Proponent regularly discusses the natural and human-induced risks to the Project's expected climate, community and biodiversity benefits. Such risks include:

- Encroachment into the Project Areas by local farmers;
- The presence of anthropogenic fire in this dry forest ecosystem; and
- The potential for illegal logging, hunting, or other unapproved use of the land.

This said, there are no known risks throughout the Project Zone associated with invasive species, pest or disease infestation, or risks associated with in-migration from outside communities.

The Project will regularly monitor for deforestation via onsite forest guard patrols, camera traps, and periodic review of satellite imagery. This will ensure quick identification of encroachment by local farmers or fire. Further, guard houses will be established to deter individuals interested in illegal logging, hunting, or other unapproved use of the land

2.1.19 Benefit Permanence (G1.11)

The Project will mitigate deforestation pressures and the associated greenhouse gas emissions in the region, which is the main climate objective of the Project. The main community objective of the Project is to provide social programs to improve the livelihoods of community members living in the vicinity of the Project. The main biodiversity objective of the Project is the preservation of biodiversity, particularly medium-to-large mammals in the project areas. To ensure these climate, community and biodiversity benefits of the Project are maintained and enhanced beyond the project lifetime, the Chaco Forest, particularly the Chaco Forest within the initial project instance, needs to remain as forest. To accomplish this overarching objective, the following measures are needed and designed:

- The continuing involvement and support of Quadriz, the landowner(s), universities, the Paraguayan Government, and local communities are needed to ensure ongoing management and monitoring of the project takes place. To this end, Quadriz has hired expert local staff, has training plans in place to ensure staff continuity, and ongoing stakeholder engagement plans to help ensure ongoing support;
- Ongoing funding is needed to help finance some of the activities beyond the project lifetime, such as Chaco Med, monitoring community benefits, and monitoring medium-to-large mammals using wildlife cameras. Quadriz has developed a pro forma to model the ongoing costs and revenue associated with the Project;
- Purchasing the land, donating the land to a conservation organization, placing some type of conservation easement, or extending the Project Lifetime beyond the initial 30 years is

needed to ensure ongoing conservation of the forest within the initial project instance. Quadriz is continuing to explore these potential, long-term options;

- Helping other landowners and the Paraguayan Government undertake additional conservation projects will help ensure other REDD+ projects are implemented (i.e., which would presumably last longer than the initial project instance) and such projects would further contribute to mitigating global climate change; and

- The visitor center, Chaco Med, and the educational facilities are needed to remain to maintain the community benefits beyond the project lifetime. The visitor center and Chaco Med will be implemented, even if no other project instances are added to the grouped project. Further, there is a chance the daily operations of the visitor center and of Chaco Med could potentially be taken over by local organizations after the initial 30-year period.

2.1.20 Financial Sustainability (G1.12)

The Project has developed a detailed pro forma outlining the funds needed for project implementation to achieve the Project's climate, community, and biodiversity benefits. This pro forma, which details Quadriz's budgets and models for project financing, will be provided to the independent validation and verification body (VVB). Furthermore, Quadriz has already financed several of the Project's activities, including the Project's initial headquarters and the forest carbon inventory work.

2.1.21 Grouped Projects

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

The following points will apply to all new grouped project instances.

1) All new grouped project instances will apply the project activities, technologies and/or measures in the same or similar manner as specified in the project description.

2) All new grouped project instances will meet the applicability conditions as set out in the methodology and Section 3.1.2 of the project document.

3) All new grouped project instances will be subject to the same or similar community and biodiversity without-project scenarios as set out in the original project document.

4) Contribute to project activities identified in Section 2.1.11 of the project document.

5) The geographic limit of the grouped project is the Chaco Region of Paraguay as defined by the Departments of Alto Paraguay, Boquerón, and Presidente Hayes.

6) All project instances will be subject to the baseline scenario as outlined in the project description.

7) All project instances will be subject to the additionality argument as outlined in the project description and have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.

8) All project instances will be subject to the same processes for stakeholder engagement and proceed through a free, prior and informed consent process as described in G5.

9) The Project's climate monitoring procedures, as outlined in the project description, will be applied across all of the project instances.

10) The Project's biodiversity implementation plan and monitoring description, as outlined in the project document, will be applied across all of the project instances.

11) The Project's community implementation plan and monitoring description, as outlined in the project document, will be applied across all of the project instances.

12) All project instances will be subject to the leakage accounting procedures as specified by the methodology and outlined in the project description.

The process for project expansion under the grouped project is as follows: First, Quadriz will put an agreement in place allowing the development of a forest carbon offset project on a specified parcel(s) of lands, whereby the VCUs generated from the project are transferred to Quadriz. Next, this identified land(s) will be assessed to ensure the lands will meet all of the requirements of Section 2.1.21. After signing this agreement and after the initial assessment, a forest inventory will then be performed on the property and methodological compliant GHG accounting undertaken. Community engagement and community consultations, along with community and biodiversity monitoring, will also take place. Each new project instance will be added to the Project at a subsequent verification event.

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

The Project's objective is to scale conservation activities to over 300,000 hectares. Up to this project size, the Project does not face severe scalability limits because:

- There are enough suitable lands to undertake this scale of conservation;
- There are enough workers in the region to support this level of effort;
- Project financing can be scaled; and
- Senior management at Quadriz have worked in large, multinational operations before and are familiar with the managerial, staffing, and financial requirements to achieve this scale.

Further, the Project's scale will result in more local community benefits (i.e., more employment opportunities, more advancement opportunities, etc.) and increase the region's biodiversity through maintaining the forest canopy cover.

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

Scalability limits for a 300,000+ hectares REDD+ project in the Chaco Region of Paraguay are not applicable. Likewise, there are no serious scalability limits, as each project instance will have their own funds and own management; more projects will result in more VCUs, which results in more funds and more funds will enable managing more projects. Quadriz, alongside its dedicated service providers, has

an onsite, world-class team with in-depth knowledge of the Chaco, land rights, and other legal aspects related to running REDD+ projects. This said, incorporating 300,000 hectares, or more, is the goal of this grouped project, not the Project's threshold.

2.2 Without-project Land Use Scenario and Additionality

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

Cattle production is the largest driver of deforestation in the Gran Chaco region. Paraguay has one of the highest rates of deforestation in the world, as every year in the Paraguayan Chaco, hundreds of thousands of hectares of primary forest are deforested and converted into cattle land, especially in the western Gran Chaco region. In the baseline scenario, in the event of no REDD+ project, the landowner would have sold the land to a land purchaser who would have submitted a request to convert up to 75% of the native forest into cattle land.

The UN-REDD Programme and the United Nations Environment Programme note that:

> While the eastern region [of Paraguay] has experienced large-scale deforestation and forest degradation over the last few decades, due to population and infrastructure expansion and the conversion of land for growing soya and for cattle grazing, forests in the Chaco are now under increasing pressure from the expansion of agriculture.[41]

Hansen et al. (2013) further state, "the tropical dry forests of South America had the world's highest rate of tropical forest loss between 2000 and 2012, due to deforestation in the Chaco of Paraguay, Argentina and Bolivia."[42] Historically, there was massive deforestation in Paraguay that began in the Atlantic forests in the Eastern part of the country. More recently, this deforestation, largely a result of the shifting agricultural frontier, has shifted to the Chaco region:

> Massive deforestation and the loss of biodiversity {in the Chaco} are chiefly the result of on the one hand past government policy and a legal system that have actually provided incentives for deforestation, and on the other of the absence of measures preventing increased land clearance for logging, livestock production, and large-scale mechanized soybean farming. The situation has been exacerbated by weak enforcement of existing laws, a lack of coordination in planning at national and local levels, and the negative impact of inadequate political and economic policies with regard to the stock of natural resources. Deforestation is leading to soil erosion, loss of soil fertility, and a decrease in the quantity and quality of water resources, thus constraining the livelihoods and economic productivity of farmers in the region. Both deforestation and land degradation have been reduced throughout eastern Paraguay over the last decade but are still happening at an alarming rate.
>
> Until very recently, the Chaco, and in particular the Western Chaco, represented one of the last undisturbed wilderness areas in Latin America. However, the current minimum estimated rate of deforestation is around 200,000 to 300,000 hectares per year (2005 - 2009). Land clearance for ranching is now at rates often exceeding 1,000 hectares per day. By mid-2009, 19.1 percent of the

[41] Walcott, J., J. Thorley, V. Kapos, L. Miles, S. Woroniecki and R. Blaney (2015). Mapping multiple benefits of REDD+ in Paraguay: using spatial information to support land-use planning. Cambridge, UK: UNEP-WCMC.
[42] Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice and J. R. G. Townshend. High-Resolution Global Maps of 21st-Century Forest Cover Change. Science, vol. 342 (2013). Available from http://earthenginepartners.appspot.com/science-2013-global-forest.

> whole Chaco region had already been converted to pasture, and further licenses for forest clearance had been issued to landowners. A recent analysis of economic drivers indicates the very strong likelihood that all suitable land (i.e., land not located within national or private protected areas or reserved for indigenous communities) will have been turned over to cattle production by 2025.[43]

While cattle pasture is by far the most common reason for land conversion in the Chaco at present, it is possible—albeit much less likely—that soybean agriculture will expand into the region. As a growing global commodity, soybeans can be a valuable cash crop. In South America, 7.9 million hectares of forest were converted to soy production between 2001-2015. While Paraguay has suffered deforestation at the hands of soy, this has overwhelmingly been in the east of the country and is not yet very prevalent the Chaco; in 2019, 98% of soy agriculture in Paraguay was in the Atlantic, and 86% of forest conversion for soy occurred there too. According to the World Resource Institute's Global Forest Watch, "Soy cannot yet be considered a significant direct driver of deforestation in the Paraguayan Chaco, and conversion of forests is mainly linked to other commodities."[44] Nevertheless, it is a risk, as the Atlantic forest in Paraguay has been further protected since 2004 by a Zero Deforestation law, making any conversion there illegal.

See Sections 3.1.4 and 3.1.5 for identification and justification of the without-project land use scenario and additionality as per the VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities."

Figures 2.14 through 2.19 document agricultural expansion in the Chaco, from 1990 through 2020, predominantly at the hand of the baseline agents, large agribusiness.

[43] Alberto Yanosky, "The Challenge of Conserving a Natural Chaco Habitat in the Face of Severe Deforestation Pressure and Human Development Needs," Page 378.
[44] Global Forest Watch, "The Commodity Report: Soy Production's Impact on Forests in South America," accessed https://www.globalforestwatch.org/blog/commodities/soy-production-forests-south-america/

Figure 2.14. Agricultural expansion in the Chaco, 1990. Imagery courtesy of Google Earth.

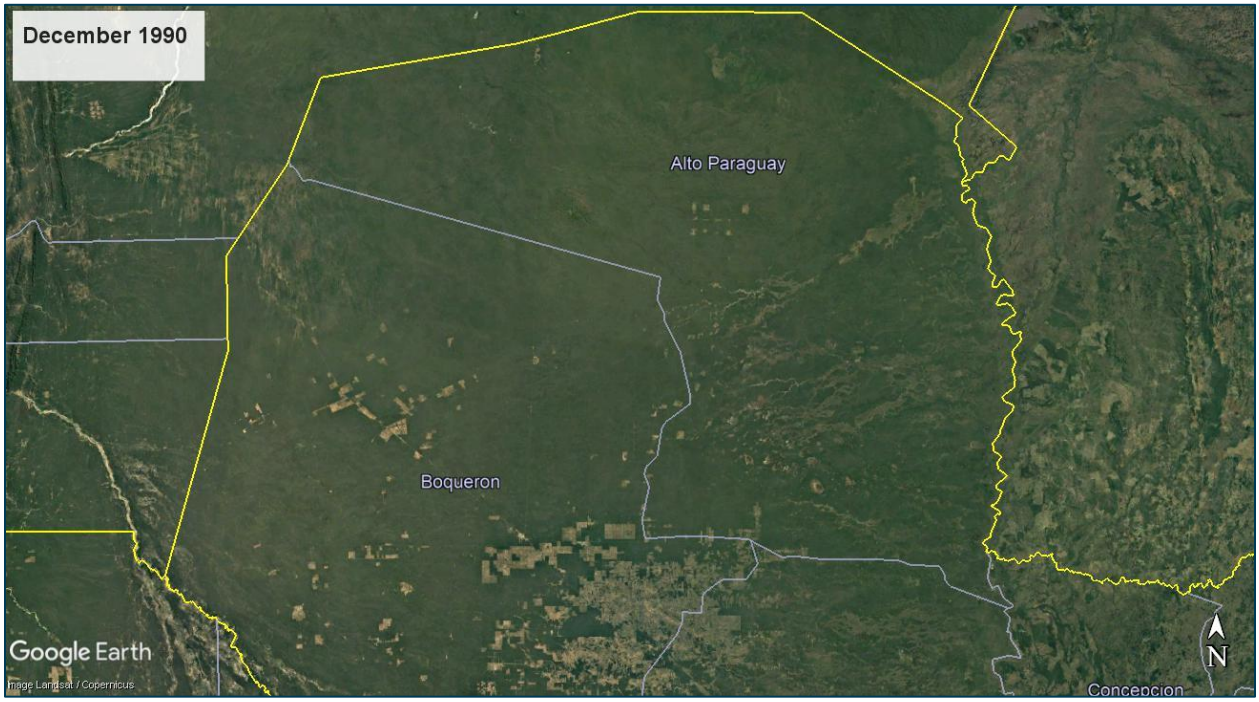


Figure 2.15. Agricultural expansion in the Chaco, 1996. Imagery courtesy of Google Earth.

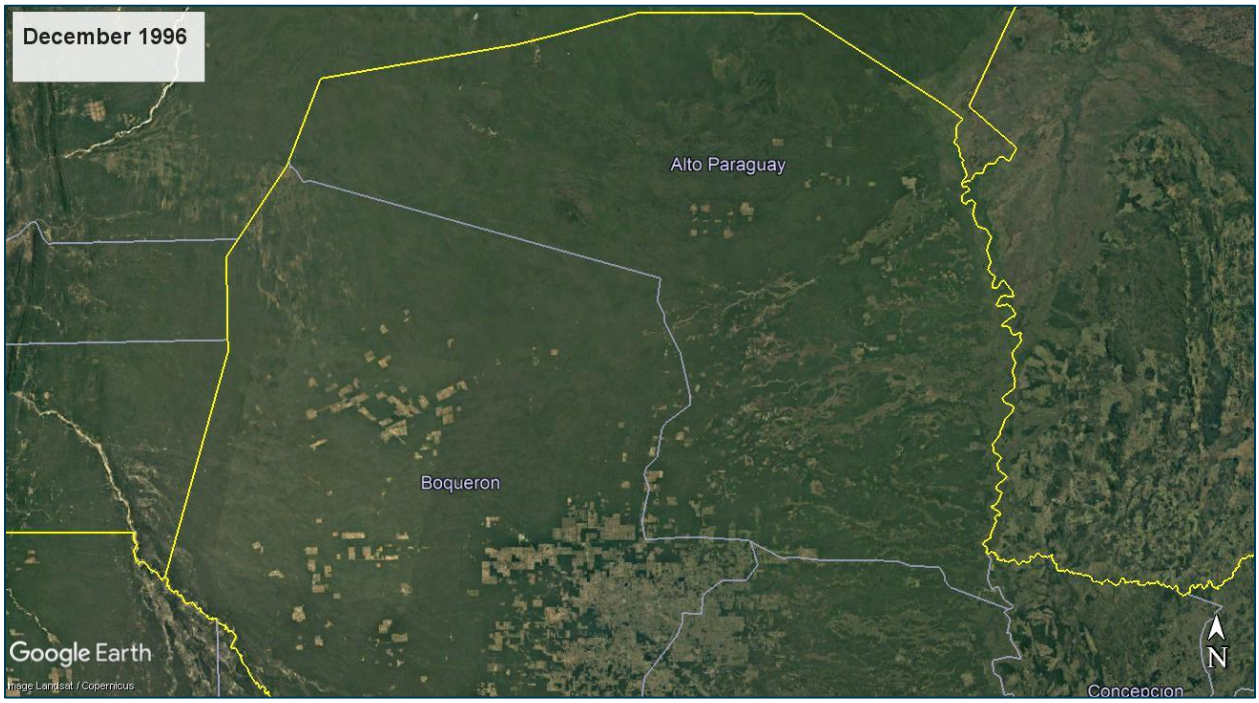


Figure 2.16. Agricultural expansion in the Chaco, 2002. Imagery courtesy of Google Earth.

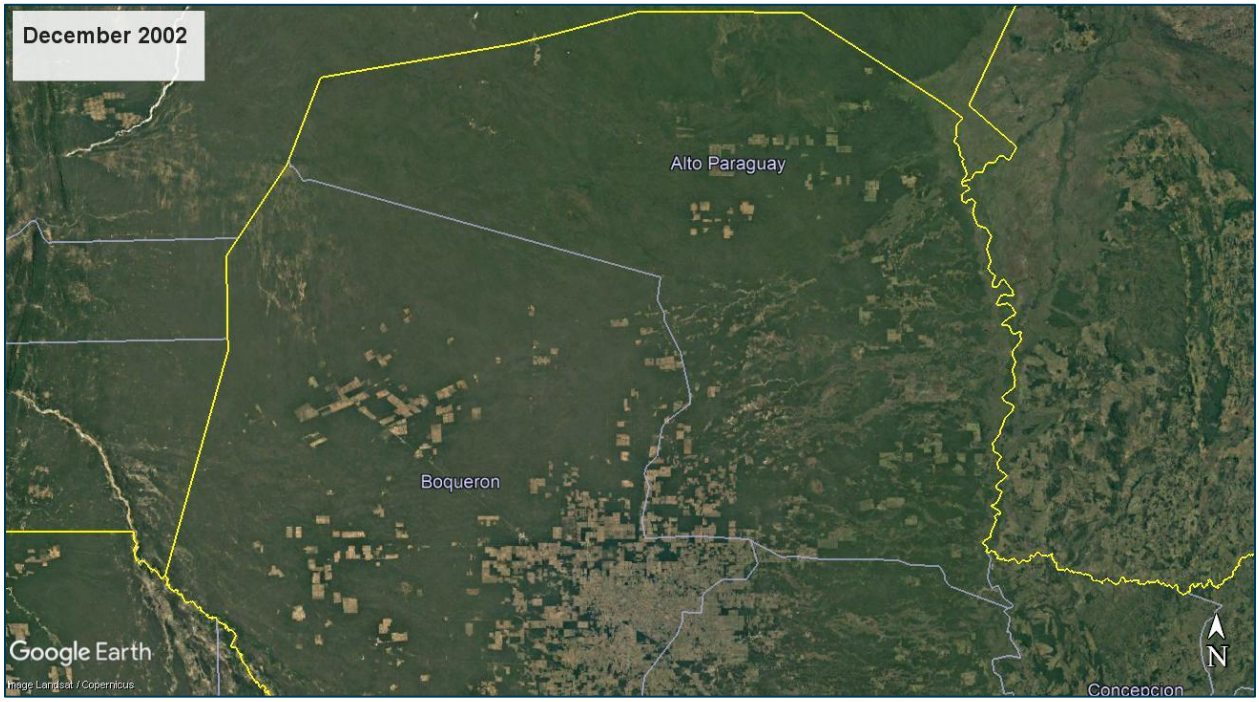


Figure 2.17. Agricultural expansion in the Chaco, 2008. Imagery courtesy of Google Earth.

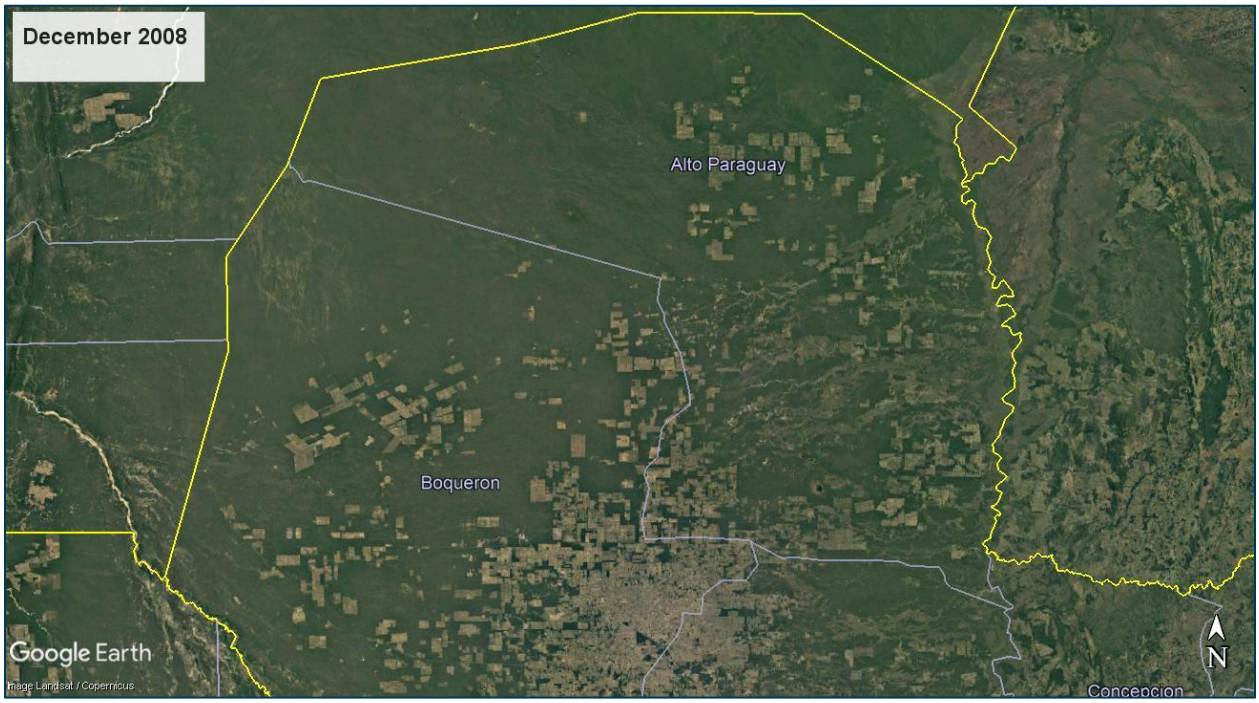


Figure 2.18. Agricultural expansion in the Chaco, 2014. Imagery courtesy of Google Earth.

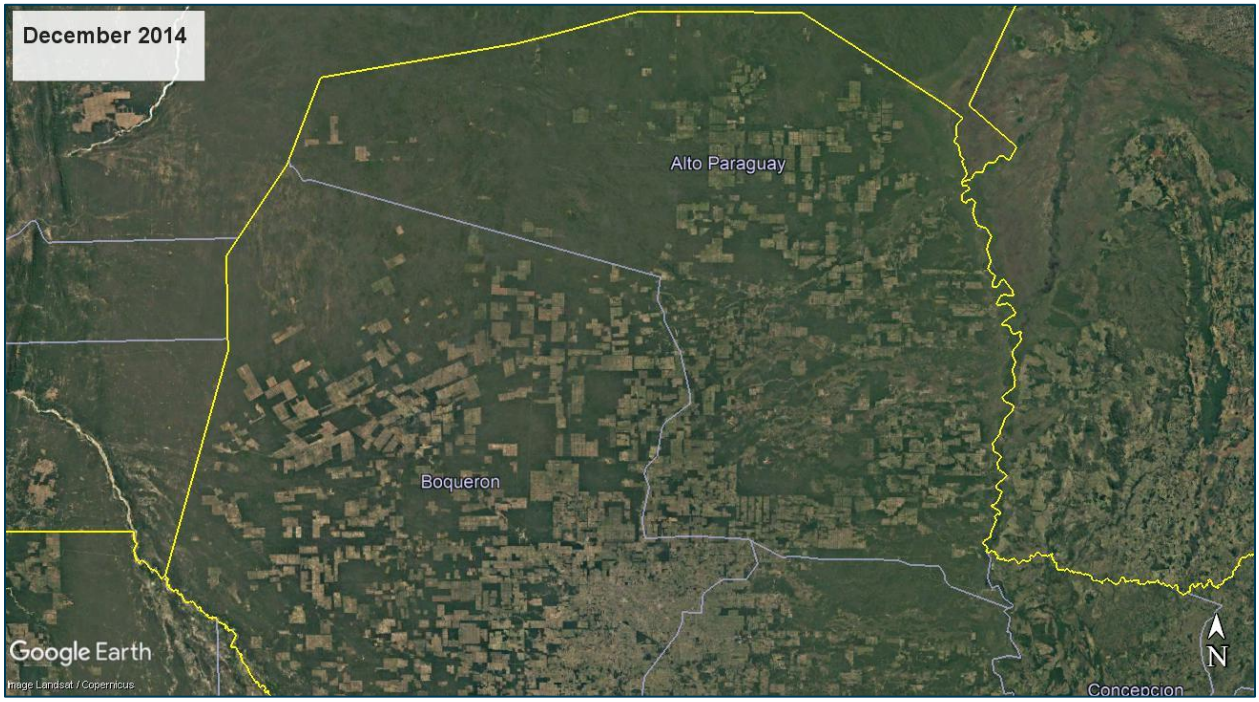
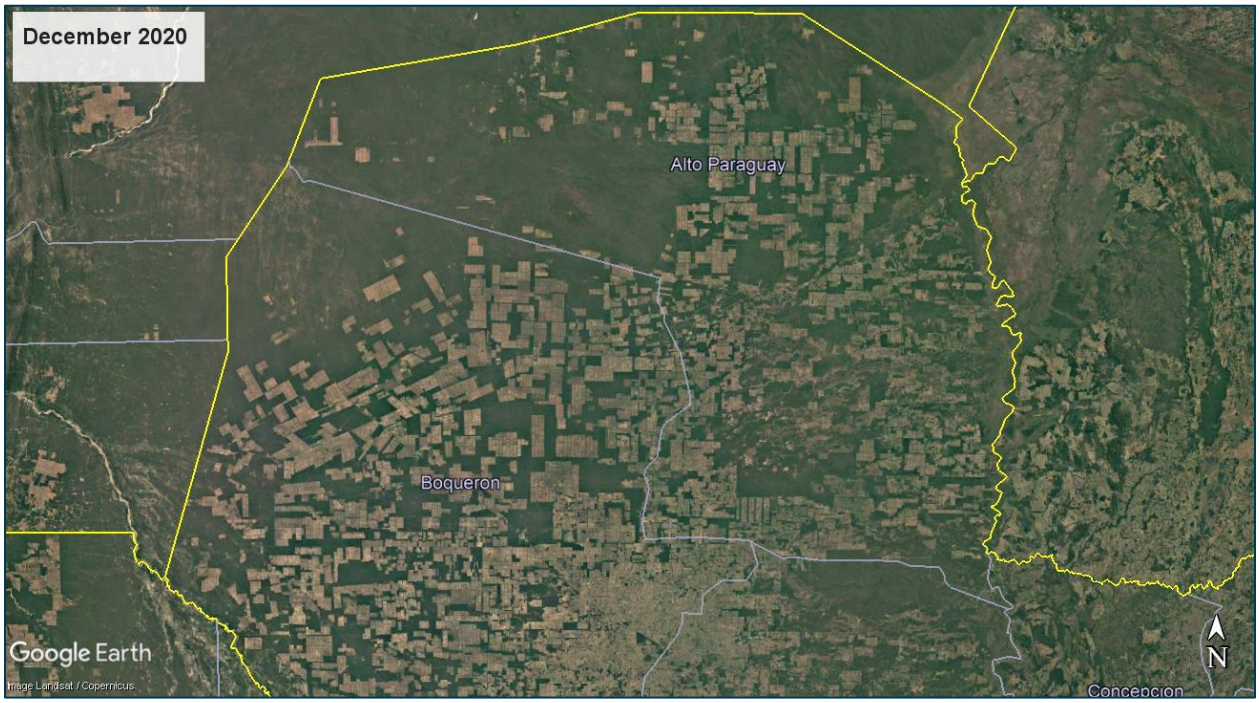


Figure 2.19. Agricultural expansion in the Chaco, 2020.



2.2.2 Most-Likely Scenario Justification (G2.1)

The most likely baseline scenario is conversion of the Project Area to pasture. Conversion of native forest to pasture is common practice in the region and is the impetus for the sales of most, if not all, large rural properties in the region.

See Sections 3.1.4 and 3.1.5 for identification and justification of the without-project land used scenario and additionality as per the VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities."

2.2.3 Community and Biodiversity Additionality (G2.2)

The VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" is applied to identify the baseline scenario of the Project, as demonstrated and justified in Sections 3.1.4 and 3.1.5. These alternative land use scenarios can be split up into two main categories including maintaining forest cover and conversion to agriculture. Community and biodiversity additionality is demonstrated as project activities would not have been implemented under the without-project scenario for any of the alternative land use scenarios.

Conversion to Agriculture

Conversion to agriculture includes both of the following alternative land use scenarios: 1) conversion to soybean agriculture; and 2) conversion to pasture. The Project's community and biodiversity benefits are additional to the without-project scenario. Without the Project, the lands would be sold and converted to cattle pastures or converted for soybean agriculture. This conversion for agricultural uses would impact a wide range of species. While several of the species photographed at the initial project instance, such as the collared peccary (*Pecari tajacu*),[45] the giant anteater (*Myrmecophaga tridactyla*),[46] and jaguar (*Panthera onca*)[47] are adaptable to living in either forested landscapes, such as the Chaco Forest, or open grasslands, there is still a threat to these species if the initial project instance was converted for agriculture. For example, large cats, such as jaguars (*Panthera onca*)[48] and pumas (*Puma concolor*),[49] are at times shot by ranchers because the cats present a direct threat to cattle and their calves.

Further, many forest dwelling animals do not utilize open agricultural land. Other species, such as the gray brocket deer (*Mazama gouazoubira*) and lowland tapir (*Tapirus terrestris*),[50] in the absence of protective forest cover and with the introduction of more roads, could become more susceptible to hunting pressures in the open grasslands[51] and agricultural land. For instance:

> Tapirs are ecologically more prone to be impacted by hunting due to long gestation and generational time. Reproduction is slow enough to make recovery difficult for the species in areas

[45] IUCN Red List, "Collared Peccary," Available: https://www.iucnredlist.org/species/41777/10562361
[46] IUCN Red List, "Giant Anteater," Available: https://www.iucnredlist.org/species/14224/47441961
[47] IUCN Red List, "Jaguar: Population," Available: https://www.iucnredlist.org/species/15953/123791436#population
[48] IUCN Red List, "Jaguar: Population," Available: https://www.iucnredlist.org/species/15953/123791436#population
[49] IUCN Red List, "Puma: Population," Available: https://www.iucnredlist.org/species/18868/97216466#population
[50] IUCN Red List, "Lowland Tapir: Population," Available: https://www.iucnredlist.org/species/21474/45174127#population
[51] IUCN Red List, "Gray Brocket Deer: Population," Available: https://www.iucnredlist.org/species/29620/22154584#population

> where there is any prolonged hunting activity. Hunting is a serious threat along the numerous new road systems, settlement and along the agricultural frontier in the Amazon basin. Hunting also occurs around logging camps and can completely eliminate the species from seemingly viable habitat.[52]

The process of rapidly clearing land with bulldozers, including the potential use of fires to clear land, can quickly overcome slow-moving animals photographed at the initial project instance such as the yellow armadillo (*Euphractus sexcinctus*), the southern three-banded armadillo (*Tolypeutes matacus*) and the giant armadillo (*Priodontes maximus*). This also includes reptiles and amphibians, which are not being formally monitored by the Project. Regarding the threat of fire and the giant anteater, "population loss of at least 30% over the past 10 years has been estimated based on local extinctions, habitat loss, and deaths caused by fires and road kills."[53] Similarly, nesting birds and burrowing animals would likely have their homes bulldozed in the process of converting the land to agricultural land. Further, depending on the when the clearing took place, the clearing could harm eggs, hatchlings, and other young offspring.

Finally, it is important to note that many species, according to Andrea Weiler, would not thrive in grasslands. This includes the giant armadillo (*Priodontes maximus*), the southern tamandua (*Tamandua tetradactyla*), the tayra (*Eira barbara*), and the lowland tapir (*Tapirus terrestris*).

Monitoring of medium-to-large mammals using wildlife cameras, including its contribution to ongoing research and understanding of biodiversity in the Chaco, would not take place in the without-project scenario.

Maintaining Forest Cover

Maintain forest cover includes both of the following alternative land use scenarios: 1) continuation of pre-project land use; and 2) the project activity on the land without being registered as a VCS AFOLU project. There is no legal requirement to undertake activities similar to the project activity, which includes reducing deforestation while simultaneously improving the livelihoods of community members living in the vicinity of the Project and preserving the Project's biodiversity. Likewise, there are no observed similar project activities in the geographical region on private lands.

By conserving the Chaco Forests, the Project will help maintain forest canopy cover, wildlife corridors, and habitat for terrestrial biodiversity dependent on forested landscapes.

Lastly, for all of the above land-use scenarios, the visitor center would not be restored, the educational center would not be established, and Chaco Med would not take place to the fullest extent[54] in the without-project scenario due to significant financial barriers. The Project activity produces no revenue, as the Project Areas will be managed for conservation purposes, rather than for commercial timber/charcoal extraction and livestock production. Costs associated with implementing project activities, project

[52] IUCN Red List. "Lowland tapir: Habitat and Ecology." Available: https://www.iucnredlist.org/species/21474/45174127
[53] IUCN Red List, "Giant Anteater: Habitat and Ecology." Available: https://www.iucnredlist.org/species/14224/47441961#habitat-ecology
[54] Chaco Med is also identified as a benefit by another project called, The Impact Reforestation in the Chaco Project. The Impact Reforestation in the Chaco Project (Verra Project ID# 2496) is being designed and implemented by Investancia, a company related to Quadriz. Chaco Med will be implemented solely by Quadriz and its REDD+ projects or solely by Investancia and the Impact Reforestation in the Chaco Project should the other project fail. However, Chaco Med will be able to provide greater coverage if being funded by both projects. Further, Chaco Med will likely receive earlier funding from Quadriz's projects due to the shorter period to validate and verify a REDD+ project versus a reforestation project.

development, and VCS project validation are significant. Additionally, while the Project will incur ongoing costs (related to management and implementation of project activities including forest patrols and social programs), it will not generate future financial benefits other than VCU related income. The Project Proponent, thus, generates no financial benefits, and therefore the outcome of a simple cost comparison shows significant project expenditure with no financial return in the absence of VCU-related income. Thus, this makes a REDD+ project impractical in the absence of carbon finance and demonstrates a clear financial barrier to project implementation.

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

There will not be any distinct community and biodiversity benefits intended to be used as offsets.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

Project documentation, including the VCS-CCB project description and the VCS-CCB monitoring reports, have been and will continue to be made accessible to communities and other stakeholders throughout the Project Lifetime in the following manner:

- The project documents are posted online at the Verra website and on the Quadriz website. If possible, the project documents will also be registered and posted on the Paraguayan Government's designated website via MADES. Thus, on MADES' website (see here: http://dncc.mades.gov.py/registro-de-reduccion-de-emisiones-en-paraguay), there will be a link to the Project's page in Verra, which has the full project documents;

- Physical copies of project documents will also be made available at Quadriz's headquarters, located at Estancia Santa Rosanna, at the visitor center in Puerto Casado, along with at Quadriz's Asunción office located at: Avda. Aviadores del Chaco 2581, SkyPark, Torre 2, Piso 12, Asunción, Paraguay;

- The project documents will be distributed to local communities and other stakeholders, including to local schools, the mayor's office, etc. For the initial project instance, the draft summary project document has been sent via WhatsApp to Patricia Villalba, the daughter of the Maria Auxiliadora community leader Hermenegildo Vera. Upon the Project achieving validation, the finalized summary documents and the finalized Project Description will be delivered in person to the Maria Auxiliadora community by Fredy Montoya and Gabriela Viñales; and

- Quadriz will plan to reach out to local Chaco TV and radio stations (i.e., such TV and radio station announcements will mention to audiences how to access the full project documents), along with posting information on its LinkedIn page. For the initial project instance, for example, the radio announcement did mention that anyone can access the full project documents by searching for the VCS Project ID# 2611 at the Verra Registry or at the Quadriz website under the blog section.

This process will be followed for the initial project instance and for all future project instances under the grouped project over the project lifetime. Further, all communities within the project instance's project

zone (i.e., within 20 kilometers of the project instance) will be eligible to receive the project's full project documents, if they are interested.

2.3.2 Dissemination of Summary Project Documents (G3.1)

As previously mentioned, the Chaco region where the Project is located is remote and there are few local communities. Nevertheless, the summary project documentation, including information required for G1.1-9, will be actively disseminated to communities. This summary information and monitoring results will be actively disseminated to communities by Federico ("Fredy") Montoya, the Field Manager at Investancia / Quadriz Paraguay S.A. and/or by Gabriela Viñales, the REDD+ Manager at Quadriz Paraguay S.A. Further, Fredy Montoya and/or Gabriela Viñales will explain the audit process, solicit public comments, and inform the local communities and other stakeholders about upcoming auditor visits. This process will be followed for the initial project instance and for all future project instances under the grouped project over the project lifetime. Further, all communities within the project instance's project zone (i.e., within 20 kilometers of the project instance) will be eligible to receive the project's summary project documents, if they are interested.

For the initial project instance, the draft summary project document has been sent via WhatsApp to Patricia Villalba, the daughter of the Maria Auxiliadora community leader Hermenegildo Vera. Upon the Project achieving validation, the finalized summary documents and the finalized Project Description will be delivered in person by Fredy Montoya and Gabriela Viñales to the Maria Auxiliadora community.

If Fredy Montoya and/or Gabriela Viñales were to leave Quadriz, there will be another person hired and trained to conduct similar work for Quadriz.

2.3.3 Informational Meetings with Stakeholders (G3.1)

Quadriz holds a variety of informational meetings with communities and local stakeholders.

Meetings with government officials, such as MADES or INFONA, are set up in advance via email or phone calls and oftentimes, an agenda is shared in advance. Such meetings take place via virtual Zoom meetings or in person at the MADES or INFONA offices in Asuncion. Such information meetings included discussions about the status of Paraguay's national REDD+ work, what map layers and data sources are available, and how private projects can register with the Paraguayan Government (See Section 2.3.7. for additional information).

Meetings with local landowners are set up in advance via word-of-mouth, phone calls, WhatsApp messages, or via email. Several meetings with the local landowner of the initial project instance, Atenil, have been held. Such meetings included discussions about the project's costs, risks and benefits, about the minimum project lifetime, and how Atenil must forego deforesting and selling the property (see Section 2.3.7. for additional information).

Personnel meetings between Quadriz and Ostrya Conservation, including with local staff, are held every 1 - 2 weeks.

The first time Quadriz made contact with the Maria Auxiliadora community, Gabriela Viñales and Fredy Montoya spoke to another indigenous leader in Puerto Casado, Francisca Centurión, who knew the Maria

Auxiliadora community well. Gabriela Viñales got the contact information for Francisca Centurión from the Atenil landowner. Francisca Centurión made the connection for Gabriela Viñales and Fredy Montoya with Hermenegildo Vera, the leader of the Maria Auxiliadora community. For the first visit, Gabriela Viñales, Fredy Montoya, and Francisca Centurión visited the Maria Auxiliadora community together. During this first visit, Gabriela Viñales and Fredy Montoya met Hermenegildo Vera, Patricia Villalba (the daughter of Hermenegildo Vera), and with other people in the community. Gabriela Viñales and Fredy Montoya also did interviews via the Forest Degradation Surveys and via the Participatory Rural Assessments with three people from the community. Also, during this first visit, Gabriela Viñales and Fredy Montoya got the cell phone / WhatsApp number for Patricia Villalba.

After the first visit to the Maria Auxiliadora community, Gabriela Viñales, Fredy Montoya and Francisca Centurión visited the nearby San Isidro community. Gabriela Viñales and Fredy Montoya mentioned they had just visited the Maria Auxiliadora, but the San Isidro community were not ready for outsiders and wanted more time to decide whether to participate in the Project.

For all future visits to the Maria Auxiliadora community, including to inform the community about the upcoming validation and ongoing verifications, Yolanda Ramos and/or Gabriela Viñales will contact Patricia Villalba via her cell phone / WhatsApp and then Patricia Villalba will inform the Maria Auxiliadora community of Quadriz's upcoming visit.

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

There are two communities in the initial Project Zone and there are no communities living in the initial Project Area. The communities in the initial Project Zone are two small indigenous communities known as the Maria Auxiliadora and San Isidro. Maria Auxiliadora has 20 families and San Isidro has 14 families.[55] The community at San Isidro have been visited twice by Quadriz, but the community would like more time to decide whether to participate in the Project. Nevertheless, community surveys known as a Degradation Survey and a Participatory Rural Assessment (PRA) were administered in March and August 2021 at the Maria Auxiliadora community in order to help identify perceived costs or risks from the community, along with the desired benefits from the Project. The PRAs were administered by Federico ("Fredy") Montoya, the Field Manager at Investancia / Quadriz Paraguay SA, and Gabriela Viñales, the REDD+ Lead Project Manager. Gabriela Viñales and Fredy Montoya are from Paraguay, speak the local languages, and visited the communities to discuss in person all aspects of the Project. The Maria Auxiliadora community did not foresee any costs or risks for their community and appreciated the benefits by the Project. The Project Proponent believes there are no costs or risks for the community at San Isidro. Further, the Project Proponent will continue to try to engage with the San Isidro to understand whether they foresee any potential costs or risks of the Project to their community and the Project Proponent will offer to provide the Project's benefits to their community.

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

The summary information on monitoring results will be actively disseminated to communities by Federico ("Fredy") Montoya, the Field Manager at Investancia / Quadriz Paraguay S.A. and/or Gabriela Viñales, the REDD+ Manager at Quadriz Paraguay S.A. Further, Fredy Montoya and/or Gabriela Viñales will explain the validation and verification audit process, solicit public comments, and inform the local

[55] Federation for Self-Determination of Indigenous Peoples. "Map." Available: https://www.tierrasindigenas.org/Mapa

communities and other stakeholders about the upcoming auditor visits. With this in mind and regarding communication methods used for the communities to inform them of the validation and verification process, Gabriela Viñales and Fredy Montoya got the cell phone / WhatsApp number for Patricia Villalba, the daughter of the community leader, during their first visit to the Maria Auxiliadora community. For all future visits to the Maria Auxiliadora community, including to inform the community about the validation and ongoing verifications, Yolanda Ramos and/or Gabriela Viñales will contact Patricia Villalba via her cell phone / WhatsApp and then Patricia Villalba will inform the Maria Auxiliadora community of Quadriz's upcoming visit.

Regarding other stakeholders, such as MADES and INFONA, these entities will be informed of the validation and verification process via email, via phone calls, and/or in person meetings.

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

Fredy Montoya and/or Gabriela Viñales will explain the validation and verification audit process, solicit public comments, and inform the local communities and other stakeholders about the upcoming auditor visits. For the onsite audit, the auditors will have direct and independent communication with both the local communities and other stakeholders.

2.3.7 Stakeholder Consultations (G3.4)

The Project Proponent has held numerous stakeholder consultations with communities and other stakeholders, including several meetings which have influenced the overall project design. A sample of these stakeholder consultations are included below:

August 16-22, 2019: Quadriz and Ostrya Conservation visit Paraguay to visit Quadriz's local Chaco headquarters and meet the local management team and local staff.

February 2-8, 2020: Quadriz and Ostrya Conservation visit Paraguay to: visit potential REDD+ project sites; meet local landowners; better understand local ecological and social conditions leading to deforestation; meet government officials in Asunción, including representatives from United Nations Development Programme (UNDP), Ministerio del Ambiente y Desarrollo (MADES; Ministry of Environment and Development) and Instituto Forestal Nacional (INFONA; National Forestry Institute); meet representative from a local forestry firm for potential forest carbon inventory work; and to meet with law firm Livieres Guggiari to better understand land ownership and carbon rights in Paraguay.

February – September 2020: Ongoing discussions with various Paraguay landowners.

June 4, 2020: Marcel van Heesewijk and Christian Nielsen of Quadriz and James Eaton of Ostrya Conservation held a call with Naomi Swickard from Verra about VCS jurisdictional baselines and Verra's work with Paraguay.

June 15, 2020: Marcel van Heesewijk, Christian Nielsen and James Eaton held a follow up call with Manuel Estrada and Angelo Sartori from Verra to further discuss VCS jurisdictional baselines and Verra's work in Paraguay.

July 1, 2020: A deal was verbally agreed upon, and within days after having reached the initial deal (on July 9), Marcel van Heesewijk informed by email Investancia/Quadriz' nominated lawyers Brigitte Urbieta and Pedro Bruno Guggiari at Paraguayan law firm Livieres Guggiari, about the details of the deal with a further request to proceed with establishing Quadriz Paraguay S.A. to lead the REDD+ project.

August 10, 2020: Christian Nielsen, Marcel van Heesewijk and James Eaton and Gabriela Viñales (Technical Specialist from UNDP) and Ulises Lovera Gaona (National Climate Change Director, MADES) met virtually to discuss VCS jurisdictional baselines for Paraguay and how to incorporate projects, how to avoid double counting.

August 13, 2020: Christian Nielsen, Marcel van Heesewijk and James Eaton gave a formal presentation to Kiantar Betancourt and Diego Puente from Atenil to explain the overall carbon markets and how REDD+ projects are developed to encourage expansion of the initial project instance under usufructo. This meeting led to Atenil requesting to change the Agreement from the original usufructo long term lease to an agreement to include Atenil as part of the project (passive landowner) with Quadriz in the role as land manager and developer of the carbon project.

September 29, 2020: Agreement signed between Quadriz and Atenil.

November 9, 2020: Marcel van Heesewijk met with Guido Cubilla, Karim Musalem (Director), Lucy Aquino (Director), and Calixto Saguier from WWF Paraguay to discuss biodiversity monitoring plans and to discuss the Indigenous Peoples charter that was prepared by WWF Paraguay.

November 10, 2020: Marcel van Heesewijk met with Pedro Bruno Guggiari from the Livieres Guggiari law firm about setting up Quadriz Paraguay and to discuss other potential REDD+ projects.

December 15, 2020: Quadriz communicated via email with WWF Paraguay for next steps, shared meeting minutes, and requested clarification on a number of points. Guido Cubilla, Karim Musalem (Director), Lucy Aquino (Director), and Calixto Saguier were included.

February 18, 2021: Christian Nielsen and Gabriela Viñales explained the Participatory Rural Assessment and the Degradation Surveys to Fredy Montoya, who was to later administer the surveys around Corazón Verde del Chaco I.

March – April 2021: Christian Nielsen visited Paraguay to meet local staff in Asuncion and at Santa Rosanna, along with to meet with a variety of stakeholders including Atenil, WWF, Andrea Weiler at the University, and additional potential project partners.

May – June 2021: James Eaton and Gabriela Viñales held an in-person training in regard to the forest carbon inventory for Fabrizio Radice Gorostiaga. James Eaton and Marcel van Heesewijk also visited additional, potential REDD+ sites during this trip.

August 2021: Fredy Montoya and Gabriela Viñales visited the San Isidro and Maria Auxiliadora communities to administer the Participatory Rural Assessments. The PRAs provided useful information on the Maria Auxiliadora community. The Project design did not change as a result of these PRAs, in part because the community is not reliant on the initial Project Area and the community did not seek additional benefits to the ones initially proposed by Quadriz. If the community was reliant on the initial Project Area,

then the Project would have revised its GHG accounting and modified its deforestation patrols. If the community sought additional benefits, the Project would have considered whether the implementation of such benefits was feasible.

January 2022: Quadriz will reach out to Guyra Paraguay / BirdLife International and Solidaridad Network, which are two additional "other stakeholders." More specifically, Gabriela Viñales will contact Solidaridad Network to learn more about their work, to inform them about Quadriz's work with REDD+ projects, and to see if there are any areas of cooperation. Regarding Guyra Paraguay / BirdLife International, Gabriela Viñales knows them from her time at UNDP and worked with them doing an environmental services project in 2018 and 2019. Gabriela Viñales will reach out to Guyra Paraguay / BirdLife International again in January 2022 to inform them about Quadriz's work on REDD+ projects and to see if they have any suggestions for modifying the project design given their previous experience working on AFOLU projects in Paraguay.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The Project Proponent will continue to communicate and consult with local communities and other stakeholders about the Project. The processes the Project will use throughout the Project Lifetime to consider this input and adapt management accordingly includes:

- Meeting stakeholders either in person, or at Quadriz's Asuncion headquarters, or at Quadriz's regional Chaco headquarters at Estancia Santa Rosanna, or at the local Chaco headquarters. Thus stakeholders, including local communities and local landowners, can meet at Estancia Santa Rosanna and this is specifically where constant feedback takes place, along with ongoing training and research;

- Using the ongoing Degradation Surveys (for communities dependent on the Project Area) and the Participatory Rural Assessments (PRAs) to identify the risks, costs, and benefits to local community members; and

- Using the wildlife camera studies to identify rare, threatened, and endemic species, along with High Conservation Value (HCV) species.

Quadriz understands that for some local communities, such as the community at Maria Auxiliadora, the distance and lack of transportation could be a major concern and could present a limitation for the community's participation. To assuage this concern, Quadriz will commit to either meet in person with these communities or will offer to provide for their transportation.

2.3.9 Stakeholder Consultation Channels (G3.5)

Quadriz has used a variety of consultation channels depending on the particular stakeholder(s), including but not limited to:

- Extensive in person meetings held in both English and Spanish with the private landowner's legal representatives in Paraguay for the initial project instance;

- Several in person meetings held in both Spanish and Guarani with the Maria Auxiliadora indigenous community, including with the community leader Hermenegildo Vera, located in the initial Project Zone. Several attempts have also been made to meet in person with the San Isidro indigenous community;

- Information sharing about developments in the carbon markets via WhatsApp;

- Ongoing phone calls and videoconferences via Zoom, Teams, etc. with a variety of stakeholders including with the private landowner's legal representatives for the initial project instance, with the Project's partners, and with government officials;

- Newsletters;

- Announcements of Quadriz's accomplishments via LinkedIn and Press Releases;

- Press Releases:

    - Spanish: https://www.einpresswire.com/article/527957314/el-proyecto-redd-m-s-grande-del-chaco-paraguayo-ya-est-en-marcha

    - English: https://www.einpresswire.com/article/527899981/largest-redd-project-in-the-paraguayan-chaco-now-underway

    - https://quadriz.com/largest-redd-project-in-the-paraguayan-chaco/

- Informational videos produced (https://www.youtube.com/watch?v=Q0SW_J9tjs4); and

- Further, periodic announcements are made on local TV and radio stations.

The Spanish Press Release was also picked up by the Filadelfia-based Chaco Communication Network (Red Chaquena da Comunicaciones or RCC in Spanish), which further distributed the press release via TV and radio.[56]

Thus, Quadriz has ensured that all consultations and participatory processes have been undertaken directly with communities and stakeholders with extensive levels of information provided about the Project.

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

There are several measures needed and designed to enable the effective participation of communities in a culture- and gender-sensitive manner. This includes:

- Quadriz's management team must, and currently does include, several local professionals, including Gabriela Viñales and Fredy Montoya. Gabriela Viñales and Fredy Montoya are both from Paraguay, both speak Spanish and Guaraní, and they understand the local culture. Speaking Guaraní is perhaps the most important aspect to ensuring culturally sensitive

[56] https://rcc.com.py/chaco/ponen-en-marcha-proyecto-de-captura-de-carbono-mas-grande-del-chaco/

communication with local communities. Gabriela Viñales, who is originally from Asunción, works from Asunción and is in frequent communication with government officials and other stakeholders. In addition, Gabriela Viñales worked on REDD+ and social safeguards while at UNDP. Gabriela Viñales also worked on REDD+ strategy for indigenous peoples during a World Bank project and from 2013 to 2015, Gabriela Viñales worked directly with indigenous communities. Fredy Montoya, who is originally from the Chaco Region, also speaks the local language Guaraní, which further helps with culturally sensitive communication throughout the Chaco;

- Quadriz will strive to have both a male and female representative present during meetings with local communities to help ensure gender-sensitivity; and
- Quadriz will either meet in person with communities or will provide for their transportation to mitigate the concerns over the lack of transportation.

2.3.11 Anti-Discrimination Assurance (G3.7)

Quadriz is proud to be an equal opportunity employer and has an experienced local team of professionals. Furthermore, Quadriz is a certified B corporation, which are "businesses that meet the highest standards of verified social and environmental performance, public transparency, and legal accountability to balance profit and purpose."[57] In the future, anti-discrimination protocols will be filed on the Estancia Santa Rosanna office and will be included in the safety manual for new hires.

Furthermore, all private landowners with suitable lands for conservation will be approached and will be considered for participation in the Project.

Thus, the measures needed and designed to ensure that all entities involved in project design and implementation are not involved in, or complicit in, any form of discrimination or sexual harassment with respect to the project are:

- The tone needs to, and is, set from the top. Thus, senior management at Quadriz has made it clear that any form of discrimination is not allowed;
- That discrimination is not allowed amongst any entities involved in project design and implementation must be clearly stated and written down. This has been done in Quadriz's new hire onboarding procedures and is contained within Quadriz's HSE Policy and Procedures manual;
- Independent assessment should take place. Thus, to help ensure discrimination is not taking place at the Project, Quadriz will continue to undertake ongoing independent CCBS audits and Quadriz will also have ongoing audits to maintain its B Corp certification; and
- There must be a mechanism for any entity who feels they have been discrimination against or been sexually harassed. Thus, the Project has a feedback and grievance redress procedure (please see Section 2.3.12).

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

Project structuring is primarily based off an agreement between Quadriz and the private landowner, with each party fully aware of their roles and responsibilities. If a conflict arises, Quadriz and the private

[57] B. Lab. "About B Corps." Available: https://bcorporation.net/about-b-corps

landowner will seek to resolve the issue. If the two parties are unable to resolve the issue, then mediation will be sought. If necessary, Quadriz will utilize the nationally competent courts, as outlined in Quadriz's Agreement with the landowners, as the third stage for any of the grievance processes.

If there are any grievances with staff (i.e., such as personnel issues), the issue will be initially handled by local Quadriz management. The office address and contact information are:

> Quadriz Paraguay
> Avda. Aviadores del Chaco 2581, SkyPark, Torre 2, Piso 12,
> Asunción, Paraguay
> Phone: 595 984865500

Larger issues (i.e., such as investor issues, issues with local landowners, etc.) will be handled by the CEO of Quadriz.

If there is any unresolved grievance with a local community or other stakeholder, Quadriz will refer the matter to the Ministerio del Ambiente y Desarrollo Sostenible (MADES; Ministry of Environment and Sustainable Development), which will act as the Project's third-party ombudsman. This said, MADES has a Safeguards Information System and has a mechanism for receiving complaints and claims related to forest carbon projects. The contact information for MADES is as follows:

> Ministerio del Ambiente y Desarrollo Sostenible (MADES)
> Dirección Nacional de Cambio Climático
> Avenida Madame Lynch N° 3500
> esq. Reservista de la Guerra del Chaco
> Phone: (021) 287-9000
> Email: onccseampy@gmail.com

MADES has a draft process for receiving, hearing, responding to and attempting to resolve grievances within a reasonable time period which takes into account traditional conflict resolution methods. In 2021, MADES finished a draft of the grievance redress system and as of February 2022, this grievance redress system was still under development.

There are many channels for filing a complaint, claim, or grievance with MADES. Likewise, the process for MADES receiving grievances will be via phone (021 287-9000), email (onccseampy@gmail.com), a form provided by MADES when visiting communities, visiting MADES in person, or in the future, via a link on the MADES website (see here for additional information: http://dncc.mades.gov.py/sistema-de-informacion-de-salvaguardas).

MADES' hearing of the complaint, claim, or grievance will be done following the procedures, which are likely to be made public in 2022. MADES would likely give the case, depending on the nature of the case, to the relevant ministry or department. For example, if the matter concerned sexual harassment, then MADES would likely refer the matter to the Ministry of Women,[58] whereas if the matter concerned labor discrimination, then MADES would likely refer the matter to the Ministry of Labor, Employment and Social Security.[59]

[58] Ministry of Women. "Home." Available: http://www.mujer.gov.py/.
[59] Ministry of Labor, Employment, and Social Security. "Home." Available: https://www.mtess.gov.py/.

Responding to and attempting to resolve the grievance will likely be done by MADES and will likely be done within 90 days. The specifics of responding to and attempting to resolve the grievance by MADES are in the draft plans. It is Quadriz's belief that for instance, the Ministry of Labor, Employment and Social Security would facilitate mediation, depending on the problem. Further, it is Quadriz's belief that such grievances referred to MADES and the Project's responses will be documented and made publicly available.

As of February 2022, the MADES grievance procedure is still in draft form, and it is unclear whether MADES will utilize arbitration or the courts as part of its third stage for any of the grievance processes.

With respect to how the feedback and grievance redress procedure will be publicized and accessible, more detailed information about this grievance redress procedure (upon MADES' completion and public posting of its procedures) will be provided in future summary documents and future monitoring reports and will be communicated to directly to communities (particularly the Maria Auxiliadora community for the initial project instance) and other stakeholders.

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

The aforementioned grievance procedure will be posted at Quadriz's Asuncion office and at Santa Rosanna, eventually posted at the visitor center, included in the summary documents, and in the full project documentation.

Quadriz's feedback and grievance procedure will be publicized and accessible via the Project's CCB-VCS Project Description, in the Summary Documents (Both English and Spanish), and in the ongoing CCB-VCS Monitoring Reports.

Staff, upon being hired, are made aware of this procedure. In addition, the feedback and grievance procedure will be posted at Quadriz's offices, and any feedback or grievances raised as part of the 30-day public comment period will be publicly posted.

2.3.14 Worker Training (G3.9)

There are numerous measures needed, and designed, to provide orientation and training. This includes:

- Orientation for a wide-range of stakeholders, from European and United States-based investors to local landowners, to local Quadriz employees, to Paraguay Government officials, about the importance of the Chaco, REDD+ projects, and how the carbon markets work, has been provided;

- Trainings have included, but are not limited to:

    - James Eaton of Ostrya Conservation and Gabriela Viñales of Quadriz provided in-person training on standard procedures for a forest carbon inventory to Fabrizio Radice Gorostiaga and his inventory team;

    - Guards will be trained by local Quadriz management, and a Standard Operating Procedures (SOP) document will be developed by Quadriz. This SOP will provide

guidance for what the guards should do, for instance, if they see deforestation, illegal logging, poaching, or in-migration;

- The wildlife photography crew were briefed on the Project and were trained on how to identify particular species, such as the Chacoan Peccary;
- Christian Nielsen and Gabriela Viñales explained the Participatory Rural Assessment and the Degradation Surveys to Fredy Montoya; and
- Andrea Weiler from the Universidad Nacional de Asunción (National University of Asuncion) provided training to Fredy Montoya about how to conduct preventative maintenance on the wildlife cameras, along with how to replace the cameras' memory and batteries. In addition, Yolanda Ramos is a biologist and she will be in charge of the biodiversity monitoring plan for Quadriz.

Future orientations and trainings will include:

- Training for local guards on how to do their jobs (i.e., anti-poaching operations);
- Orientation to participants in Chaco Med; and
- Orientation at the visitor center.

The orientation and training that has taken place, along with future orientations and trainings, are intended to build locally useful skills and knowledge to increase local participation in project implementation. Quadriz has already hired local personnel, including for management positions, such as Yolanda Ramos, Fredy Montoya, and Gabriela Viñales. These Quadriz personnel have received orientation and training, for example, on implementing private forest carbon projects, conducting community surveys, and conducting biodiversity impact monitoring. These skills and knowledge are becoming even more locally useful as Quadriz seeks to expand into additional project instances and thus, there will be more career opportunities and more trainings for local GIS specialists, local forest inventory teams, local biologists, and local project managers. To help further their knowledge, ongoing training will take place on matters such as understanding new carbon methodologies, new approaches to forest inventory, and the latest developments in the voluntary carbon market industry. Further, the skills and knowledge being taught may also lead to local personnel pursuing degrees, or teaching, environmental engineering and forest engineering degrees at the university level.

Quadriz has a few approaches to help ensure local capacity is not lost through staff turnover. First, there is a lot of cross training. For instance, Gabriela Viñales is providing a lot of training and orientation to her colleague Yolanda Ramos and James Eaton of Ostrya Conservation is teaching several members of the forest carbon inventory teams. Second, there are written plans being developed (i.e., such as a general biodiversity monitoring plan and the HSE Policy and Procedures manual) and lots of information, sources, lessons learned, etc. are being documented in the Project's project documents. Most, if not all, of this information is being remotely backed up in case of staff turnover, so that such information is not lost. Lastly, Quadriz will request that all departing staff give a sufficient notice so that some of their local capacity can be properly handed over.

2.3.15 Community Employment Opportunities (G3.10)

Quadriz will employ people from the nearby villages of Puerto Casado, Vallemi and the vicinities, following Quadriz's standard company recruitment policies and procedures. This includes reaching out to indigenous communities in the vicinity.

People from these communities will be given an equal opportunity to fill all work positions, including management positions, if the job requirements are met. Workers will be selected for their positions based off their merit and availability. New hires start on a grace period and if everything works out, the new hire will stay on.

There are several measures needed, and designed, to ensure community members, including women, vulnerable, and/or marginalized people, are given a fair chance to fill positions for which they can be trained. These measures include:

- Positions are announced on the local radio to ensure everyone can hear about open positions and listeners are informed about how to apply; and
- Puerto Casado is a relatively small city, where word-of-mouth spreads fast.

With respect to measures designed to ensure community members, specifically indigenous community members from the Maria Auxiliadora, are given a fair chance to fill positions for which they can be trained:

- First, Quadriz has actively reached out to the Maria Auxiliadora community to inform the community about the Project, its goals, its potential impacts and benefits, and about potential positions available in the future;
- Next, this engagement and consultation process has led to trust between Quadriz and the Maria Auxiliadora community and there is now open communication between both;
- Although there are few positions to fill for the first project instance, Quadriz has committed to informing the Maria Auxiliadora community about open positions, such as when Fredy Montoya needs help in the field with building infrastructure and undertaking maintenance-related work.

Potential employment opportunities for local communities, include:

- Assistance with community and biodiversity studies;
- Project management positions;
- Forest patrols/guards;
- Helping with Chaco Med;
- Assistance to with the forest carbon inventory; and
- Workers to build and/or renovate the visitor center and/or health clinic.

2.3.16 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

According to the International Labour Organization, there are several relevant laws and regulations related to workers' rights in Paraguay. These include:

1. Constitution of the Republic of Paraguay (CRP), of 1992 as amended to 2011 - Constitución de la República de Paraguay de 1992;

2. Law establishing the Labor Code (CT), No. 213 of 1993 - Ley que establece el Código del Trabajo, No. 213 de 1993 1993;

3. Law (LNCSP) that regulates the Collective Bargaining of the Public Sector, No. 508 of 1994 - Ley que regula la Negociación Colectiva del Sector Público, No. 508 de 1994; and

4. Law (CPT) that sanctions the Labor Procedural Code, No. 742 of 1961 - Ley que sanciona el Código Procesal del Trabajo, No. 742 de 1961.[60]

The measures needed and taken by the project team to inform workers about their rights includes:

- Providing orientation to new hires;

- Providing a safety manual, which outlines worker's rights; and

- Posting what is required by law (i.e., for example, minimum salaries) on the wall at Estancia Santa Rosanna.

Furthermore, phone numbers for emergency services are publicly posted at the headquarters. This said, Quadriz assures the Project meets or exceeds each of the relevant laws and regulations related to worker's rights in Paraguay.

2.3.17 Occupational Safety Assessment (G3.12)

Some of the relatively substantial risks to worker safety that could arise due to project implementation are detailed below.

Snake Bites – Snake bites, particularly several species of coral snakes and vipers, pose a substantial risk to all visitors to the Chaco.[61] To help mitigate this risk, snake bite anti-venom is stored at the Project's headquarters in Santa Rosanna. Further, snake bite anti-venom will eventually be located at the Chaco Med health clinic and project visitor center.

Other Wildlife – One potential occupational risk, particularly for biologists, forest inventory team, and forest guards is other wildlife, such as jaguars. However, these individuals are familiar with the working conditions in the Chaco. To mitigate this risk, all personal visiting the project site will be briefed on the wildlife they may come into contact with and safe courses of action to take when in close proximity to common wildlife species.

[60] ILO, "Paraguay – 2016," Available: https://www.ilo.org/dyn/irlex/en/f?p=LEGPOL:1000
[61] Fauna Paraguay, "Gallery of Reptiles," Available: http://www.faunaparaguay.com/imagesreptiles.html

Tropical Diseases – The main tropical diseases in the Gran Chaco are Chagas disease, dengue fever, and Zika virus. The Project Proponent, along with visitors and affiliates, will be encouraged to take precautions by using bug spray, sleeping with mosquito nets, and taking vaccines (if applicable).

Getting Lost - Getting lost in the Chaco is a real concern as navigation and mobile phones do not work well in many parts of the Chaco and the Chaco dry forests can be very dense. To mitigate the risk of getting lost, all project participants will be encouraged, if not required, to travel with locals who are familiar with the area and know the Chaco well.

Driving Around the Chaco – Driving at night, driving during flooded conditions, and driving on roads with dust clouds can create potentially hazardous conditions. To mitigate these risks associated with driving, Quadriz will only use drivers with extensive knowledge of these local conditions.

Heat and Dehydration Related Illnesses During Fieldwork – The Chaco's high summer temperatures can lead to heat and dehydration related illnesses, particularly during fieldwork. To mitigate the risk of heat and dehydration related illnesses, the following measures will be undertaken:

- Fieldwork, including forest inventory work and onsite independent audits, will be prioritized for transition periods during the wet and dry season to minimize the chances of heat related illnesses;
- Fieldwork will be prioritized for early morning or early evening to avoid the midday sun;
- Supplies, such as water and suntan lotion, will be provided to visitors by Quadriz; and
- All visitors to the Project will be informed of these potential risks.

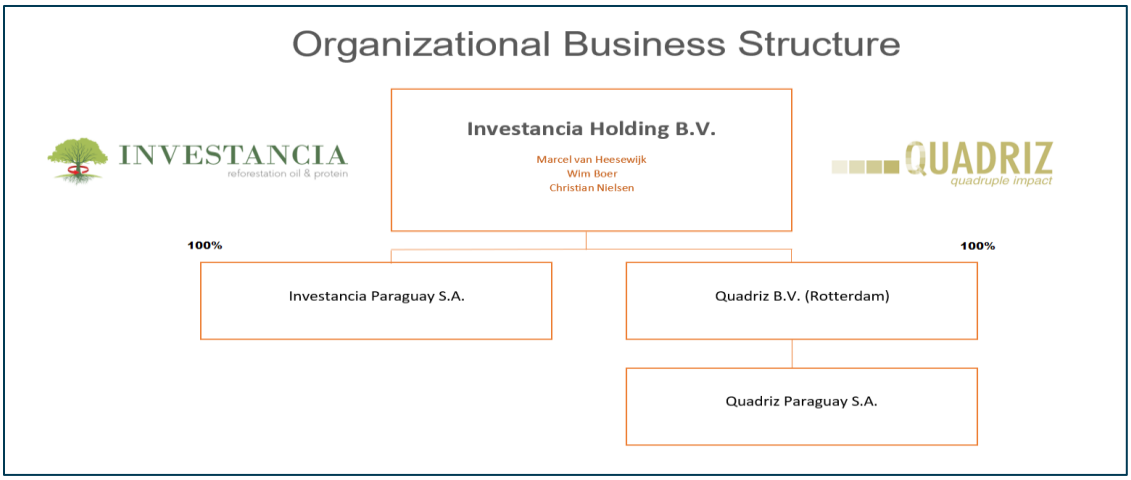
Potential Hostile Confrontations with Illegal Hunters or Illegal Loggers – There is a potential for illegal hunting and illegal logging at the Project and inadvertent confrontation with these actors could lead to a hostile situation. To mitigate the potential of encountering illegal hunters or illegal loggers in the first place, the Project will employ forest guards who will regularly patrol the area for such activities. Further, visitors will be informed of these risks and on most occasions, visitors will be accompanied by a representative from Quadriz, particularly Fredy Montoya, who is familiar with how to deescalate the situation.

These risks, including any future risks identified, will be added to the latest version of the HSE Policy and Procedures manual to help inform workers of the Project's known risks.

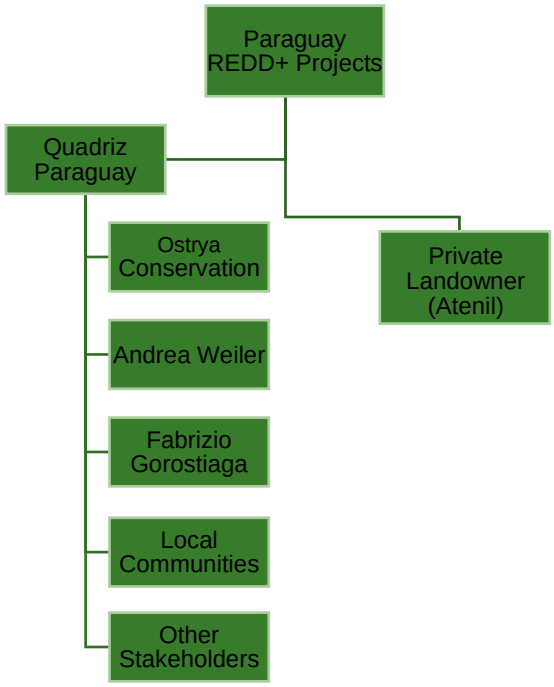
2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The following is the organizational chart for Quadriz and Investancia. Please note, Investancia is specifically focused on reforestation and Pongamia tree propagation activities, while Quadriz is the sole entity directly involved in REDD+ activities and is the designated entity to sell all VCUs from both project activities.



Further, the organizations involved in project development, project implementation, and project monitoring are listed below:



To further clarify the roles and responsibilities for these organizations:

- Quadriz Paraguay: Quadriz Paraguay is the Project Proponent and is responsible for all aspects of the Corazón Verde del Chaco Project's project design and project implementation.
- Ostrya Conservation: Ostrya Conservation is the lead project advisor and is responsible for the preparation of the CCB & VCS Project Description, along with leading the ongoing monitoring, reporting and verification work.

- Andrea Weiler: Andrea Weiler is an independent consultant who is responsible for conducting the biodiversity impact monitoring plan with the use of motion-sensitive, wildlife cameras and for the preparation of the biodiversity reports.
- Fabrizio Gorostiaga: Fabrizio Radice Gorostiaga is an independent consultant who is the leader of the forest carbon inventory.
- Private Landowner (Atenil): Atenil is the passive landowner and has the primary responsibilities of providing all landownership documentation, along with foregoing deforestation and foregoing the sale of the initial Project Area.
- Local Communities: The local communities have no direct roles or responsibilities in the initial project instance, but may see benefits (i.e., employment opportunities, Chaco Med, etc.) from the Project.
- Other Stakeholders: Other Stakeholders do not have any direct roles or responsibilities in the initial project instance but may have an interest in the Project (i.e., such as UNDP).

2.4.2 Required Technical Skills (G4.2)

The key technical skills required to successfully implement the Project, include:

- Stakeholder identification and community engagement;
- Legal analysis of landownership documentation;
- Government policy;
- Biodiversity assessment and monitoring;
- Carbon stock measurement and monitoring;
- Regional deforestation and land-use modelling;
- Project management;
- Local knowledge and fluency in Spanish and Guarani; and
- Sales of carbon offset credits to raise climate finance.

The Project's management team and advisors have both the expertise and prior experience with financing, designing, and implementing forest carbon projects. Thus:

- Stakeholder identification and community engagement is being led by Quadriz, particularly Federico ("Fredy") Montoya and Gabriela Viñales in the initial stages of the Project;
- Legal analysis of landownership documentation is being led by Quadriz and the law firm Livieres Guggiari;
- Government policy is being led by Quadriz;

- Biodiversity assessment and monitoring is being led by Quadriz and Dr. Andrea Weiler;
- Carbon stock measurement and monitoring is being led by James Eaton of Ostrya Conservation and Fabrizio Radice Gorostiaga;
- Regional deforestation and land-use modelling is being led by James Eaton of Ostrya Conservation;
- Project management is being led by Quadriz;
- Local knowledge and fluency in Spanish and Guarani is being led by Quadriz and particularly Marcel van Heesewijk, Federico ("Fredy") Montoya, and Gabriela Viñales; and
- Sales of carbon offset credits to raise climate finance is being led by Quadriz, particularly Christian Nielsen.

Further, Quadriz plans to hire an advisor in 2022 to assist the Project with stakeholder engagement and community monitoring.

2.4.3 Management Team Experience (G4.2)

The management team, in conjunction with its partnerships, has extensive expertise and experience implementing land management and carbon projects at the scale of this Project.

Marcel van Heesewijk, Founder and CEO, Investancia and Quadriz

Marcel van Heesewijk is Founder and CEO of the Investancia group. Marcel van Heesewijk has extensive international business development experience focused on company creation, growth strategies, and financing. Marcel van Heesewijk holds a bachelor's degree in economics from the University of Groningen in the Netherlands and a master's degree from the ESCP Europe (École Supérieure de Commerce de Paris), a 3-year MBA course studying and working in Paris, Oxford and Berlin. Marcel van Heesewijk was born in Sao Paulo, Brazil from Dutch parents and is fluent in six languages.

Marcel van Heesewijk has broad working experience covering various industries such as packaged consumer products (Nestle), computer hardware (Siemens), computer software packages (B+S Multisoft), software development & consulting and Biofuel production from reforestation and carbon certification projects. In 1993, Marcel van Heesewijk founded SourcingLink, an electronic product sourcing software-as-a -service (SAAS) platform for worldwide retailers that went public on NASDAQ. SourcingLink was an innovative technology company based in California. It developed on-line catalogs and negotiation applications which revolutionized how large retailers source products globally. As one of the first b-2-b internet operators, the company reached a market value of over $300 million in 1999 and later formed strategic partnership with the largest e-commerce exchanges for retailers connecting with their suppliers in Europe, the US and Asia.

Since then, Marcel van Heesewijk has been mainly active in South America where he incorporated livestock trading and land real estate operations in Uruguay. In 2013, he founded Investancia.

Christian Nielsen, Head of Sales, Carbon Offsets

Christian Nielsen is the Head of Sales, Carbon Offsets at Quadriz. Christian Nielsen has over 10 years of experience in commodity sales and trading from different roles based in Denmark, UK, Dubai and Spain. Before joining Quadriz in early 2020, Christian Nielsen worked as a Carbon Trader at Vertis Environmental Finance, where he traded EU allowances in the compliance carbon market of the European Union Emissions Trading Scheme (EU ETS) as well as carbon offsets in the voluntary carbon market.

Federico ("Fredy") Montoya, Field Manager at Investancia / Quadriz Paraguay SA

Born in the Gran Chaco, Paraguay, Fredy Montoya knows the Chaco and its challenges more than most. For the past 20 years Fredy Montoya has been working within the areas of agriculture, livestock and reforestation. Since 2015, Fredy Montoya has been the Field Manager at Investancia Paraguay SA, in charge of the areas of logistics, development and the reforestation program. More recently, Fredy Montoya has been working to support the conservation efforts and monitoring of Quadriz Paraguay SA in relation to its REDD+ programs.

Gabriela Viñales, REDD+ Lead Project Manager

Gabriela Viñales is an Environmental Engineer and holds an MSc. in Natural Resources Management and Environmental Management of the Territory. Since February 2021, Gabriela Viñales joined the Quadriz team, as the REDD+ Project Manager. During the previous six years, Gabriela Viñales was working in the REDD+ preparation phase of Paraguay, in the United Nations Environment Programme (UNEP) for the implementation of the UN REDD National Program and lastly in the United Nations Development Programme (UNDP) for the execution of a Forest Carbon Partnership Facility (FCPF) project called Forests for Sustainable Growth (BCS). The results of both processes have allowed the country to access financing from the Green Climate Fund (GCF), through the results-based payment of 23,000,000 $mtCO_2eq$.

During the last two years, in the role as UNDP technical specialist, Gabriela Viñales supported the process of preparing the National JNR Program and its monitoring report, managing the execution of technical actions and generating dialogue between stakeholders in the process (MADES, Verra, INFONA and others). In addition to stakeholder mapping and stakeholder engagement, Gabriela Viñales also worked on REDD+ and social safeguards while at UNDP. Gabriela Viñales also worked on REDD+ strategy for indigenous peoples during a World Bank project and from 2013 to 2015, Gabriela Viñales worked directly with indigenous communities.

Further, Gabriela Viñales supported the development of important tools for the carbon market such as MADES' Registry of Reductions and a proposal for a legal tool that addresses the ownership of carbon and the benefit sharing plan.

Gabriela Viñales' experience is based on the management and execution of projects, mainly in the area of climate change and environment, which implies a technical, operational and administrative management, accompanied by the relationship with the different actors that the execution of a project demands.

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

James Eaton, Director, Ostrya Conservation

To help address the technical requirements associated with implementing land management and carbon projects at this scale, Quadriz has entered into a partnership with Ostrya Conservation.

Jamie decided to start Ostrya Conservation after working for nearly a decade developing and implementing ecosystems services projects around the world. He has extensive experience in the fields of forest ecology, geographic information systems, soil biogeochemistry, land-use change science, and tropical ecology. For 14 years, Jamie has led the planning and design, and assisted with the implementation of, conservation projects which have conserved over a million acres of land throughout the world. These ecosystem service projects work with local communities and landowners to provide financing which enable these stakeholders to protect and conserve natural lands. While many of these projects have been in the realm of voluntary and compliance greenhouse gas mitigation projects, he has also developed nutrient banks, wetland mitigation banks, and stream mitigation banks. Project management skills and consulting experience has allowed Jamie to pull together diverse stakeholders' including private individuals, environmental non-governmental organizations, public companies, and government agencies in pursuit of these conservation efforts worldwide.

Jamie hails from the mid-west but he fell in love with the Virginia mountains, piedmont, and coastal regions upon moving there in 2001 after completing a B.A. in Biology from Saint Louis University. He obtained a M.S. in Environmental Science with a concentration in Forest Ecology from the University of Virginia, after spending three summers battling mosquitos while measuring biomass and soils in the dry tropical forests of Mexico's Yucatan Peninsula. As a 2005-2006 Fulbright Scholar, he worked to better understand ecological succession and land-use change in central Europe's Carpathian Mountains. In 2009, he was part of an interdisciplinary team to win the Sustainability Science Award from the Ecological Society of America.

Andrea Weiler

Andrea Weiler was born in Asunción and is a graduate of Bachelor of Science, Mention in Biology at the Faculty of Exact and Natural Sciences-National University of Asunción, Paraguay. She did her Master of Science's Degree in Wildlife at New Mexico State University. She is currently doing her PhD in Biology and Biodiversity Conservation, at the University of Salamanca, Spain. Her research is entitled: "Determination of the value of livestock landscapes for the conservation of biodiversity (beetles, amphibians, reptiles, birds and mammals) in the Paraguayan Dry Chaco". She is a Research Professor in the Department of Biology at the Faculty of Exact and Natural Sciences (FACEN), General Coordinator of the Biodiversity Research Nucleus (NIB) and Director of Postgraduate Studies at FACEN. In addition, she is a Tutor of the Scientific Initiation Program at the Faculty of Exact and Natural Sciences (FACEN-UNA). She is part of the PRONII: Level I-Res.: 148/2020. She currently participates as coordinator of several projects in areas of Ecology and Biodiversity Conservation and is dedicating her life to conservation and environmental education to raise awareness in society about the state of the local fauna.

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

Quadriz has the financial health to ensure adequate financial support over the Project Lifetime. Quadriz B.V.'s financial statements are annually audited by Binder Dijker Otte (BDO), the international assurance, tax, and financial advisory services company. In the future, Quadriz Paraguay's financial statements will also be audited by BDO. Such audited financial statements will be provided to the Project's independent validation and verification body (VVB) upon request.

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

Quadriz is a certified B corporation, which are "businesses that meet the highest standards of verified social and environmental performance, public transparency, and legal accountability to balance profit and purpose."[62] Thus, Quadriz is not involved in, or complicit in, any form of corruption such as bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion. Ongoing B corporation certification, along with ongoing independent verification to the VCS and CCB, shall provide this assurance. Furthermore, and as previously mentioned, Quadriz Paraguay will be annually audited by BDO.

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

There is no commercially sensitive information excluded from the public version of the project description.

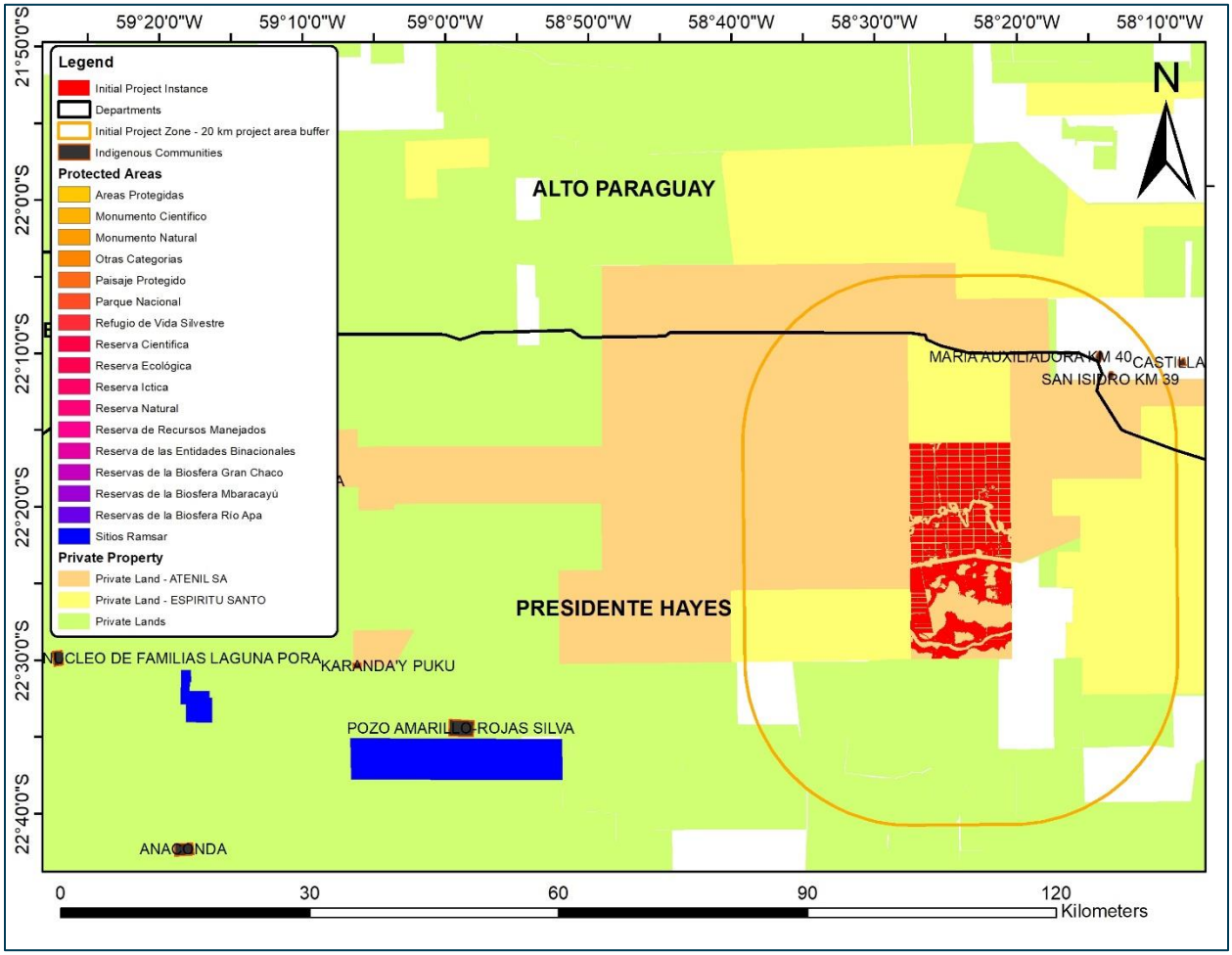
2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

The initial project instance and all additional grouped project instances will be on privately owned lands. The vast majority of lands within, and surrounding, the initial project zone are privately owned lands with the use, access and management rights of private landowners. Also located within the initial project zone are the two Indigenous communities known as Maria Auxiliadora and San Isidro.

[62] B. Lab. "About B Corps." Available: https://bcorporation.net/about-b-corps

Figure 2.20. Map of land tenure within, and surrounding, the initial project zone.



A similar map will be prepared for each additional project instance added to the grouped project.

2.5.2 Recognition of Property Rights (G5.1)

The initial project area is owned by Atenil S.A. as documented in the project database. All land use and access rights are owned by Atenil S.A. as the project is implemented on private land. Atenil provided consent to Quadriz for access and use of the property and "provide[s] all necessary consent to Quadriz, as necessary, for the development of VERs" for the specific purpose of developing a REDD+ project in their Letter of Agreement for Verified Carbon Unit Credits.

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

The Project will take place on private property and will not encroach on other private property, community lands, or government lands. The Project Proponent undertook a Free, Prior, and Informed Consent process with the private landowner.

Free - The Project Proponent presented an agreement to the private landowner. The private landowners are a group of well-educated, sophisticated investors who are familiar with negotiating contracts. Likewise, the landowners were free to accept the agreement, to discuss with counsel, and to accept alternative offers.

Prior - The Project Proponent met with the landowners several times, including visits to the property, and further discussed the Project's details on numerous occasions prior to presenting a draft agreement.

Informed - As previously mentioned, the Project Proponent met with the landowners several times, and further discussed the Project's details on numerous occasions prior to proceeding with an Agreement. These discussions included:

- Informing the landowners about the potential risks, benefits and costs associated with undertaking a REDD+ project;
- The minimum Project Lifetime; and
- The potential volumes and pricing of Verified Carbon Units (VCUs).

Further, for undertaking a forest conservation project and foregoing the opportunity to convert the land to a cattle ranch, or to sell the land to ranchers, the private landowner will be compensated with a share of the verified emission reductions (VERs).

Consent - Consent by the private landowners is formally demonstrated by a signed Letter of Agreement for Verified Carbon Unit Credits.

2.5.4 Property Rights Protection (G5.3)

The Project's activities do not lead to any 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.

2.5.5 Illegal Activity Identification (G5.4)

The three main potential illegal activities that could negatively affect the Project's climate, community and biodiversity impacts are encroachment, fire, and poaching. This said, there are no perceived positive benefits that will, or could be, derived from these illegal activities.

The measures designed and undertaken to reduce encroachment and fire are focused around on-the-ground monitors, periodic aerial surveillance, and satellite imagery analysis. With respect to poaching, the installation of guard houses and periodic biodiversity impact monitoring via wildlife cameras should be able to identify the presence of illegal poaching.

2.5.6 Ongoing Disputes (G5.5)

To the best of the Project Proponent and landowner's knowledge, there are no ongoing or unresolved conflicts or disputes over the rights to the initial Project Area's lands and resources. In addition, there have been no such disputes that were resolved during the last twenty years at the initial Project Area.

2.5.7 National and Local Laws (G5.6)

The Project is in compliance with all laws, statutes, and regulatory requirements. The local and national government supports the efforts to conserve parts of the Chaco. As no project activity is mandated by law and the project activity does not involve the clearing of native ecosystems, the project activities are in compliance with all environmental laws. Compliance can be demonstrated via satellite imagery analysis and via firsthand observations.

The Ministry of Environment and Sustainable Development (MADES) is responsible for environmental regulations under the Environmental Impact Assessment Law (Law Nº 294/93). As part of this responsibility, rural properties larger than 20 hectares are subject to the assessment of environmental impacts and the environmental licensing process (Decree 954/2013 and Decree Nº 453/2013).

The most important law pertaining to land use in the Paraguay is the Forestry Law 422/73. As part of this law, the National Forest Institute (INFONA) and MADES approve forest clearing and non-forest use of cleared lands. To ensure compliance, Quadriz has been in regular contact with INFONA and MADES.

Other pertinent and relevant laws stemming from the above regulation pertinent to conservation projects include:

- The 1973 Paraguay Forest Law, mentioned above, which also requires "landowners to set aside 25 percent of each parcel as forest and preserve natural greenery around rivers and streams as a bulwark against erosion and water pollution. Compliance with this law can be demonstrated via the project area maps and the alternative use map provided in section 2.1.5;"[63]

- Law Nº 4,241/10 and Decree Nº 9,824/12, provide for riparian and wetland buffers on properties cleared for agricultural production. This law is not directly applicable as the Project does not involve clearing for agricultural production;

- The 2004 Zero Deforestation Law which only affects part of the country was extended through 2018;[64] This law stops the conversion of natural forests to other land uses in Eastern Paraguay (Law Nº 2,524/2004 and subsequently Nº 3,139/ 2006, Nº 3,663/2008, Nº 5,045/2013, Nº 6,256/2018 and N°6676/2020). This law is not directly applicable as the Project is not located in Eastern Paraguay;

- Law N° 4890/13 Real Right of Forest Surface (Derecho real de superficie forestal)[65] allows the legally decoupling of forest ownership from land ownership; and

[63] Alberto Yanosky, "The Challenge of Conserving a Natural Chaco Habitat in the Face of Severe Deforestation Pressure and Human Development Needs," Page 381.
[64] World Wildlife Fund, "Paraguay extends Zero Deforestation Law to 2018," Available: http://wwf.panda.org/?210224/Paraguay-extends-Zero-Deforestation-Law-to-2018
[65] INFONA, "Ley N. 4890," Available: http://www.infona.gov.py/application/files/6914/2902/7121/Ley_N_4890_DERECHO_REAL_DE_SUPERFICIE_FORESTAL.pdf

- 3001 Act for Payment for Ecosystem Services – "The rescheduling of the 2006 Act for Payment for Ecosystem Services (PES) to compensate for the environmental debt of landowners in the Eastern Region may be directed toward the Chaco territory."[66]

In addition to the aforementioned national laws, Paraguay is a party to the United Nations Framework Convention on Climate Change (UNFCCC). Paraguay has submitted a Nationally Determined Contribution (NDC) to the UNFCCC, with updates in 2021, which is essentially Paraguay's non-binding commitment for how it will seek to achieve GHG emission reductions.[67] A World Bank analysis indicates that Paraguay intends to seek involvement from the private sector, intends to include a carbon pricing / international market mechanism, and that Paraguay has an economy-wide goal (which includes the forestry sector) of reducing GHG emissions by 20% (as compared to business-as-usual) by 2030.[68]

As of November 2019, Paraguay is a member of the International Civil Aviation Organization (ICAO) but has not agreed to participate in the voluntary phase of the Carbon Offset and Reduction Scheme for International Aviation (CORSIA). Likewise, the most recent compilation of states, which does not include Paraguay, by ICAO states, "As of 16 July 2019, {stated that} 81 States, representing 76.63% of international aviationn activity, intend to voluntarily participate in CORSIA from its outset."[69]

Quadriz is closely following all the developments of Paraguay's NDC and Paraguay's involvement with ICAO.

As previously mentioned, other project activities include Chaco Med and the visitor center. Quadriz consulted Livieres Guggiari to outline the relevant laws and regulations pertaining to Chaco Med and the visitor center.

For Chaco Med, a few applicable laws are:

- National Constitution of the Republic of Paraguay;
- Law No. 836/80 of the Sanitary Regulatory Code;
    - Regulatory Decrees of the Sanitary Code: Decree No. 10,735/91 which regulates Art. 270°;
    - Decree No. 1,635/99 which regulates Art. 175°; and
    - Decree No. 7,441/00 by which Decree No. 6,967 is modified, by which Art. 206 is regulated;
- Decree No. 7,885/00 by which Art. 65 is regulated, which declares the obligation of prior medical control of the units authorized by the Ministry of Public Health and Social Welfare, to obtain licenses for drivers of land and river vehicles. or air; and
- Law No. 1,032/96 creating the National Health System;
    - Regulatory Decrees of Law No. 1,032/96: Decree No. 19,966/98, which regulates Local Health Decentralization, Citizen Participation and Self-Management in Health, as strategies for the development of the National Health System;

[66] Alberto Yanosky, "The Challenge of Conserving a Natural Chaco Habitat in the Face of Severe Deforestation Pressure and Human Development Needs," Page 381.
[67] UNFCCC, Paraguay," Available: https://www4.unfccc.int/sites/NDCStaging/pages/Party.aspx?party=PRY
[68] World Bank Group's Climate Policy Team. "Paraguay: (Intended) Nationally Determined Contribution – (I)NDC." Available: spappssecext.worldbank.org/sites/indc/PDF_Library/PY.pdf
[69] International Civil Aviation Organization, "CORSIA States for Chapter 3 State Pairs," Available: https://www.icao.int/environmental-protection/CORSIA/Pages/state-pairs.aspx

- Law No. 1,032/96, Decree No. 22,385/98 which regulates the operation of the National Health Council and the Regional and Local Health Councils;
- Decree No. 20,553/98 which regulates Articles 31 and 33 of Law No. 1,032/96, which establishes the Superintendence of Health;
- Law No. 3,007/06 which modifies and expands Law No. 1,032/96 that creates the National Health System;
- Law No. 2,319/06 that establishes the functions and powers of the Superintendence of Health created by Law No. 1,032/96; and
- Decree No. 21,376/98 establishing the new functional organization of the Ministry of Public Health.

Upon initiation of Chaco Med, Quadriz will abide by all applicable laws and regulations, including those mentioned above, as they relate to Chaco Med.

For the visitor center, a few applicable laws are:

- National Constitution of the Republic of Paraguay; and
- Law No. 836/80 of the Sanitary Regulatory Code;
  - Regulatory Decrees of the Sanitary Code: Decree No. 10,735/91 which regulates Art. 270°;
  - Decree No. 1,635/99 which regulates Art. 175°; and
  - Decree No. 7,441/00 by which Decree No. 6,967 is modified, by which Art. 206 is regulated.

Upon initiation of the visitor center, Quadriz will abide by all applicable laws and regulations, including those mentioned above, as they relate to the visitor center.

2.5.8 Approvals (G5.7)

The Project is a voluntary REDD+ project on privately owned land and thus, the Project only needs approval from the private landowner (i.e., not from governmental authorities). This said, the initial project instance has approval from the appropriate authorities (i.e., the private landowners) and this can be demonstrated via the signed agreement between the Project Proponent and the landowner, entitled "Letter of Agreement for Verified Carbon Unit Credits." Further, a revised agreement with the private landowners, the DRSF Letter Agreement: "Acuerdo para créditos por unidades verificadas de carbono ATENIL – QUADRIZ" effectively gives the ownership of the land to Quadriz for the 30 year term of the Agreement.

The Project Proponent also received consent from local community at Maria Auxiliadora to conduct the Participatory Rural Appraisals (PRAs) and the Degradation Surveys.

2.5.9 Project Ownership (G5.8)

Atenil S.A. has clear, uncontested title to both property and the carbon rights.

Property Title

The initial Project Area is owned by Atenil S.A. as documented in the "Condiciones de Dominio" for each property which are located in the project database. All land use and access rights are owned by Atenil S.A. as the project is implemented on private land. Atenil provided consent to Quadriz for access and use of the property and "provide[s] all necessary consent to Quadriz, as necessary, for the development of VERs" for the specific purpose of developing a REDD+ project in their Letter of Agreement for Verified Carbon Unit Credits.

A copy of the property rights documentation is provided in the project database including documentation for each of the following properties:

- *Matricula P-04-186, Padron 853, 2,530 ha*
- *Matricula P-04-186, Padron 852, 11,942 ha*
- *Matricula P-04-186, Padron 851, 17,386 ha*

This documentation satisfies the VCS Standard as rights of use "arising by virtue of a statutory, property or contractual right."

Carbon Rights

Carbon rights reside with the private landowner as determine by the law firm Livieres Guggiari in their Memorandum[70] of 2 December 2020.

Transfer of carbon rights

The Letter of Agreement for Verified Carbon Unit Credits on September 28th, 2020, between Quadriz Paraguay S.A. and Atenil S.A. lays out the roles and responsibilities for each party under this agreement. As such, Quadriz Paraguay S.A. will develop and implement REDD+ activities in return for "a share of sales of the tradable VCUs generated".

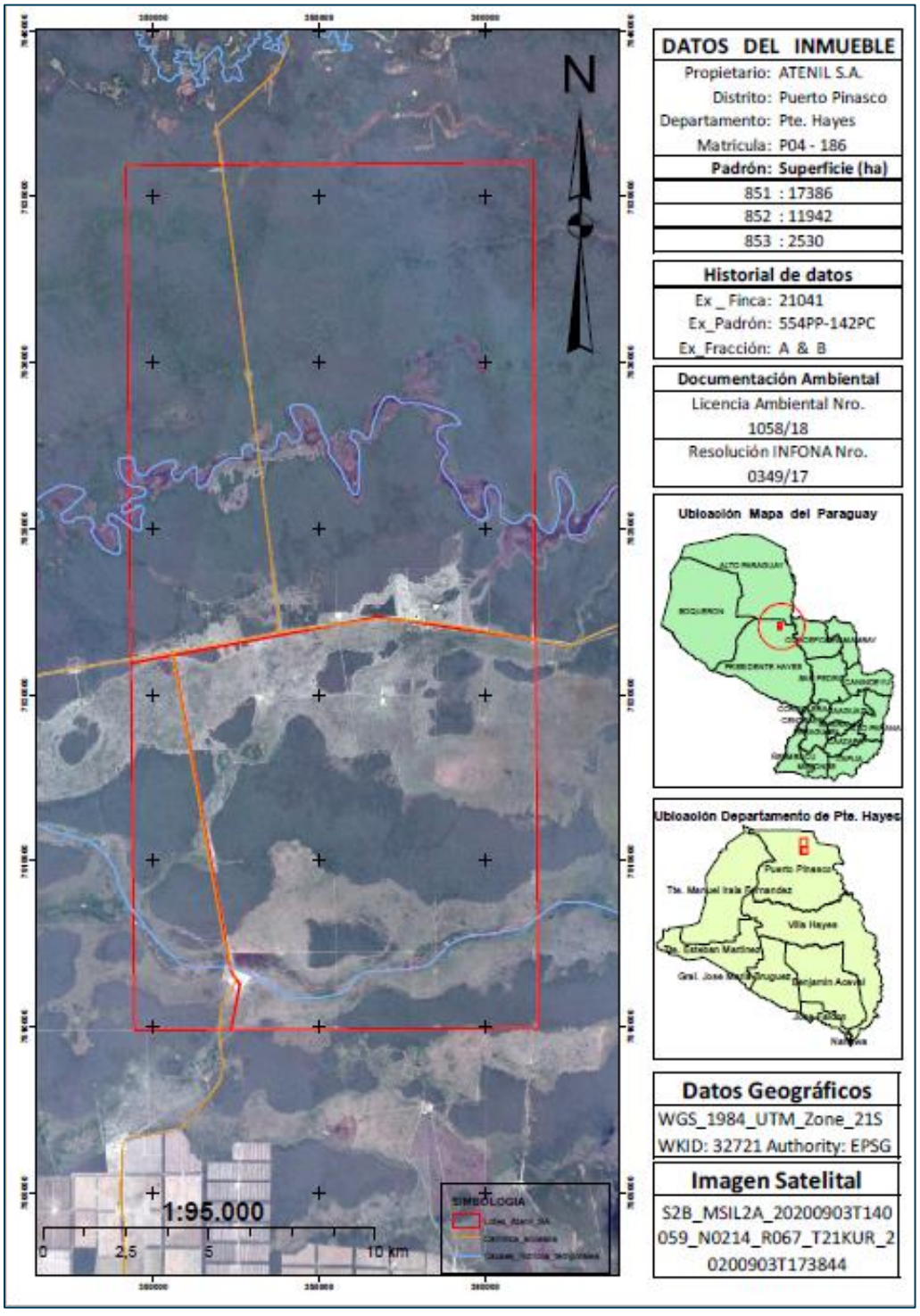
Atenil "provide[s] all necessary consent to Quadriz, as necessary, for the development of VERs" including transfer of carbon rights, such that Quadriz is able to fulfill its part of the contract. Further, "in return for Quadriz's leadership and technical work, Quadriz will receive and be owner and the seller of the Verified Carbon Unit credits (VCUs)." Figure 2.21 was included in the Letter of Agreement thus specifying the Padron numbers and specific project location for where the VCUs will be generated.

The agreement is registered under the Real Right of Forest Surface (Derecho Real de Superficie Forestal, DRSF), which is regulated by Law 4890/13 Establishes the Real Right of Forest Surface - https://www.bacn.gov.py/leyes-paraguayas/3082/ley-n-4890-derecho-real-de-superficie-forestal. It is through this registration that carbon rights are transferred from Atenil S.A. to Quadriz Paraguay S.A. This is further stipulated in the DRSF Letter Agreement: "Acuerdo para créditos por unidades verificadas de carbono ATENIL – QUADRIZ" signed November 18, 2021, states:

[70] See "dictamen Reed _03122020_143425.pdf" in the project database for a copy of the memorandum.

Quadriz will receive from Atenil definitively and irrevocably the title and rights to the carbon emerging from the forest mass, the carbon and any future carbon credits or any verified carbon unit are always related only to the agreed Project Area and Quadriz will also be the owner and seller of the credits for Verified Carbon Units (VCUs) of such areas (31,858 hectares), in consideration for Quadriz' leadership, care and preservation of the property and technical development work, upon execution of this agreement and subject to fulfillment of its obligations.

Figure 2.21. Initial Project Area as specified in the Letter of Agreement for Verified Carbon Unit Credits between Quadriz Paraguay S.A. and Atenil S.A.



2.5.10 Management of Double Counting Risk (G5.9)

Other than Verified Carbon Units (VCUs) with Climate, Community & Biodiversity tags issued under Verra's Verified Carbon Standard and the Climate, Community & Biodiversity Standards, there will be no other environmental or social credits sought for the Project. Double counting will be avoided by using the Verra registry system, by working closely with the Paraguay Government, and by periodically undertaking a project portfolio audit.

2.5.11 Emissions Trading Programs and Other Binding Limits

The Project is not participating in any other emissions trading program or other mechanism that includes GHG allowance trading. Similarly, the Project is not generating any GHG emission reductions and removals to be used for compliance under any such programs or mechanisms. If an opportunity should arise for the Project to participate in a compliance program, such as under the Carbon Offset and Reduction Scheme for International Aviation (CORSIA) or under Article 6 of the Paris Agreement, then the Project will follow Verra's prescribed procedures.

2.5.12 Other Forms of Environmental Credit

The Project has not sought, nor received, any other GHG-related environmental credits such as Renewable Energy Certificates (RECs), biodiversity offsets, or water credits.

2.5.13 Participation under Other GHG Programs

The Project has not registered, nor is it seeking registration, under any other GHG Programs such as the American Carbon Registry (ACR), the Clean Development Mechanism (CDM), or the Gold Standard.

2.5.14 Projects Rejected by Other GHG Programs

The Project has not been rejected by other GHG Programs such as the American Carbon Registry (ACR), the Clean Development Mechanism (CDM), or the Gold Standard.

2.5.15 Double Counting (G5.9)

Double counting will be avoided by using the Verra registry system, by working closely with the Paraguay Government, and by periodically undertaking a project portfolio audit. Further, the Project will seek registration and eventually nesting, with the Paraguayan national emission reduction registry.[71]

Paraguay is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and Paraguay has submitted a Nationally Determined Contribution (NDC) to the UNFCCC, which is essentially Paraguay's non-binding commitment for how it will seek to achieve GHG emission reductions.[72] As of November 2020, Paraguay is a member of the International Civil Aviation Organization (ICAO), but has not agreed to participate in the voluntary phase of the Carbon Offset and Reduction Scheme for International Aviation (CORSIA) starting January 1, 2021.[73]

[71] DNCC, "Registro de Reduccion de Emisiones en Paraguay," Available: http://dncc.mades.gov.py/registro-de-reduccion-de-emisiones-en-paraguay
[72] UNFCCC, Paraguay," Available: https://www4.unfccc.int/sites/NDCStaging/pages/Party.aspx?party=PRY
[73] International Civil Aviation Organization, "CORSIA States for Chapter 3 State Pairs," Available: https://www.icao.int/environmental-protection/CORSIA/Pages/state-pairs.aspx; https://www.icao.int/environmental-protection/CORSIA/Documents/CORSIA_States_for_Chapter3_State_Pairs_Jul2020.pdf

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

The Corazón Verde del Chaco Project is utilizing the Avoided Deforestation Partners' VCS REDD Methodology, entitled, "VM0007: REDD Methodology Modules (REDD-MF)." The only eligible activity as part of this Project is avoiding planned deforestation, hence only modules related to planned deforestation are required. This Project is eligible as an avoiding planned deforestation project because the forest land is expected to be converted to non-forest land in the baseline case and the land is legally permitted to be converted to non-forest. The specific modules applied to the Project are listed below.

REDD-MF, REDD Methodology Framework Version 1.6

Carbon pool modules:

CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools", version 1.1

CP-D, "VMD0002 Estimation of carbon stocks in the dead-wood pool," version 1.0

CP-L "VMD0003 Estimation of carbon stocks in the litter pool", version 1.0

CP-W, "VMD0005 Estimation of carbon stocks in the long-term wood products pool," version 1.1

Baseline module:

BL-PL "VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation", version 1.3

Leakage modules:

LK-ASP "VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation/forest degradation and avoided planned wetland degradation", version 1.3

LK-ME "VMD0011 Estimation of emissions from market-effects", version 1.1

Monitoring module:

M-REDD "VMD0015 Methods for monitoring of greenhouse gas emissions and removals", version 2.2

Miscellaneous Modules:

E-BPB "VMD0013 Estimation of greenhouse gas emissions from biomass and peat burning", version 1.2

X -STR "VMD0016 Methods for stratification of the project area", version 1.2

X-UNC "VMD0017 Estimation of uncertainty for REDD project activities", version 2.2

Tools:

T-SIG, CDM tool "Tool for testing significance of GHG emissions in A/R CDM project activities," version 1.0

T-ADD, "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities," version 3.0

T-BAR, "VCS AFOLU Non-Permanence Risk Tool," version 4.0,

Use of modules, REDD-MF, M-REDD, T-ADD, T-BAR, X-UNC, and X–STR, is always mandatory when using the VM0007 methodology. Further use of modules, BL-PL and LK-ASP, is mandatory in the case of projects focusing on planned deforestation. Use of the module T-SIG determines whether GHG emissions by sources and/or decreases in carbon pools are insignificant. Finally, CP-AB is mandatory in all cases and while CP-L and CP-D is optional as the litter and dead wood pool is greater in the project scenario than the baseline scenario.

3.1.2 Applicability of Methodology

The above modules are applicable because they meet the applicability conditions of the REDD Methodology Framework and other modules as set out below.

Table 3.1. Applicability conditions and justifications for the REDD Methodology Framework Module.

Applicability Condition	**Justification**
Land in the project area has qualified as forest (following the definition used by VCS; in addition, see Section 5.1.2) for at least the 10 years prior to the project start date.	The entire Project Area meets the local CDM definition of a forest. All nonforest areas were removed from the project as part of developing the Alternative Use Plan, which is submitted to MADES, a local government authority which approves conversion of native forest to pasture.
If land within the project area is peatland or tidal wetlands and emissions from the SOC pool are deemed significant, the relevant WRC modules (see Table 3) must be applied alongside other relevant modules.	None of the project area contains peatland or tidal wetlands. The Global Peatland Map 2.0[74] indicates there are no peatlands within Paraguay.
Baseline deforestation and forest degradation in the project area fall within one or more of the following categories: -Unplanned deforestation (VCS category AUDD) -Planned deforestation/degradation (VCS category APD) -Degradation through extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD)	Baseline deforestation in the project area falls within the planned deforestation category, as the agents of deforestation are large agribusinesses implementing industrial scale cattle ranches.
Leakage avoidance activities must not include: -Agricultural lands that are flooded to increase production (e.g., rice paddy) -Intensifying livestock production through use of feed-lots and/or manure lagoons.	Leakage avoidance activities do not include flooding agricultural land or creating feed-lots or manure lagoons.
Where conversion of forest lands to a deforested condition must be legally permitted.	Conversion of forest lands to pasture is legally allowed in the Chaco Region of Paraguay, where the agents of deforestation follow laws and the approval process as laid out by MADES and INFONA.

Table 3.2. Applicability conditions and justifications for the other modules.

Module	**Applicability Condition**	**Justification**

[74] "United Nations Environment Programme. 2021. THE GLOBAL PEATLAND MAP 2.0. https://wedocs.unep.org/20.500.11822/37571

CP-AB, VMD0001	This module is applicable to all forest types and age classes. Inclusion of the aboveground tree biomass pool as part of the project boundary is mandatory as per the framework module REDD-MF. Non-tree aboveground biomass must be included as part of the project boundary if the following applicability criteria are met (per framework module REDD-MF): -Stocks of non-tree aboveground biomass are greater in the baseline than in the project scenario, and - Non-tree aboveground biomass is determined to be significant (using the T-SIG module). Belowground (tree and non-tree) biomass are not required for inclusion in the project boundary because omission is conservative.	This module is applicable to all forest types and age classes. Inclusion of the aboveground tree biomass pool as part of the project boundary is mandatory. It is appropriate to exclude non-tree aboveground biomass in the project boundary as the baseline agent of deforestation disks pastureland every 2-4 years thus ensuring the non-tree aboveground biomass stocks are greater in the project scenario than the baseline.
CP-D, VMD0002	None	This module is applicable to all forest types and age classes.
CP-L, VMD0003	None	This module is applicable to all forest types and age classes.
CP-W, VMD0005	Timber harvest occurs prior to or in the process of deforestation, and where timber is destined for commercial markets.	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.
BL-PL, VMD0006	The module is applicable for estimating the baseline emissions on forest lands (usually privately or government owned) that are legally authorized and documented to be converted to non-forest land.	All project lands are privately owned. The landowner has followed all laws in delineating the area to be cleared, as demonstrated in Section 3.2.1. Further, the Project Proponent has submitted an Alternative Use Plan to MADES requesting permission to convert the forest area to an alternative use.
BL-PL, VMD0006	Where, pre-project, unsustainable fuelwood collection is occurring within the project boundaries Modules BL-DFW and LK-DFW must be used to determine potential leakage.	There is no fuelwood collection occurring within the project boundary due to the distance of the local communities to the initial project area. There are no national or regional forestry or nature conservation regulations in relation to fuel wood collection for domestic use.
LK-ME, VMD0011	As referenced in REDD-MF, this module is mandatory where: - The process of deforestation involves timber harvesting for commercial markets -The baseline is calculated using module BL-DFW and fuel wood or charcoal is harvested for commercial markets	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.
E-BPB, VMD0013	This module is applicable to REDD project activities with emissions from biomass burning and REDD-WRC project activities with emissions from biomass and/or peat burning. This module is also applicable to RWE and ARR-RWE project activities with emissions from peat burning.	This module was used as the baseline forest clearing practices in the region involve biomass burning.
M-REDD, VMD0015	Emissions from logging may be omitted if it can be demonstrated the emissions are de minimis using T-SIG.	Logging emissions have been omitted as no commercial timber harvest occurs in the with-project case.

M-REDD, VMD0015	If emissions from logging are not omitted as de minimis, logging may only take place within forest management areas that possess and maintain a Forest Stewardship Council (FSC) certificate for the years when the selective logging occurs.	Not applicable
M-REDD, VMD0015	Logging operations may only conduct selective logging that maintains a land cover that meets the definition of forest within the project boundary.	Not applicable
M-REDD, VMD0015	All trees cut for timber extraction during logging operations must have a DBH greater than 30 cm.	Not applicable
M-REDD, VMD0015	During logging operations, only the bole/log of the felled tree may be removed. The top/crown of the tree must remain within the forested area.	Not applicable
M-REDD, VMD0015	The logging practices cannot include the piling and/or burning of logging slash	Not applicable
M-REDD, VMD0015	Volume of timber harvested must be measured and monitored.	Not applicable
T-ADD, VT0001	AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced;	The proposed project activity in the project area, namely forest conservation, does not lead to violation of any laws. Figure 2.10 is an alternative use map which was used to delineate the project area. The alternative used map as shown in Figure 2.10 is in compliance with laws and regulations as cited in Section 3.2.1 of this PD
T-ADD, VT0001	The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.	The VM0007 methodology, including the baseline methodology or BL-PL module, provides for the use of a stepwise approach, namely the VT0001 module, for determining the most plausible baseline scenario. This project does not propose a new baseline methodology.
X-STR, VMD0016	None	Any module referencing strata i must be used in combination with this module.
X-UNC, VMD0017	None	This module is mandatory when using methodology REDD+ MF.

3.1.3 Project Boundary

Identification of GHG sources and sinks follows methodology VM0007 and relevant VCS guidance. Selection of GHG sources and sinks for inclusion in the project boundary is summarized below.

Table 3.3. GHG sources and sinks for inclusion in the project boundary.

Source		Gas	Included	Justification/Explanation
Baseline	Above-ground biomass	CO_2	Yes	Mandatory to include.
	Below-ground biomass	CO_2	Yes	Included as a component of the total biomass stock.
	Dead-wood	CO_2	Yes	Included as a component of the total biomass stock.
	Litter	CO_2	Yes	Included as a component of the total biomass stock.

	Harvested Wood Products	CO_2	Yes	Included as commercial harvesting for wood products may take place for some project instances in the baseline as part of the forest conversion process.
	Soil organic carbon	CO_2	No	Inclusion of this pool is optional in the baseline.
	Burning of woody biomass	CO_2	No	CO_2 emissions are not included as these emissions are accounted for in the carbon stock changes.
		CH_4	Yes	CH_4 is mandatory to include.
		N_2O	Yes	N_2O is mandatory to include.
Project	Above-ground biomass	CO_2	Yes	Mandatory to include where pool is included in REDD baseline accounting.
	Below-ground biomass	CO_2	Yes	Mandatory to include where pool is included in REDD baseline accounting.
	Dead-wood	CO_2	Yes	Mandatory to include where pool is included in REDD baseline accounting.
	Litter	CO_2	Yes	Mandatory to include where pool is included in REDD baseline accounting.
	Harvested Wood Products	CO_2	Yes	Mandatory to include where pool is included in REDD baseline accounting.
	Soil organic carbon	CO_2	No	Not included because not included in the baseline accounting.
	Burning of woody biomass	CO_2	No	CO_2 emissions are not included as these emissions are accounted for in the carbon stock changes.
		CH_4	Yes	CH_4 and N_2O are mandatory to include where GHG emissions are included in REDD baseline accounting.
		N_2O	Yes	

Emissions from fossil fuel combustion are optional and are therefore excluded in the baseline and with-project case.

Figure 3.1. Map of the initial project area.

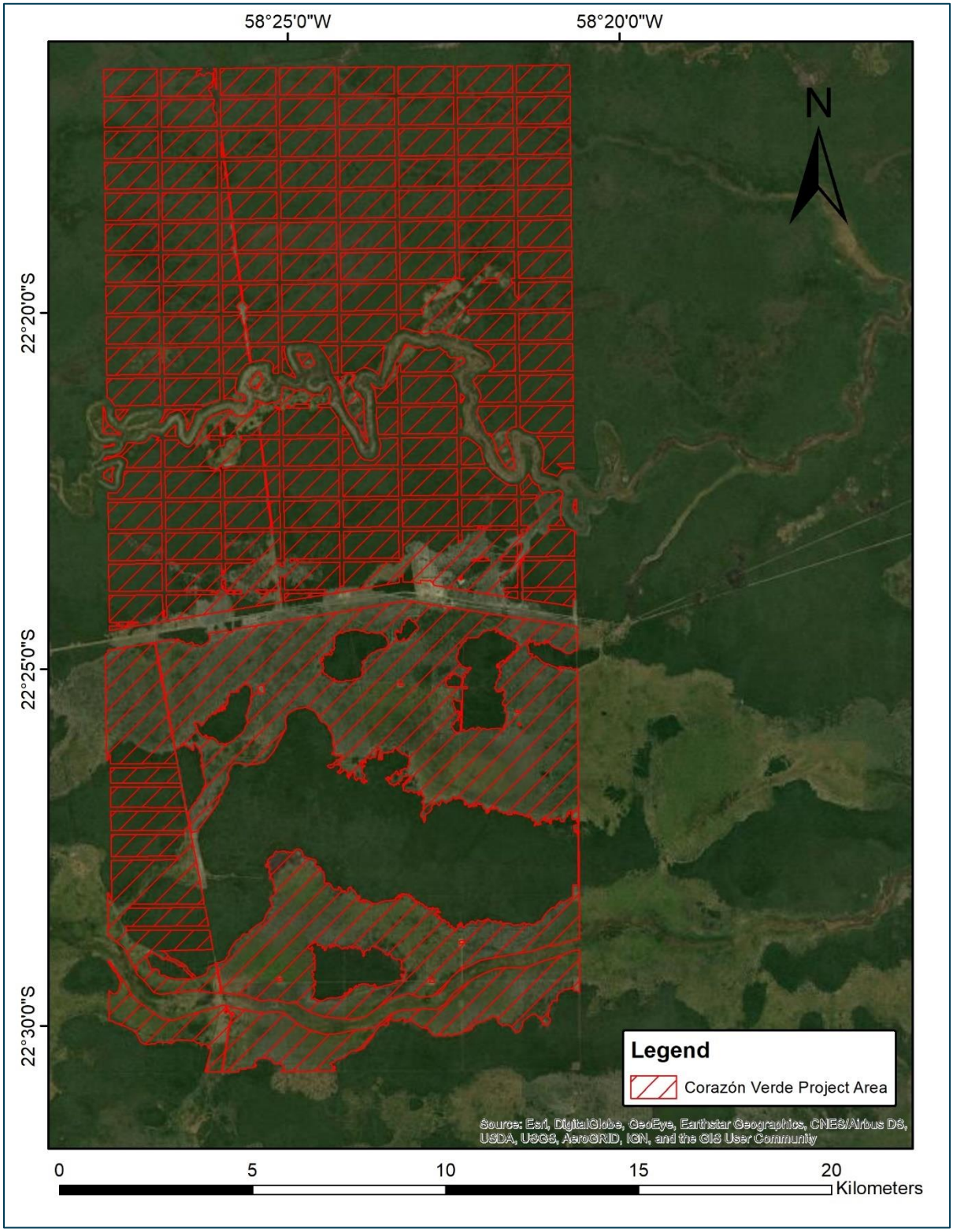


Figure 3.2. Map of the initial project zone where initial project activities are implemented.

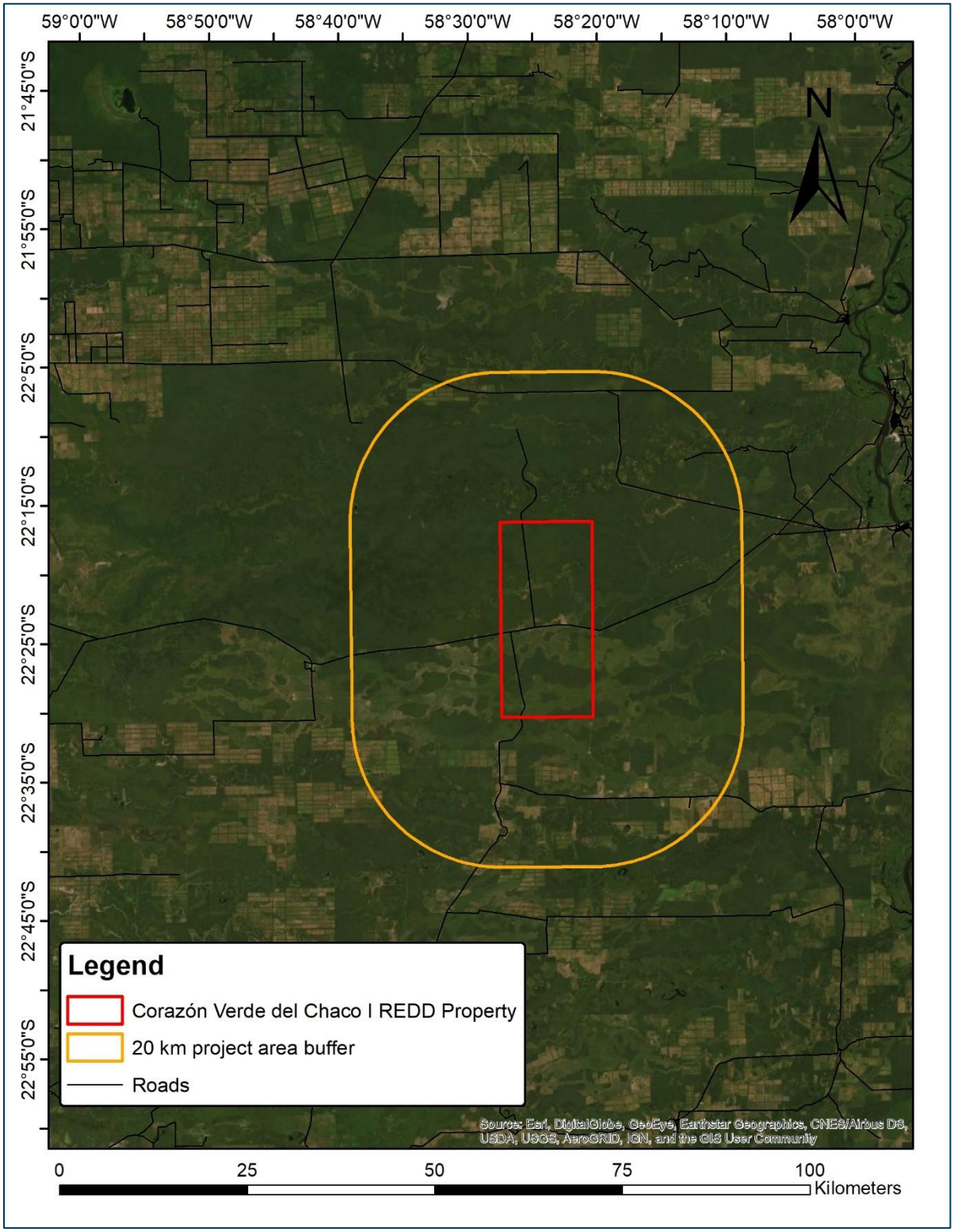
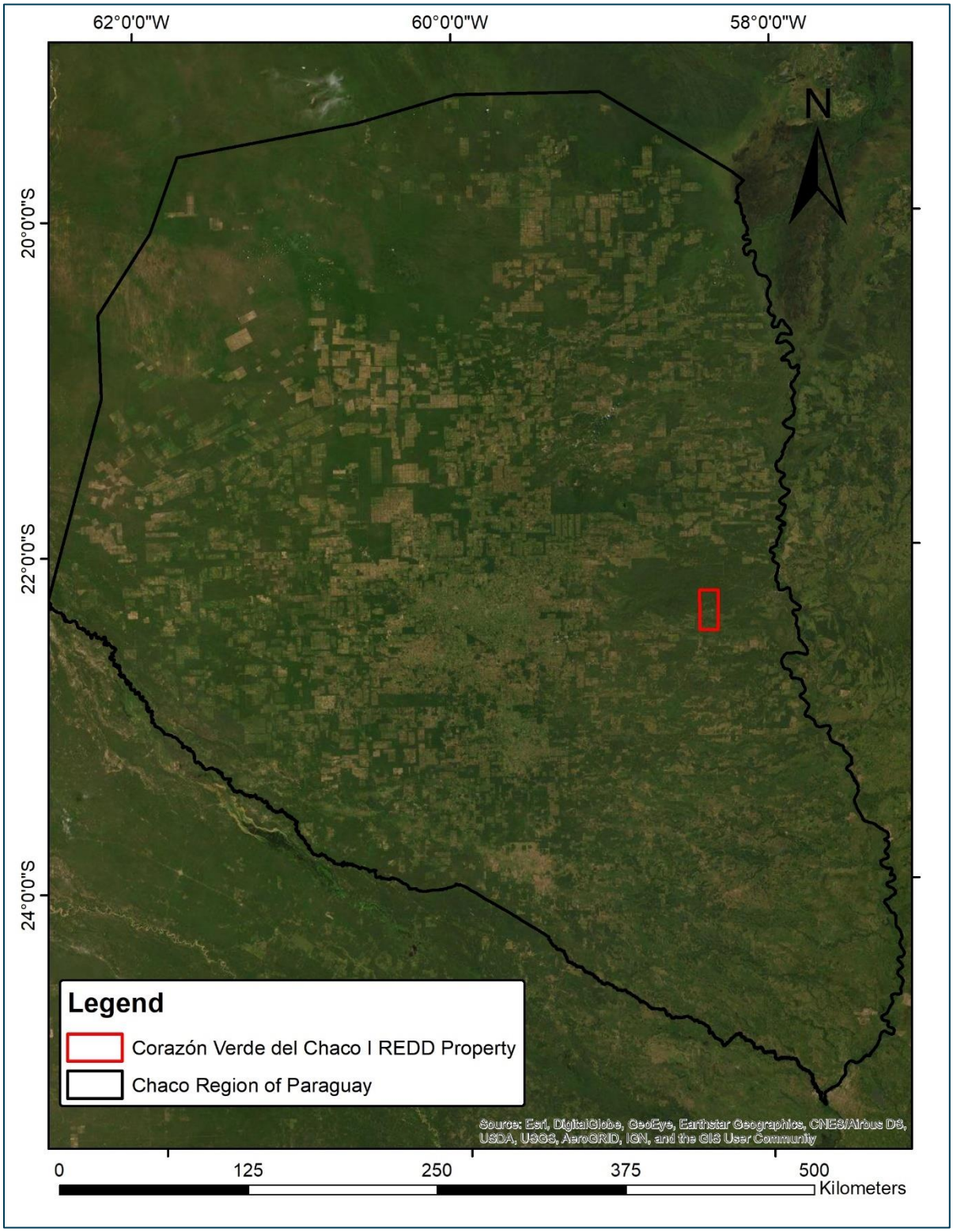


Figure 3.3. Map of the area subject to activity shifting leakage (i.e., the Grouped Project Boundary) as defined by the Departments of Alto Paraguay, Boquerón, and Presidente Hayes.



3.1.4 Baseline Scenario

The VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" is applied to identify the baseline scenario of the Project.

As the outcome of sub-step 1a of the tool, the following alternative land use scenarios were identified.

1) Continuation of pre-project land use;
2) Project activity on the land without being registered as a VCS AFOLU project;
3) Conversion to soybean agriculture; and
4) Conversion to Pasture.

There is no legal or regulatory requirement to keep the project area as forest, hence alternative land use scenario 1 and 2 identified above (i.e., continuation of pre-project land use; and project activity on the land without being registered as a VCS AFOLU project) are not mandated by law. In fact, common practice by landowners in the region is to convert forest land to agriculture and/or pasture as demonstrated in Section 3.2.1. Alternative land use scenario 3 and 4 (i.e., conversion to soybean agriculture; and conversion to Pasture) are also allowed in the project area, as the project area was delineated following all applicable legal and regulatory requirements as demonstrated in the "Legal Permissibility for Deforestation" section of Section 3.2.1. As the outcome of Sub-step 1b, all land use scenarios identified above are in compliance with applicable legal and regulatory requirements.

These scenarios are discussed and justified below. There is no legal requirement to undertake activities similar to the project activity. Likewise, there are no observed similar project activities in the geographical region on private lands.

Continuation of the Pre-Project Land Use

The landowner maintains the property as dry tropical forest. A profit-driven landowner would likely be simply waiting for the right price or purchase offer to then sell this land that is otherwise not generating revenue.

Project Activity on the Land without being Registered as the VCS AFOLU Project

The landowner maintains the property as dry tropical forest. Forest conservation in the Project Area, as a decision by a profit-driven landowner, would be unlikely under any non-carbon, market-related scenario. Even if targeted forest conservation was limited to just part of the land within the project boundary, the cost of protection is too high without carbon credits to offset the expenses.

Conversion to Soybean Agriculture

In this scenario, the landowner decides to convert their forest to a soybean farm or sells it to a large agribusiness seeking to do the same. This scenario is unlikely and not popular in the Chaco region. The high upfront costs of preparing and improving the soils for large-scale, mechanized agriculture and the challenging climate for agriculture makes this venture risky. Further, only a smally portion of the land in

the Chaco is suitable for soy agriculture. Giménez[75] documents land use change trends in the Chaco (Región Occidental) of Paraguay during the period 2000 and 2016. Giménez found 99.13% of forest land lost was converted to pasture, while only 0.25% of forest lost was converted for agricultural crops.

Conversion to Pasture

Cattle production is the largest driver of deforestation in the Gran Chaco region. Paraguay has one of the highest rates of deforestation in the world, as every year in the Paraguayan Chaco, hundreds of thousands hectares of primary forest are deforested and converted into cattle land largely due to the rapid expansion of cattle ranching, especially in the western Gran Chaco region. In the baseline scenario, in the event of no REDD+ project, the landowner would have sold the land to a land purchaser who would have submitted a request to convert up to 75% of the native forest into cattle land.

The most likely baseline scenario is conversion of the Project Area to pasture. Conversion of native forest to pasture is common practice in the region and is the impetus for the sales of most, if not all, large rural properties in the region. This is clearly demonstrated by the land use patterns in the region and evidence of agricultural expansion as demonstrated above. Conversion of native forest to pasture is common practice in the region. This is substantiated in the baseline whereby numerous landowners have deforested part of their property for pasture and establishment of ranches.

3.1.5 Additionality

The VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" is applied to demonstrate additionality.

Simple Cost Analysis

As the Project activity generates no financial or economic benefits to the Project Proponent other than VCUs (Verified Carbon Units; also known as carbon credits) related income through the project activity, a simple cost analysis is justified.

An economic analysis[76] comparing a large-scale cattle ranch, conservation of the project property, and a REDD+ carbon project shows that after year 10, and for all future years, a cattle ranch is much more profitable than a REDD+ carbon project. Thus, doing a REDD+ carbon project requires carbon financing and such a project is additional compared to doing a private conservation project without carbon financing.

The Project activity produces no revenue, as the Project Areas will be managed for conservation purposes, rather than for commercial timber/charcoal extraction and livestock production. Costs associated with implementing project activities, project development, and VCS project validation are significant. Additionally, while the Project will incur ongoing costs (related to management and

[75] Larrosa, Carlos Antonio Giménez. 2018. Descripción de procesos y métodos utilizados para la reclasificación de ''Tierras de cultivo'' a ''Cultivos Agrícolas'', ''Pasturas implantadas'' y ''Mosaico Agropecuario'' de todo el territorio nacional, periodo 2000-2016. Proyecto "Colaboración para los Bosques y la Agricultura". Report prepared for WWF, Instituto Forestal Nacional, and the Gobierno Nacional.
[76] See the "REDD+ Economic Additionality Analysis" workbook in the project database.

implementation of project activities including forest patrols and social programs), it will not generate future financial benefits other than VCU related income. The Project Proponent, thus, generates no financial benefits, and therefore the outcome of a simple cost comparison shows significant project expenditure with no financial return in the absence of VCU-related income. Thus, this makes a REDD+ project impractical in the absence of carbon finance and demonstrates a clear financial barrier to project implementation.

Common Practice

Conservation of privately owned forest land in the Chaco Region of Paraguay, is generally limited to the green reserve. The green reserve is a requirement of INFONA for all large landholders in rural areas and therefore fundamentally different than the project area. Clear evidence of the agricultural expansion in the Chaco over the last 20 years suggest that landowners with market access (i.e., access to major roads) have deforested the maximum amount of their property as allowed by INFONA under their Plano de Uso.

Other conserved forest land in the Chaco is government land in the form of National Parks, such as Teniente Agripino Enciso National Park and Médanos del Chaco National Park. However, to our knowledge, there are no privately funded projects on private lands with the aim of stopping deforestation in the Paraguayan Chaco without the aid of carbon finance.

Results of the Additionality Analysis

As demonstrated above, the project activity, without revenue from carbon credits, is unlikely to occur and is not a common practice in the region. The Project is therefore additional.

3.1.6 Methodology Deviations

The following deviations to the methodology are applied.

1) While sampling lying dead wood using the line intersect method:
   a. Two 100-meter transect lines were used rather than two 50-meter transect lines;
   b. The sampling lines did not bisect each sample plot, but rather ran from one plot center to the next; and
   c. The sampling lines were oriented to the north and east, and no randomization in the bearing of the first line was employed.

   This approach does not negatively impact the conservativeness of the quantification and improves the accuracy of the lying dead wood sampling by enlarging the sampling unit.

2) Rather than using a root to shoot ratio to estimate belowground biomass as per the CP-AB module, belowground biomass was estimated using an allometric equation developed by Cairns et al.[77] This alternative method is more efficient for the project-specific circumstances as only one equation is needed for the project. Further, Cairns et al. is appropriate for determining

[77] Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world's upland forests. Oecologia 111, 1-11.

belowground biomass as this equation is published in a peer-reviewed scientific journal and is cited in IPCC 2006 Annex 4A.2 (page 4.116). This source is appropriate as we are using a more recent version of IPCC guidance similar to the VCS Standard guidance "Where external documents are referenced, such as the IPCC 2006 Guidelines for National GHG Inventories, and such documents are updated, the most recent version of the document shall be used." This deviation is likely to yield the same level of accuracy (or better) given the wide range of root-to-shoot ratios found in the IPCC GL AFOLU guidance as found in the methodology. In fact, guidance for methodologies as found in VCS AFOLU Requirements version 3.4 specifically mentions the Cairns et al. equations in reference to established procedures for quantifying belowground biomass, thus further indicating the appropriateness of this source.

3) Rather than monitoring Cpost using modules CP-AB and CP-D as described in the M-REDD modules, C(post) can conservatively be assumed to be zero in the with-project case, not only for natural disturbance (CP,Dist,q,i , as stated in the M-REDD module) but also for deforestation (CP,post,u,i). This deviation is conservative because subtracting zero from the baseline stocks, leads to the conclusion that ΔCpools,Def,u,i,t is equal to C(BSL,i), which leads to the maximum emission in the with-project case, which is conservative. This deviation may be used for the first and each subsequent monitoring period.
4) The forest inventory has deviated from the criteria for selection (i.e., the equation is based on a datasets comprising at least 30 trees, with an r^2 that is ≥ 0.8) and validation of the allometric equation related to palm biomass, however the equation used is likely to result in a conservative estimate of palm biomass for the following reasons:
    a. -Volume is calculated as the volume of a paraboloid rather than the volume of a cylinder; and
    b. -Only stem biomass is estimated, thus conservatively excluding other aboveground biomass including palm fronds.
5) This project deviates from using the default value for the carbon fraction of dry litter matter as provided in the CP-L module (VMD0003, Version 1.0). Rather, a value of 0.47 t C t^{-1} d.m was used for this project. This carbon fraction value is appropriate as it is in line with VCS guidance that where "external documents are referenced, such as the IPCC 2006 Guidelines for National GHG Inventories, and such documents are updated, the most recent version of the document shall be used." The default value provided in the CP-L module was sourced from IPCC 2003. The updated value of 0.47 t C t^{-1} d.m is derived from page 4.48 of the IPCC 2006 Guidelines for National GHG Inventories. This value corresponds with the value for "all parts of the tree" and was sourced from McGroddy[78] et al., 2004. Finally, this value of 0.47 was also cited as the carbon fraction for foliage component in tropical and subtropical forest in the IPCC table on page 4.48, as sourced from Feldpausch et al., 2004. This represents a deviation to "data and parameters available at validation". This methodology deviation is warranted as it increases the accuracy of the quantification of GHG emission reductions or removals.

[78] McGroddy, Megan E., Tanguy Daufresne, and Lars O. Hedin. "Scaling of C: N: P stoichiometry in forests worldwide: Implications of terrestrial redfield-type ratios." *Ecology* 85, no. 9 (2004): 2390-2401. McGroddy et al., 2004 investigated C, N, and P in forest foliage and litter and used a carbon value of 47% of reported biomass, based on the mean of reported data.

6) This project deviated from the VM0007MF,v1.6 requirement "The starting date of this [Historical Reference Period] must be between 9 and 12 years in the past and the end date must be within two years before project start date". This idea of a historical reference period only makes sense in terms of an unplanned REDD project where the rate of deforestation is defined over a distinct period of time, as opposed to the “number of years over which deforestation occurred in land parcel pn in proxy area” as defined in the BL-PL module. Notably, there is no mention of a historical reference period in the BL-PL module. One of criteria for identifying proxy areas, as stated in BL-PL module is "Deforestation in the proxy area must have occurred within the 10 years prior to the baseline period" thus clearly conflicting with the VM0007MF,v1.6 Historical Reference Period requirement. This requirement does not specify the starting year for the deforestation in the proxy years. Rather, one of the parameters used in determining "D%planned,i,t" (i.e., the projected annual proportion of land that will be deforested in stratum i during year t) is the parameter "Yrspn". This parameter is the number of years over which deforestation occurred in land parcel pn in proxy area. This change represents a deviation to “parameters available at validation.” This methodology deviation doesn't impact the project conservativeness or accuracy, since VMD0006-BL-PL requirements are met. Further, this deviation does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals because it does not affect the quantification of GHG emission reductions or removals.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Development of the baseline for a planned deforestation project was conducted in conformance with the VCS modular REDD methodology VM0007, specifically the BL-PL module.

Agent of Deforestation

Identifying the Most Likely Class of Deforestation Agents

The agent of deforestation is a “class of deforestation agents” as the current landowners would have sold the property should carbon finance not be achieved. The most likely agent of deforestation is: a large scale agribusiness practicing farming on parcels larger than 1,000 ha. The class of deforestation agents has been responsible for large scale clearing of the Chaco Forest for pasture/ranching. The historical evidence for this agent of deforestation is that these large agribusinesses implement industrial scale cattle ranches and are responsible for almost all of the native forest clearance in the last 20 years (see Table 3.4) in the Chaco. On average, this clearing has represented a loss of over 300,000 ha of forest per year. Upon acquisition of the project area, the large agribusinesses apply to MADES/INFONA to clear the land. Once clear, the land would be converted to a large ranch. Figure 2.14 through 2.19 documents agricultural expansion in the Chaco, from 1990 through 2020, predominantly at the hand of the baseline agents, large agribusiness.

Table 3.4. Estimates of forest loss 2000-2015 by Paraguay's UN-REDD initiative.[79]

Año	Período considerado*	B. Húmedo de la Región Oriental (BHRO)	B. Seco Chaqueño (BSC)	B. Sub Húmedo del Cerrado (BSHC)	B. Sub Húmedo Inundable del Río Paraguay (BSHIRP)	Total Deforestación ha/año
1	2000 - 2001	119.115,17	119.742,44	1.229,85	41.658,11	281.745,56
2	2001 - 2002	119.115,17	119.742,44	1.229,85	41.658,11	281.745,56
3	2002 - 2003	119.115,17	119.742,44	1.229,85	41.658,11	281.745,56
4	2003 - 2004	119.115,17	119.742,44	1.229,85	41.658,11	281.745,56
5	2004 - 2005	119.115,17	119.742,44	1.229,85	41.658,11	281.745,56
6	2005 - 2006	45.327,60	238.014,69	2.482,15	65.572,45	351.396,89
7	2006 - 2007	45.327,60	238.014,69	2.482,15	65.572,45	351.396,89
8	2007 - 2008	45.327,60	238.014,69	2.482,15	65.572,45	351.396,89
9	2008 - 2009	45.327,60	238.014,69	2.482,15	65.572,45	351.396,89
10	2009 - 2010	45.327,60	238.014,69	2.482,15	65.572,45	351.396,89
11	2010 - 2011	45.327,60	238.014,69	2.482,15	65.572,45	351.396,89
12	2011 - 2012	41.145,11	284.693,97	3.913,72	122.105,49	451.858,28
13	2012 - 2013	41.145,11	284.693,97	3.913,72	122.105,49	451.858,28
14	2013 - 2014	27.913,19	236.700,64	799,90	21.212,33	286.626,06
15	2014 - 2015	27.913,19	236.700,64	799,90	21.212,33	286.626,06

Justifying the Class of Agent through Stratification

The geographic limit of the grouped project is the Chaco Region of Paraguay as defined by the Departments of Alto Paraguay, Boquerón, and Presidente Hayes. The selection of class of agent, "a large scale agribusiness practicing farming on parcels larger than 1,000 ha", has been justified through stratification of the Chaco Region based on factors that affect the ability of the class of agent to convert the area to pasture. The stratification is based on land tenure, forest carbon stocks, slope, and elevation.

- Land tenure has been stratified as either private land, lands protected from conversion to agriculture (e.g. National Parks and other protected areas), and indigenous owned lands.
- The region has been further stratified based on forest carbon stocks resulting in 2 strata: lands with less than 20 tons/ha aboveground biomass and lands with greater than or equal to 20 tons/ha aboveground biomass.

[79] Programa Nacional Conjunto (ONU-REDD+ Paraguay). 2015b. Metodología de procesamiento y análisis de datos del Inventario Forestal Nacional (IFN): Informe del equipo técnico. Versión de setiembre 2015. S. p.

- Slope has been stratified into two classes 0-15% and 15+% slope.
- Elevation has been stratified into two classes 0-500m and 500+m elevation.

The results of the stratification analysis identified privately owned forest lands within the Chaco region (see the area in green in Figure 3.4a below) with aboveground biomass stocks (i.e., a proxy for forest carbon stocks) greater than 20 tons/ha, with slopes <15%, and elevation <500m. It is these forested lands the baseline agents would target for future land acquisition, conversion to pasture, followed by a large scale ranching operation. The vast majority (i.e., >90%) of the areas in orange in Figure 3.4a represent land already converted for large scale (>1000 ha) farming operations.

Activity-driven parameters relating to the distinct conversion practices (i.e., conversion of native forest to pasture) do not play a role in the landowners decision to purchase and deforest land. As the baseline agent of deforestation are large scale agribusiness, the primary activity-driven parameter considered is the access to markets. As demonstrated in Figure 3.4b below, land is converted for ranching in the most remote areas of the Chaco where the distance to markets is greater than 340 km. This Figure depicts a buffer of 350 km around the closest slaughterhouse[80] in Loma Plata to most of the ranches in the Chaco demonstrating that access to markets does not significantly affect landowners decision to purchase and deforest land. In summary, access to markets does not play an influential role on development of cattle farms in the Paraguayan Chaco.

[80] The primary slaughterhouses used by ranches in the Chaco include: 1). the Chortizer Cooperative in Loma Plata (i.e. the Central Chaco); 2) the Frigomerc plant in Asuncion; and 3) Frigoríficos Concepción.

Figure 3.4a. Stratification of Chaco Region to document the where the baseline agent of deforestation operates.

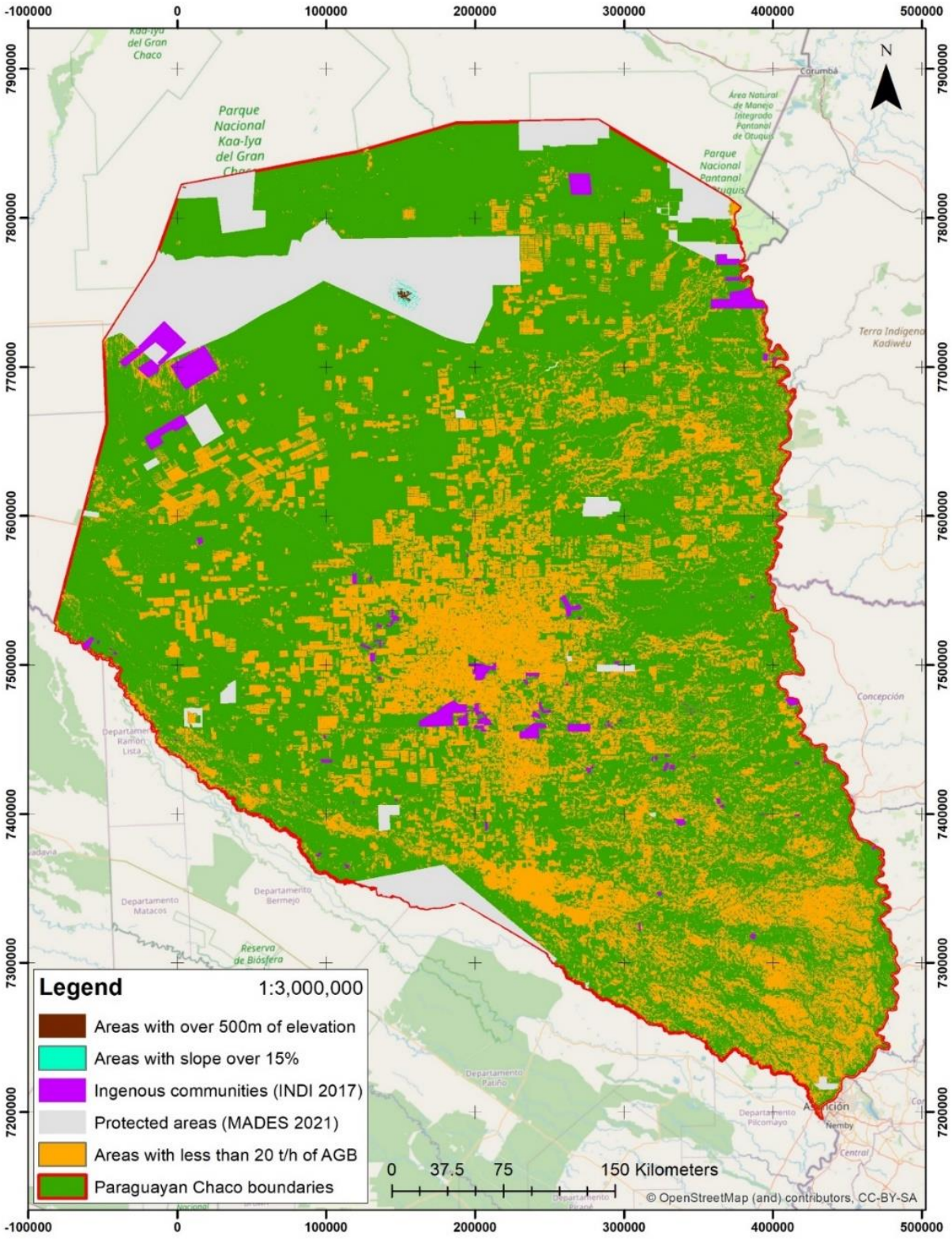
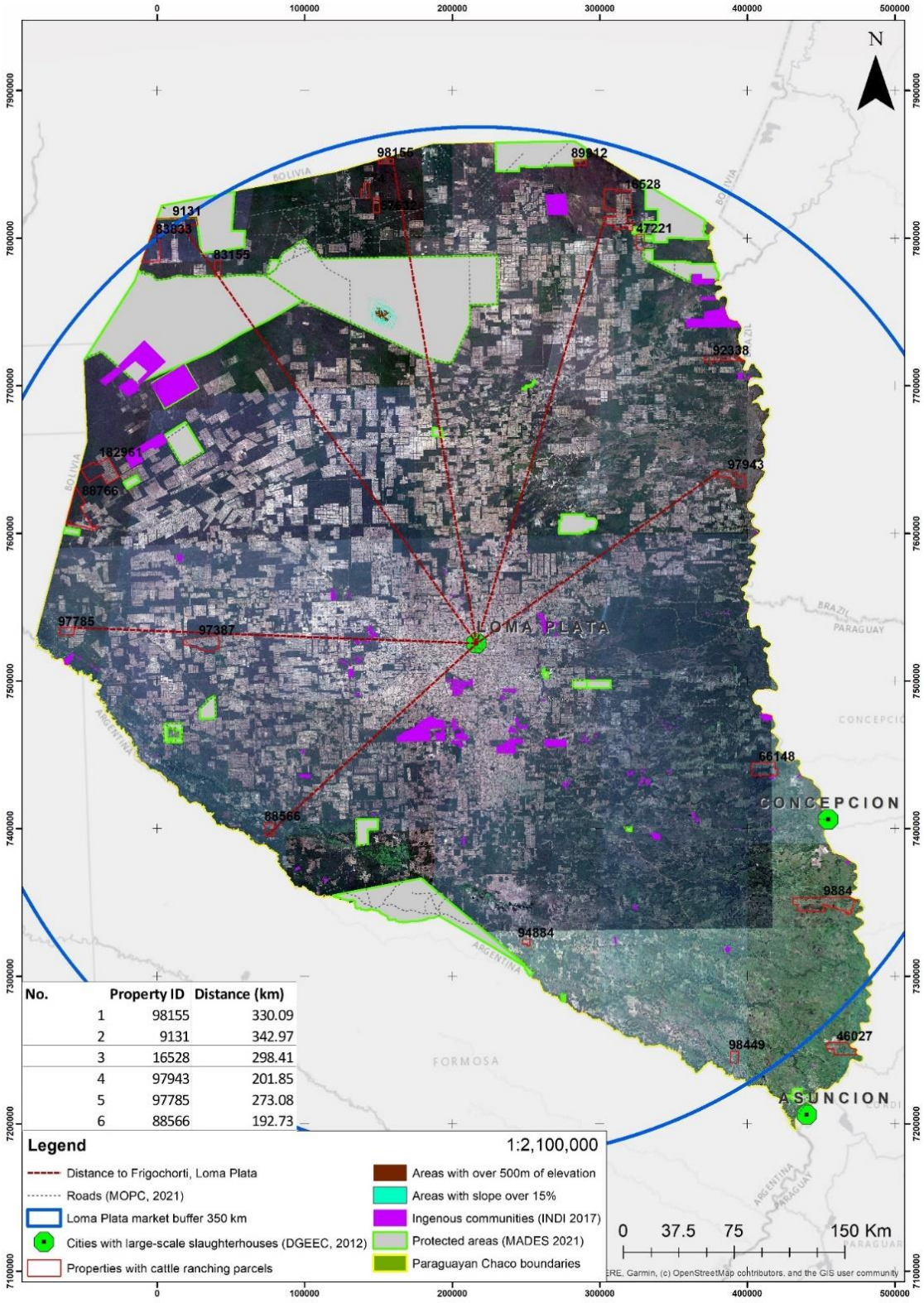


Figure 3.4b. Document that access to markets (an activity-driven parameter) does not limit the baseline agent of deforestation decision to purchase and deforest land in the Chaco.



Justifying the Class of Agent is the Most Common Purchaser of Similar Lands

Gasparri and le Polain de Waroux[81] observe that over the past several decades the landscape of the Chaco has become more and more dominated by large-scale agribusinesses. In a review of historical MADES and Catastro Nacional data for the years 1991-2008, Oxfam en Paraguay[82] state that: "Large farms with areas greater than 1,000 hectares account for nearly 80% of the agricultural land (i.e., 24.5 million hectares of the 31 million hectares of land used for agricultural)." This statement clearly indicates the most common landowner is large scale agribusiness practicing farming on parcels larger than 1,000 ha. Further, CEO of P.E. Agro Business Real Estate Pablo Engel, a realtor focusing on farmland in Paraguay has identified "large scale agribusiness practicing farming on parcels larger than 1,000 ha" as the most common purchaser of land identified in the stratification analysis based on his experience in the region over the last 20 years.

Threat of Deforestation

The immediate, site-specific threat can be demonstrated by documentary proof of the following:

- Legal permissibility for deforestation;
- Suitability of project area for conversion to alternative non-forest land use;
- Evidence of likely transfer of ownership;
- Government approval; and
- Evidence of similar planned deforestation activities by the baseline agent within the previous five years to show intent to deforest.

Legal Permissibility for Deforestation

It is important to note that the formal land clearing/forest conversion process in Paraguay takes place with the approval of the Ministry of the Environment and Sustainable Development (MADES) and National Forest Service (INFONA). This section outlines the legal permissibility and framework for private landowners to proceed with deforestation. The legal forest conversion process in the Western Region (Chaco) of Paraguay, is framed in the Forestry Law 422/73. The formalization of these practices is managed through two institutions, the Ministry of the Environment and Sustainable Development (MADES), which is the enforcement authority of Law 294/93 on Environmental Impact Assessment and the National Forest Institute (INFONA), which is responsible for compliance with Forestry Law 422.

MADES grants proponents of land use change projects an Environmental Impact Statement (or DIA in Spanish), which specifies the size of the area to be cleared, respecting the legal reserve, corresponding to 25% of the existing forests in 1986 (baseline), as well as the protective forests of water courses and the windbreaks located around each production plot. Ones that MADES gives the DIA, the proponent

[81] Gasparri, Nestor Ignacio, and Yann le Polain de Waroux. "The coupling of South American soybean and cattle production frontiers: new challenges for conservation policy and land change science." Conservation Letters 8.4 (2015): 290-298.
[82] See page 17 of the Oxfam Report, Oxfam en Paraguay. Yvy Jára. Los dueños de la tierra en Paraguay. Asunción, Oxfam, Noviembre 2016.

manages the Land Use Plan with INFONA oversight.

A land use plan constitutes a document whose technical content must serve for decision-making in accordance with the provisions of Law No. 422/73. Article 12 indicates that the National Forest Service (i.e., INFONA) has specific powers to regulate and supervise the conservation and recovery or use of forest lands. Further, Article 23 of the same law prohibits the devastation of forests and forest lands as well as the irrational use of forest products. INFONA thereby is charged with authorizing the rational use and change of land use in properties larger than 50 ha in the Eastern Region and larger than 150 ha in the Chaco Region (Res. SFN INT. 224/2001, Art. 2). Currently, authorizations for change of land use in the Eastern Region of Paraguay are not issued due to the validity of Law No. 6256/18.

This formal land clearing/forest conversion process involves submission of the following documentation to MADES/INFONA for approval:

1) Environmental Impact Statement;

2) Map of current and alternative use;

3) Property title (certified copy);

4) Current original domain certificate;

5) Authenticated copy of the lease (if any);

6) Authenticated copy of ID of the owners or attorney;

7) Authenticated copy of the power of attorney (if any); and

8) Authenticated copy of the statute if it is a legal entity.

The land clearing/forest conversion process typically starts with a fleet of bulldozers, which have a capacity to clear up to 250 ha per day. During this process the wood is not utilized for commercial purposes but is left to dry for periods of up to 30 days, after which the area is cleared by burning.

As the Corazón Verde del Chaco Project is not looking to actually convert the property to a non-forest condition, it is not required to complete the Environmental Impact Statement. Rather, the Project Proponent has delineated the Project Area in accordance with Paraguayan law as specified below and made the remaining documentation (Items 3 - 8) available to MADES.

Figure 2.10 contains the Alternative Use Map (i.e., potential map of the deforested condition), which identifies the area the landowner is legally allowed to clear. This map has been prepared by a local consultant familiar with this process following legal guidance as stipulated below.

I. The property must have a reserve of 25% of forest (Law No. 422/73 Art. 42; Decree No. 175/18 Art.3.3.2; Decree No. 18831/86 Art. 11, Res. INFONA No. 1242/12 Art.5).

    a. The forest reserve must be a continuous and compact mass of forest (Res. INFONA N ° 1242/12).

b. The 25% forest reserve must be calculated based on the natural forests of the year 1986 including forests for the protection of water courses.

II. Water protection forests (Law No. 3239/07 Art. 23 Inc. a); Law N ° 4241/10; Decree 18831/86 Art. 3, Decree N ° 9824/12 Art.5,):

a. In the Chaco: Protection forests must be established at 100m to each margin of water channels; and

b. In the Eastern region: the protection forests are established according to the width of the water channel in question (Decree No. 9824/12 Art. 5). It is clarified that this is an interpretation applied by MADES.

III. The forest strip between plots (Decree 18831/86, Res. INFONA N ° 1242/12 Art. 2, Art. 3, Art.4; Res. INFONA N ° 1001/19, Art.1, Art. 2)

a. The maximum size of land allotments is 100ha (Forest cleaning)

IV. Project location in relation to protected wild areas (Law No. 352/94, Res. SEAM No. 200/01 Art. 31).

V. Location of the project in relation to indigenous communities (Law No. 904/81).

VI. Resolution 200/2001: About wildlife protected areas, in case of the property limits falls into the area of the Gran Chaco Biosphere, Art. 31 inc. c), which stipulates maintaining at least 50% of the property within the Gran Chaco Biosphere under natural conditions.

Compliance with Law

The baseline for the initial project instance and each subsequent project instance of the Corazón Verde del Chaco Project will be in full compliance with Paraguayan forest laws as outlined above. Further, the Alternative Land Use Map will be submitted to MADES for approval.

Suitability of Project Area for Conversion to Alternative Non-Forest Land Use

Suitability for conversion of the Project Area to non-forest is demonstrated in Table 3.5. This table demonstrates that the Project Area has similar soils and topography to the proxy areas that have already been converted to pasture (see analysis below). While there is a significant west (400 mm/yr) to east (1000 mm/yr) precipitation gradient in the Chaco, this does not really affect the decision to convert the forest to pasture, but rather impacts the livestock stocking density. In general, the entire Chaco region is suitable for conversion to pasture except in a few locations where water is present year round or in the few cases where slopes prohibit grazing (<1% of the Grouped Project Region).

The following pictures from the Project Zone are indicative of the baseline land use in the region whereby native vegetation has been cleared for cattle pasture.

Figure 3.5. Photo baseline land use pasture at Estancia Eirete.

Figure 3.6. Photo of baseline land use pasture at Estancia Eirete.

Evidence of Likely Transfer of Ownership

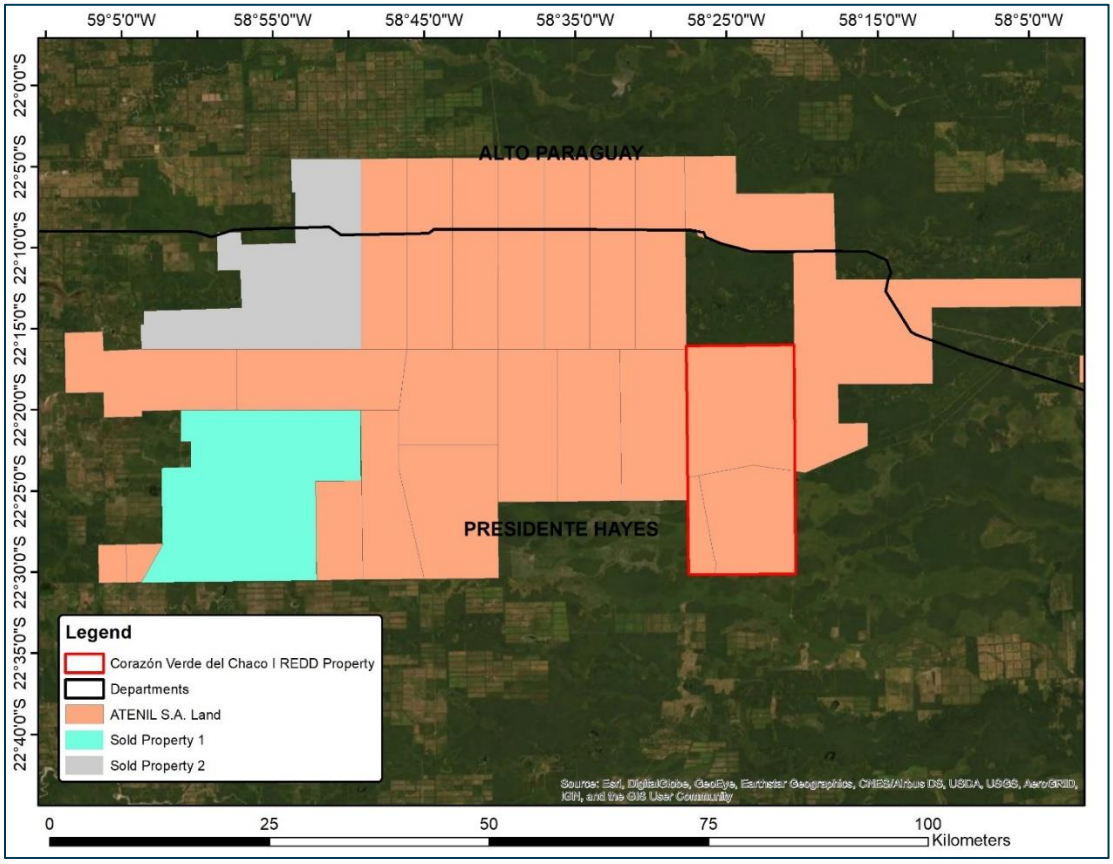
As the landowners are not the baseline agent of deforestation, the Corazón Verde del Chaco Project demonstrates a likely transfer of ownership to a large agricultural business with a focus on cattle ranching using: “Other evidence that control of the project area would have been transferred to the baseline agent or class of agents in the absence of the project” as allowed by the methodology. It is acknowledged that future project instances may demonstrates a likely transfer of ownership using other types of evidence as outlined in the methodology.

Atenil S.A. is one of Paraguay’s largest landowners, and 10 years ago the company used to own nearly 330,000 hectares, however it sold a number of properties which brought their overall land holdings down to approximately 280,000 hectares. Atenil S.A. has been slowly divesting their land holding over time. As such, Atenil S.A. has sold large two parcels to agribusinesses in the last 10 years (Figure 3.7).

Quadriz Founder and CEO, Marcel van Heesewijk first met the directors of Atenil at the Conference ‘Foro de Negocios Verdes’ in Asunción in October 2018, after which frequent contact begun, until the parties in April 2019 first time verbally discussed the of idea land purchase/lease. Quadriz had come to learn that Atenil had put part of its untouched forest property up for sale, after the project property had previously been investigated for development into a large-scale cattle ranch.

In the baseline scenario, a purchaser of the Atenil property would have submitted a plan for conversion, hence once the development of the REDD+ carbon project was agreed, this task fell to the project developer to submit this plan.

Figure 3.7. Map of Atenil S.A. lands and parcels sold.



Government Approval

Approval for the removal of native vegetation and conversion to alternative land uses is overseen by MADES/INFONA, as described in the Section on "Legal Permissibility for Deforestation." In line with the methodology, the Project Proponent requested approval of their Alternative Use Plan in a communication[83] with INFONA on September 7, 2021.

Intent to deforest

As the agent of deforestation is an identified class of agents, their intent to deforest can be demonstrated by documenting the history of similar planned deforestation within the five years previous to without-project deforestation. This documentation includes:

1) Development of the baseline using proxy areas and data from 2014-2019;
2) Table 3.4 containing estimates of forest loss from 2000-2015 by Paraguay's UN-REDD initiative;[84]

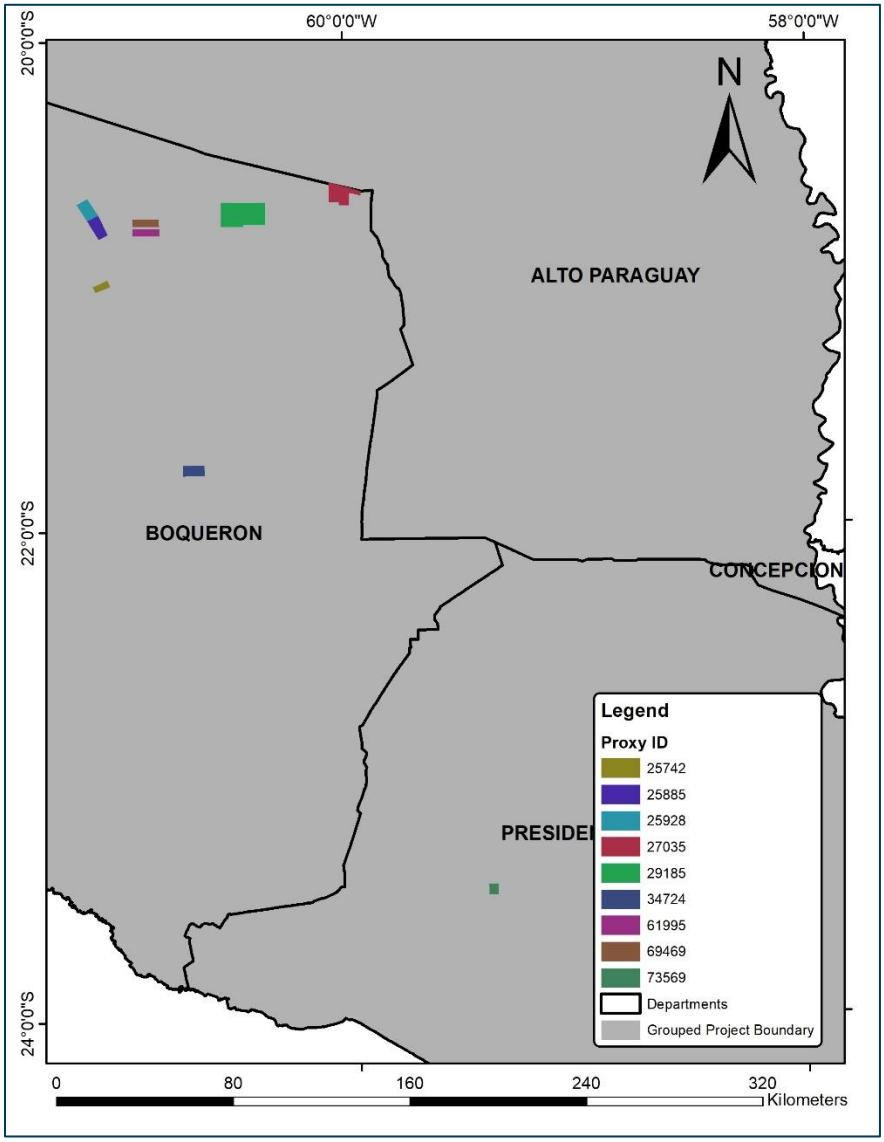
[83] See the project database for a copy of this communication.
[84] Programa Nacional Conjunto (ONU-REDD+ Paraguay). 2015b. Metodología de procesamiento y análisis de datos del Inventario Forestal Nacional (IFN): Informe del equipo técnico. Versión de setiembre 2015. S. p.

3) Figures 2.14 through 2.19 documenting agricultural expansion in the Chaco over the period 1990 - 2020.

Identifying proxy areas

Nine areas were identified within the Grouped Project Boundary that proved suitable to use as proxy sites from which to estimate rate of planned deforestation in the baseline (see Figure 3.8).

Figure 3.8. Map of the 9 proxy sites in the Grouped Project Boundary.



Each proxy site was selected to meet the following criteria:

1) Land conversion practices are the same as those used by the baseline agent, and are similar authorized clearings throughout Departments of Presidente Hayes, Alto Paraguay, and Boquerón, typically involving bulldozing of the forest, followed by mechanized clearing of the land, and burning;
2) The post-deforestation land use is ranching/pasture, the same as the baseline scenario, confirmed via inspection of satellite imagery;[85]
3) It has similar management and land use rights as the project area under the business-as-usual scenario, which are similar on large (>1,000 ha) private holdings throughout the Chaco (the areas

[85] The boundaries of proxy areas overlaid high resolution aerial photos which depicted features typical of large scale ranches, including many cattle trails and ponds.

are confirmed to be private lands by process of elimination – i.e., no overlap with GIS layers of state lands or Indigenous lands;

4) It is located within the Grouped Project Boundary (i.e., Departments of Presidente Hayes, Alto Paraguay, and Boquerón);
5) Deforestation is legally permitted as the property is georeferenced and registered with MADES; and
6) It has deforestation which has occurred within 10 years prior to the baseline period.

The Project Area is similar in forest type, elevation, slope, and soil type to each proxy area (See Table 3.5), and hence suitable for conversion to non-forest as these proxy sites have been. While the previous forest type in the Chaco does not influence a landowners decision as to whether forest in the region is converted to pastureland (Ing. Agr. Daline Gómez, pers comm), the forest types in the proxy area prior to deforestation are in the same proportion (±20%) as those in the project area (see Table 3.5b). All proxies and the project areas were 100% within the 0-500m elevation classes. This is reflective of the fact Chaco has little relief and elevations greater than 500 meters are not common. Similarly, slopes in the proxy site were similar to the Project Area (predominately <15%). The vast majority of land (and soil) in Chaco is suitable for ranching as discussed above

Table 3.5a. Comparison of soil type, elevation, and slope in the project area and proxy sites.

Proxy Area	Identification	Soil Class	Elevation (%)	Slope (%)	
		High Activity Clay (HAC)	0-500m	Gentle (<15%)	Steep (>15%)
	Project Instance 1	100%	100%	100%	0%
1	73,569	100%	100%	100%	0%
2	34,724	100%	100%	100%	0%
3	25,928	100%	100%	100%	0%
4	25,742	100%	100%	100%	0%
5	25,885	100%	100%	100%	0%
6	61,995	100%	100%	100%	0%
7	27,035	100%	100%	100%	0%
8	29,185	100%	100%	100%	0%
9	69,469	100%	100%	100%	0%

Table 3.5b. Comparison of forest types in the project area and proxy sites.

Proxy Area	Identification	Vegetation Class			
		Broadleaved deciduous or evergreen forest	Closed to open (>15%) shrubland (<5m)	Mosaic Cropland (50-70%) / Vegetation (grassland, shrubland, forest) (20-50%)	Mosaic Vegetation (grassland, shrubland, forest) (50-70%) / Cropland (20-50%)
	Project Instance 1	87.0%	9.2%	3.8%	0.0%
1	73569	100.0%	0.0%	0.0%	0.0%
2	34724	100.0%	0.0%	0.0%	0.0%
3	25928	97.6%	0.0%	2.4%	0.0%
4	25742	99.9%	0.0%	0.1%	0.0%
5	25885	91.1%	0.0%	8.9%	0.0%

6	61995	100.0%	0.0%	0.0%	0.0%
7	27035	99.5%	0.0%	0.5%	0.0%
8	29185	99.7%	0.0%	0.1%	0.2%
9	69469	100.0%	0.0%	0.0%	0.0%

Rate and Annual area of deforestation cleared in the baseline

The rate of deforestation is calculated for each of the 9 proxy areas using Equation 3.1 and then averaged to derive a baseline rate of deforestation (D%planned,i,t).

Equation 3.1. Equation for estimating the projected annual proportion of land that will be deforested.

$$D\%_{planned,i,t} = \left(\sum_{pn=1}^{n^*} \left(D\%_{pn} / Yrs_{pn} \right) \right) / n$$

Table 3.6. Parameters and Values Used to Calculate the projected annual proportion of land that will be deforested.

Parameter	Description	Value	Justification
D%planned,i,t	Projected annual proportion of land that will be deforested in stratum i during year t.	14.3%	Calculated in Table 3.7.
D%pn	Percent of deforestation in land parcel *pn* etc of a proxy area as a result of planned deforestation as defined in this module; %	See Table 3.7.	See project workbook for calculations.
Yrspn	Number of years over which deforestation occurred in land parcel pn in proxy area	See Table 3.7.	See project workbook for calculations.
Aplanned,i, (ha)	Total area of planned deforestation over the baseline period for stratum i; ha	31,858.6	This is the total area of the project property. In order for Equation 4 to work with Equation 5 of the BL-PL module, both equations need to reference the "proportion of land that will be deforested". This approach is conservative because if the Aplanned was the sum of all areas of planned deforestation, the rate (D% planned) would necessarily be much greater.
L-Di	Likelihood of deforestation for stratum i; %	100%	As the project area is not under government control, "L-Di shall be equal to 100%" as set by the methodology.
AAplanned,i,t	Annual area of baseline planned deforestation for stratum i at time t; ha	See Table 3.8.	Calculated in Table 3.8.

Table 3.7. Calculation of the projected annual proportion of land that will be deforested.

Proxy Site ID	25928	25885	34724	25742	27035	73569	69469	61995	29185	Sum/Average
Area deforested 2014-2019 (Hectares)	4,676	4,307	3,393	1,411	6,146	1,388	2,569	2,539	13,309	
Parcel Area (Hectares)	5,012	5,017	4,704	2,095	9,127	2,085	4,036	4,017	21,140	
$D\%_{pn}$	93.3%	85.8%	72.1%	67.3%	67.3%	66.5%	63.6%	63.2%	63.0%	
Yrs_{pn}	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
pn	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	9
n										
$D\%_{pn}/Yrs_{pn}$	18.7%	17.2%	14.4%	13.5%	13.5%	13.3%	12.7%	12.6%	12.6%	
D%planned,i,t Actual										14.3%

The area of land cleared in the baseline is calculated using Equation 3.2. The calculated annual area of planned deforestation, found in Table 3.8, was conservatively applied to strata with the lowest carbon stocks which are deforested first (see Table 3.9). Discussions with property owners and farm managers revealed it is possible to easily clear up to 8,000-10,000 hectares in any given year as there are few limits to the number of bulldozers available to clear and prepare the land for ranching.

Equation 3.2. Equation for estimating the annual area of planned deforestation in the baseline.

$$AA_{planned,i,t} = \left(A_{planned,i} * D\%_{planned,i,t}\right) * L - D_i$$

Table 3.8. Calculation of the annual area of planned deforestation in the baseline, per methodology.

Year	AAplanned,i, (ha)	D%planned,i,t Actual	L-Di	AAplanned,i,t
2021	31,859	14.3%	100%	4,547.3
2022	31,859	14.3%	100%	4,547.3
2023	31,859	14.3%	100%	4,547.3
2024	31,859	14.3%	100%	4,547.3
2025	31,859	14.3%	100%	2,325.8
2026	31,859	14.3%	100%	
2027	31,859	14.3%	100%	
2028	31,859	14.3%	100%	
2029	31,859	14.3%	100%	
2030	31,859	14.3%	100%	
Total				20,515.0

Table 3.9. Conservative planned deforestation baseline. Values are conservative because they assume the strata with the lowest carbon stocks are deforested first.

Year	AAplanned,i,t (ha)	AAplanned,i,t Paleo-Drainage (ha)	AAplanned,i,t Palm Savanna (ha)	AAplanned,i,t Forest (ha)

2021	4,547	548	3,999	0
2022	4,547	0	3,471	1,076
2023	4,547	0	0	4,547
2024	4,547	0	0	4,547
2025	2,326	0	0	2,326
2026	0	0	0	0
2027	0	0	0	0
2028	0	0	0	0
2029	0	0	0	0
2030	0	0	0	0
Total	20,515	548	7,470	12,496

Estimation of Carbon Stock Changes and GHG Emissions

Stratification of the Total Area Subject to Deforestation

The native forest within the geographic boundary of the grouped project is a mosaic of mesoxerophytic semi-deciduous forests and palm savannah forest which comprises the eastern border of the geographic boundary. *Schinopsis balansae*, *Cesalpinea paraguayensis*, and *Aspidosperma* quebracho-blanco are often found in the mesoxerophytic semi-deciduous forests, although their relative abundance varies according to a west (400 mm/yr) to east (1000 mm/yr) precipitation gradient. The savannahs are dominated by *Copernicia alba* which does well in the seasonally flooded lowland areas adjacent to the Rio Paraguay.

The initial Project Area was stratified, according to module X-STR, using a visually interpretation of aerial imagery in conjunction with on the ground knowledge of vegetation in the region. The same forest strata are used for preparation of the Alternative Use Plan. The forest types and strata areas present in the initial Project Area are listed in Table 3.10.

Table 3.10. Stratum areas within the Initial Project Area.

Stratum	Stratum Description	Area (hectares)
Paleo-Drainage	Open forest associated with historic river channels often dominated with *Copernicia alba* palms	548.2
Palm Savanna	Palm savannah forest dominated by *Copernicia alba*	7,470.5
Forest	Mesoxerophytic semi-deciduous forests	12,496.3

Estimation of Carbon Sequestered in Long-Lived Wood Products

While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances. For this reason, the following CP-W procedures have been outlined.

Carbon sequestered in long-lived wood products is calculated using module CP-W Option 2, Commercial Inventory Estimation. The trees harvested would have been made into sawnwood[86] as is typical for the tropical hardwood species in the region, hence only one wood product class (sawnwood, "s") is extracted in the baseline. No other wood is extracted for commercial markets. Table 3.11 list all parameters used for CP-W Option 2.

Table 3.11. Parameters and Values used estimate carbon stocks entering the wood products pool.

Parameters	Description	Value	Source
CAB_tree,i	Mean aboveground biomass carbon stock in stratum i; t CO_2-e ha^{-1}	332.1	Calculated from forest inventory data for the forest stratum.
BEF	Biomass expansion factor (BEF) for conversion of volume to total aboveground tree biomass; dimensionless		To be determined
Pcomi	Commercial volume as a percent of total aboveground volume in stratum i; dimensionless		To be determined
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)	(s) sawnwood	All wood harvested is for sawnwood.
WWty	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product ty; dimensionless	0.24	Default value for developing countries from CP-W module
SLFty	SLFty Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product ty; dimensionless	0.20	Default for sawnwood from CP-W module
Ofty	OFty Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product ty; dimensionless	0.84	Default value from previous version of methodology

Equation 3.3. Equation for estimating the mean stock of extracted biomass.

$$C_{XB,i} = C_{AB\_tree,i} * \frac{1}{BCEF} * Pcom_i$$

[86] Of the wood product classes identified in the CP-W module (i.e., sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other), only sawnwood is a commercial timber product occasionally harvested from Chaco forests (Javier Rodas Forest Engineer, pers. comm).

Table 3.12. Calculation of the mean stock of extracted biomass.

CAB_tree,I (t CO_2/ha)	BEF	Pcomi	$C_{XB,sawnwood}$ (t CO_2/ha)
332			0

Equation 3.4. Equation for estimating the carbon stock entering the wood products pool.

$$C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * (1 - WW_{ty})$$

Table 3.13. Calculation of the carbon stock entering the wood products pool.

$C_{XB,sawnwood}$ (t CO_2/ha)	WW_s	$C_{WP,i}$ (t CO_2/ha)
0	0.24	0

Equation 3.5. Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years

$$C_{WP100,i} = C_{WP,i} - C_{WP,i} * (1 - SLFp) * (1 - Ofp)$$

Table 3.14. Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years.

$C_{WP,i}$ (t CO_2/ha)	SLF_s	Ofs	$C_{WP100,i}$ (t CO_2/ha)
0	0.20	0.84	0

Estimation of Carbon Stocks and Carbon Stock Changes per Stratum

Forest carbon stocks were directly measured in a forest inventory of the initial Project Area in 2022. Results are detailed in the “Forest biomass carbon inventory for the Corazón Verde del Chaco, Paraguay” which can be found in the Project’s database. Results are summarized for forest strata in Table 3.15, below. Stratum specific values for live aboveground biomass (CAB_tree,i), belowground biomass, (CBB_tree,i) and dead wood (CDW,i), and stratum totals (CBSL,i) were derived from the forest inventory. The total carbon stock entering the wood products pool ($C_{WP,i}$) and 100-year emissions ($C_{WP100,i}$) can be found in Table 3.15 and were derived using the CP-W module.

Baseline post-deforestation carbon stocks are defined as the long-term average stocks in the baseline scenario. Lezcano et al.[87] found that aboveground carbon stocks in pasture after deforestation within the Grouped Project Region to be 1.1 tC/ha. Using this value as a default value is conservative, as this value is greater than the value (0.0 tC/ha) used by local government agencies when developing Paraguay's

[87] Díaz Lezcano, M. I., L. Leguizamón, C. C. Gamarra Lezcano, M. Vera de Ortíz, and M. P. Galeano Samaniego. "Estimación del contenido de carbono en sistemas silvopastoriles de Prosopis spp en el chaco central paraguayo." *Quebracho (Santiago del Estero)* 27, no. 1 (2019): 54-54.

national forest reference emissions level (UN-REDD funded FREL[88]). This assumption was incorporated into Paraguay's national effort to develop their forest reference emissions level and is reasonable for cases where land has been fully deforested to make way for pasture. However, use of a post-deforestation aboveground carbon stocks of 0.0 tC/ha, as proposed, may not capture the reality where an occasional tree is not cleared or where regrowth occurs. Our average aboveground biomass stock value of 1.1 tons C per hectare is also similar to that found by Bonino (2006) for the grazed shrubby grasslands in the Chaco of Argentina, which was 1.37 tons C per hectare.

Belowground biomass is estimated by applying the equation developed by Cairns et al.[89] for an above ground biomass value of 2.34 tons dry biomass/ha. This resulted in a belowground biomass value of 0.74 dry biomass/ha or 0.35 tC/ha.

Post-deforestation carbon stocks in the litter and deadwood pools are zero due to the presence of fire in conjunction with the presence of repeatedly clearing the scrubby regrowth in pastures every 2-3 years in the baseline scenario where regrowth occurs.

[88] Republic of Paraguay. 2015. Nivel de Referencia de las Emisiones Forestales por Deforestación en la República del Paraguay para pago por resultados de REDD+ bajo la CMNUCC. Auncion, Paraguay.
[89] Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world's upland forests. Oecologia 111, 1-11.

Table 3.15. Estimation of Carbon Stocks and Post-Deforestation carbon stocks for all carbon pools and strata.

Stratum	Description	Paleo-Drainage	Palm Savanna	Forest	Area Weighted Mean for the Initial Project Area	Cpost Baseline
CAB_tree,i (t CO_2-e ha^{-1})	Carbon stock in aboveground tree biomass in stratum i; t CO_2e ha^{-1}	89.0	98.4	332.1	240.5	4.0
CBB_tree,i (t CO_2-e ha^{-1})	Carbon stock in belowground tree biomass in stratum i; t CO_2e ha^{-1}	22.4	24.6	75.8	55.8	1.3
CLI_tree,i (t CO_2-e ha^{-1})	Carbon stock in litter in stratum i; t CO_2e ha^{-1}	7.1	12.1	11.7	11.7	0.0
CDW,i (t CO_2-e ha^{-1})	Carbon stock in dead wood in stratum i; t CO_2e ha^{-1}	13.6	1.5	13.6	9.2	0.0
CBSL,i (t CO_2-e ha^{-1})	Carbon stock in all carbon pools in forest stratum i; t CO_2e ha^{-1}	132.1	136.7	433.2	317.2	5.3
$C_{WP,i}$ (t CO_2/ha)	Total carbon stock entering the wood products pool at the time of deforestation; t CO_2-e ha^{-1}				0	
$C_{WP100,i}$ (t CO_2/ha)	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i; t CO_2-e ha^{-1}				0	

Stocks of belowground biomass and dead wood are emitted from the year of conversion/deforestation at a linear rate equal to 1/10 of the initial stock annually, for 10 years. Carbon stocks entering the wood products pool and that are expected to be emitted over 100 years are emitted from the year of conversion/deforestation at a linear rate equal to 1/20 of the initial stock annually, for 20 years. Net emissions (CBSL -C post) from steady decomposition of these pools are elaborated in Tables 3.16, 3.17, and 3.18.

Table 3.16. Emissions from steady decomposition of belowground biomass post deforestation in the initial project area, ($CBSL_{BB}$ -C $post_{BB,}$ t CO_2-e).

Year	BGB Emissions from Deforestation (t CO_2)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2021	104,802	10,480	10,480	10,480	10,480	10,480	10,480	10,480	10,480	10,480	10,480
2022	161,168		16,117	16,117	16,117	16,117	16,117	16,117	16,117	16,117	16,117
2023	339,071			33,907	33,907	33,907	33,907	33,907	33,907	33,907	33,907
2024	339,071				33,907	33,907	33,907	33,907	33,907	33,907	33,907
2025	173,421					17,342	17,342	17,342	17,342	17,342	17,342
2026	0						0	0	0	0	0
2027	0							0	0	0	0
2028	0								0	0	0
2029	0									0	0
2030	0										0

Table 3.17. Emissions from steady decomposition of dead wood post deforestation in the initial project area, ($CBSL_{DW}$ -C $post_{DW,}$ t CO_2-e).

Year	DW Emissions from Deforestation (t CO_2)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2021	13,502	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350
2022	19,873		1,987	1,987	1,987	1,987	1,987	1,987	1,987	1,987	1,987
2023	61,820			6,182	6,182	6,182	6,182	6,182	6,182	6,182	6,182
2024	61,820				6,182	6,182	6,182	6,182	6,182	6,182	6,182
2025	31,618					3,162	3,162	3,162	3,162	3,162	3,162
2026	0						0	0	0	0	0
2027	0							0	0	0	0
2028	0								0	0	0
2029	0									0	0
2030	0										0

Table 3.18. Emissions from steady decomposition of wood products post deforestation in the initial project area, (C_{WP} -C $post_{WP,}$ t CO_2-e).

Year	Wood Product Emissions from Deforestation (t CO_2)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2021	0	0	0	0	0	0	0	0	0	0	0
2022	0		0	0	0	0	0	0	0	0	0
2023	0			0	0	0	0	0	0	0	0
2024	0				0	0	0	0	0	0	0
2025	0					0	0	0	0	0	0
2026	0						0	0	0	0	0
2027	0							0	0	0	0
2028	0								0	0	0
2029	0									0	0
2030	0										0

Estimation of the Sum of Baseline Carbon Stocks Changes in all pools

Net CO_2 emissions in the baseline for the Project Area are calculated by summing the net changes in carbon stocks using Equation 3.6. The parameters ΔCAB_non-tree, ΔCBB_non-tree, ΔCSOC have been left out of calculations as they are not included in the project boundary.

Equation 3.6. Equation for estimating the Sum of Baseline Carbon Stocks Changes in all pools.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} * (\Delta C_{AB_{tree},i} - \Delta C_{WP,i} + \Delta C_{AB_{non-tree},i} + \Delta C_{LI,i}) + (\sum_{t-10}^{t} A_{planned,i,t}) * (\Delta C_{BB_{tree},i} + \Delta C_{BB_{non-tree},i} + \Delta C_{DW,i}) * \left(\frac{1}{10}\right) + (\sum_{t-20}^{t} AA_{unplanned,i,t}) * \left(C_{WP100,i} + \Delta C_{SOC,i}\right) * \left(\frac{1}{20}\right)$$

Table 3.19. Calculation of the Sum of Baseline Carbon Stocks Changes in all pools.

Year	AAplanned,i,t Paleo-Drainage (ha)	AAplanned,i,t Palm Savanna (ha)	AAplanned,i,t Forest (ha)	$CBSL_{AB}$ - C $post_{AB}$ (t CO_2-e)	$CBSL_{LI}$ - C $post_{LI}$ (t CO_2-e)	$CBSL_{BB}$ -C $post_{BB}$ (t CO_2-e)	$CBSL_{DW}$ -C $post_{DW}$ (t CO_2-e)	C wp (t CO_2-e)	ΔCBSL,i
2021	548	3,999	0	424,035	52,455	10,480	1,350	0	488,321
2022	0	3,471	1,076	680,579	54,705	26,597	3,337	0	765,218
2023	0	0	4,547	1,491,683	53,037	60,504	9,520	0	1,614,744
2024	0	0	4,547	1,491,683	53,037	94,411	15,702	0	1,654,833
2025	0	0	2,326	762,932	27,126	111,753	18,863	0	920,675
2026	0	0	0	0	0	111,753	18,863	0	130,617
2027	0	0	0	0	0	111,753	18,863	0	130,617
2028	0	0	0	0	0	111,753	18,863	0	130,617
2029	0	0	0	0	0	111,753	18,863	0	130,617
2030	0	0	0	0	0	111,753	18,863	0	130,617

Estimation of GHG Emissions in the Baseline

Greenhouse gas emissions in the baseline resulting from deforestation activities within the Project Area (GHGBSL,E,i,t) are calculated in Table 3.22 using Equation 3.7. Parameters are found in Table 3.20 and Table 3.47.

Equation 3.7. Equation for Calculating GHG Emissions as a Result of Deforestation Activities within the Project Area in the Project Case.

$GHG_{BSL-E,i,t} = E_{BiomassBurn,i,t}$ = Aburn,i,t * Bi,t * COMF I * Gg,I * 10^-3 * GWPg

Table 3.20. Parameters and Values Used to Calculate Annual Ex-Ante GHG Emissions.

Parameter	Description	Value	Justification
GHGBSL-E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the	See Table 3.22.	Calculated below.

	baseline stratum i during project year t; t CO_2-e $year^{-1}$		
EBiomassBurn,i,t	Non-CO_2 emissions due to biomass burning in stratum i in year t; t CO_2e	See Table 3.22.	Biomass burning is expected to occur in the with-project case.

Baseline Net GHG Emissions for Planned Deforestation

Net CO_2 emissions in the baseline for the Project Area are calculated by summing the net changes in GHG emissions and net changes in carbon stocks using Equation 3.8.

Equation 3.8. Equation for estimating the baseline net GHG emissions for planned deforestation.

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t} \right)$$

Table 3.21. Parameters and Values used to estimate the baseline net GHG emissions for planned deforestation.

Parameter	Description	Value	Justification
ΔCBSL,planned	Net greenhouse gas emissions in the baseline from planned deforestation; t CO_2-e	See Table 3.22.	Calculated below.
ΔCBSL,i,t	Net carbon stock changes in all pools in the baseline stratum i at time t; t CO_2-e	See Table 3.22.	Calculated above.
GHGBSL-E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i during project year t; t CO_2-e $year^{-1}$	See Table 3.22.	Calculated below.

Table 3.22a. Calculation of the baseline net GHG emissions for planned deforestation.

Year	ΔCBSL,i	E-N_2O Biomass Burning (tCO_2e)	E-CH_4 Biomass Burning (tCO_2e)	GHGBSL-E,i,t	ΔCBSL,planned
2021	488,321	18,278.4	65,664.4	83,943	572,263
2022	765,218	18,278.4	65,664.4	83,943	849,161
2023	1,614,744	18,278.4	65,664.4	83,943	1,698,687
2024	1,654,833	18,278.4	65,664.4	83,943	1,738,776
2025	920,675	9,348.6	33,584.6	42,933	963,608
2026	130,617	0.0	0.0	0	130,617
2027	130,617	0.0	0.0	0	130,617
2028	130,617	0.0	0.0	0	130,617
2029	130,617	0.0	0.0	0	130,617
2030	130,617	0.0	0.0	0	130,617

Table 3.22b. Reallocation of the baseline net GHG emissions to account for split year vintages and full year GHG accounting in the with-project case.

Year	ΔCBSL,planned
2020	286,132
2021	710,712
2022	1,273,924
2023	1,718,731
2024	1,351,192
2025	547,113
2026	130,617
2027	130,617
2028	130,617
2029	130,617
2030	124,702
2031	109,734
2032	80,638
2033	40,548
2034	10,252
2035	0
2036	0
2037	0
2038	0
2039	0
2040	0

3.2.2 Project Emissions

Expected project emissions are estimated ex-ante and apply Equation 3.9 of module M-REDD (VMD0015) of Methodology VM0007. Values for individual parameters are justified in Table 3.23 or derived in Tables 3.26, Table 3.28, Table 3.30, and Table 3.31. Ex-ante projections of deforestation in the project case assumes no deforestation has occurred as the baseline agent of deforestation did not purchase the property and does not have access to the property to undertake land clearing for pasture on the property.

Equation 3.9. Equation for Calculating the Net GHG emissions within the Project Area under the Project Scenario.

$$\Delta C_{WPS-REDD} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t} \right)$$

Table 3.23. Parameters and Values used to Calculate Annual Ex-Ante Project Emissions.

Parameter	Description	Value	Justification
$\Delta C_{WPS-REDD}$	Net greenhouse gas emissions in the REDD project scenario up to year t; t CO_2e	See Table 3.24.	Calculated below.
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t; t CO_2e	See Table 3.26.	Calculated below.
$\Delta C_{P,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i at time t; t CO_2e	$\Delta C_{P,Deg,i,t}$ = 0	The landowners and Project Proponent have committed to not deforest, not harvest fuelwood, and not harvest timber in forests in the Project Area. Further, the presence of forest patrols will deter degradation by illegal actors. As such, ex-ante degradation is estimated as zero. Emissions resulting from degradation due to selective logging of FSC certified areas (parameter ΔCP,SelLog,i,t) equates to zero as no selective FSC logging occurs in the with-project case.
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum i at time t; t CO_2e	See Table 3.28.	Calculated below.
$GHG_{P-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum i in year t; t CO_2e	See Table 3.30.	Calculated below.
$\Delta C_{P,Enh,i,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum i at time t; t CO_2e	$\Delta C_{P,Enh,i,t}$ = 0	Conservatively set to zero as allowed by the methodology

Table 3.24. Data used to Calculate $\Delta C_{WPS-REDD}$.

Year	ΔCP,DefPA,i,t (t CO_2-e)	ΔCP,Deg,i,t (t CO_2-e)	ΔCP,DistPA,i,t (t CO_2-e)	GHGP-E,i,t (t CO_2-e)	ΔCP,Enh,i,t (t CO_2-e)	ΔCWPS-REDD (t CO_2-e)
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0
2030	0	0	0	0	0	0

Deforestation in the with-project case

Equation 3.10. Equation for Calculating the Net Carbon Stock Change as a Result of Deforestation in the Project Case.

$$\Delta C_{P,DefPA,i,t} = \sum_{u=1}^{U} \left(A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t} \right)$$

Table 3.25. Parameters and Values used to Calculate Annual Ex-Ante Deforestation Emissions.

Parameter	Description	Value	Justification
ΔCP,DefPA,i,t	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t; t CO_2e	See Table 3.26.	Calculated below.
ADefPA,u,i,t	Area of recorded deforestation in the project area stratum i converted to land use u at time t; ha	See Table 3.26.	Ex-ante this value is set to zero as no deforestation is expected within the project area.
ΔCpools,Def,u,i,t	Net carbon stock changes in all pools in the project case in land use u in stratum i at time t; t CO_2e ha^{-1}	ΔCpools,Def,u,i,t = 317.2	This value is the strata area weighted mean carbon stock in all pools in the baseline case (CBSL,i) minus the carbon stock in all pools in post-deforestation land use (CP,post,u,i) minus the carbon stock sequestered in wood products from harvests (CWP,i)

Table 3.26. Data Used to Calculate ΔCP,DefPA,i,t.

Year	ADefPA,u,i,t (ha)	ΔCpools,Def,u,i,t (t CO_2-e/ha)	ΔCP,DefPA,i,t (t CO_2-e)
2021	0.0	317.2	0
2022	0.0	317.2	0
2023	0.0	317.2	0
2024	0.0	317.2	0
2025	0.0	317.2	0
2026	0.0	317.2	0
2027	0.0	317.2	0
2028	0.0	317.2	0
2029	0.0	317.2	0
2030	0.0	317.2	0

Natural disturbance in the with-project case

Equation 3.11. Equation for Calculating the Net Carbon Stock Change as a Result of Natural Disturbance in the Project Case.

$$\Delta C_{P,DistPA,i,t} = \sum_{q=1}^{Q} \left(A_{DistPA,q,i,t} * \Delta C_{P,Dist,q,i,t} \right)$$

Table 3.27. Parameters and Values used to Calculate Annual Ex-Ante Natural Disturbance Emissions.

Parameter	Description	Value	Justification
$\Delta CP_{,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum i in year t; t CO_2-e	See Table 3.28.	Calculated below.
$ADist_{PA,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum i, in year t; ha	See Table 3.28.	Natural disturbance will be distinguished from deforestation (ADefPA,u,i,t) using ancillary data such as high-resolution imagery and information from local land managers. Ex-ante this value is set to zero as no natural disturbance is expected within the Project Area.
$\Delta CP_{,Dist,q,i,t}$	Net carbon stock changes in pools as a result of natural disturbance in post natural disturbance stratum q in stratum i in year t; t CO_2-e ha^{-1}	See Table 3.28	Ex-ante, this value is equal to the strata area weighted mean carbon stock in all pools in the baseline case (CBSL,i) minus the carbon stock in all pools in post-deforestation land use (CP,post,u,i) minus the carbon stock sequestered in wood products from harvests (CWP,i). In the with-project case, this will be monitored.

Table 3.28. Data Used to Calculate $\Delta CP_{,DistPA,i,t}$.

Year	$ADist_{PA,q,i,t}$ (ha)	$\Delta CP_{,Dist,q,i,t}$ (t CO_2-e/ha)	$\Delta CP_{,DistPA,i,t}$ (t CO_2-e)
2021	0	317.2	0
2022	0	317.2	0
2023	0	317.2	0
2024	0	317.2	0
2025	0	317.2	0
2026	0	317.2	0
2027	0	317.2	0
2028	0	317.2	0
2029	0	317.2	0
2030	0	317.2	0

GHG Emissions

Greenhouse gas emissions as a result of deforestation activities within the Project Area (GHGP,E,i,t) and leakage areas (GHGLK-E,i,t) are similarly expected to be zero. These parameters are calculated using Equation 3.12 and parameters values found in Table 3.30 and Table 3.47.

Equation 3.12. Equation for Calculating GHG Emissions as a Result of Deforestation Activities within the Project Area in the Project Case.

$GHG_{P\text{-}E,i,t} = E_{BiomassBurn,i,t} = Aburn,i,t * Bi,t * COMF\ I * Gg,I * 10\text{^-}3 * GWPg$

Table 3.29. Parameters and Values Used to Calculate Annual Ex-Ante GHG Emissions.

Parameter	Description	Value	Justification
GHGP,E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project area in the project case in stratum i in year t; t CO_2e	See Table 3.30.	Calculated below.
EBiomassBurn,i,t	Non-CO_2 emissions due to biomass burning in stratum i in year t; t CO_2e	See Table 3.30.	Biomass burning is expected to occur in the with-project case.

Table 3.30. Calculation of $E_{BiomassBurn,i,t..}$ for the project area.

Year	Aburn,q,i,t. (ha)	E-N_2O Biomass Burning (tCO_2e)	E-CH_4 Biomass Burning (tCO_2e)	E-Biomass Burning (tCO_2e)	GHGP-E,i,t (t CO_2-e)
2021	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0
2026	0.0	0.0	0.0	0.0	0.0
2027	0.0	0.0	0.0	0.0	0.0
2028	0.0	0.0	0.0	0.0	0.0
2029	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0

Table 3.31. Calculation of $E_{BiomassBurn,i,t..}$ for the leakage areas.

Year	$LKA_{planned}$ (ha)	E-N_2O Biomass Burning (tCO_2e)	E-CH_4 Biomass Burning (tCO_2e)	E-Biomass Burning (tCO_2e)	GHGLK-E,i,t (t CO_2-e)
2021	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0
2026	0.0	0.0	0.0	0.0	0.0
2027	0.0	0.0	0.0	0.0	0.0

2028	0.0	0.0	0.0	0.0	0.0
2029	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0

3.2.3 Leakage

Leakage emissions from displacement of planned deforestation are estimated in conformance with the VCS modular REDD methodology VM0007, specifically by applying the LK-ASP and LK-ME modules. These modules provide for accounting of activity shifting leakage resulting from displacement of deforestation activities by the agent of deforestation and estimating GHG emissions caused by the market-effects leakage related to extraction of wood for timber.

There is no anticipated market leakage for this project as the process of deforestation does not involve timber harvesting for commercial markets and further, the baseline is not calculated using BL-DFW where fuelwood or charcoal is harvested for commercial markets.

Estimation of Activity Shifting Leakage

Activity shifting leakage due to displacement of planned deforestation was assessed using a series of equations outline in LK-ASP. The primary equations are listed below.

Equation 3.13. Equation for Estimating Activity Shifting Leakage for Projects Preventing Planned Deforestation.

$$\Delta C_{LK-AS,planned} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(LKA_{planned,i,t} \times \Delta C_{BSL,i} \right) + GHG_{LK,E,i,t}$$

Table 3.32. Parameters and Values used to Estimate Activity Shifting Leakage for Projects Preventing Planned Deforestation.

Parameter	Description	Value	Justification
ΔCLK-AS,planned	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation; t CO_2-e	See table below for calculations.	Calculated below.
LKAplanned,i,t	The area of activity shifting leakage in stratum i at time t; ha	See table below for calculations.	Calculated below.
ΔCBSL,i	Net carbon stock changes in all pools in baseline stratum i; t CO_2-e ha^{-1}	311.8	Calculated using information from the forest inventory.
GHGLK,E,i,t	Greenhouse gas emissions as a result of leakage of avoided deforestation activities in stratum i in year t; t CO_2-e	See Table 3.31.	Calculated in Section 3.2.2.

Table 3.33. Calculation of Activity Shifting Leakage for Projects Preventing Planned Deforestation.

Year	$LKA_{planned}$ (ha)	ΔCBSL,i (t CO_2-e/ha)	GHGLK-E,i,t (t CO_2-e)	ΔCLK-AS,planned (t CO_2-e)
2021	0.0	311.8	0.0	0
2022	0.0	311.8	0.0	0

2023	0.0	311.8	0.0	0
2024	0.0	311.8	0.0	0
2025	0.0	311.8	0.0	0
2026	0.0	311.8	0.0	0
2027	0.0	311.8	0.0	0
2028	0.0	311.8	0.0	0
2029	0.0	311.8	0.0	0
2030	0.0	311.8	0.0	0

Leakage is tracked by identifying all the areas that may be expected to be converted to non-forest land by large agribusiness, the agent of deforestation, outside the project boundaries during the baseline period. Baseline deforestation in the leakage areas is based on Option 1.3b of the LK-ASP module and utilizes Equation 3.14 and 3.15.

Equation 3.14. Equation for estimating forest clearance by the baseline agent of the planned deforestation where no leakage is occurring.

$$NewR_{i,t} = \left(D\%_{planned,i,t,OP} \times A_{planned,i,OP}\right)$$

Equation 3.15. Equation for determining the area of shifting leakage in the with-project case.

$$LKA_{planned,i,t} = A_{defLK,i,t} - NewR_{i,t}$$

Table 3.34. Parameters and values used to calculate NewRi,t, and LKAplanned.

Parameter	Description	Value	Justification
$D\%_{planned,i,t,OP}$	Projected annual proportion of land that will be deforested outside the project boundary in stratum i in year t (%)	14.3%	Set to value of D%planned,i,t as stipulated in LK-ASP module.
$A_{planned,i,OP}$	Total area of planned deforestation outside the project boundary over the baseline period for stratum i (ha)	4,503,571	The value of the parameter Aplanned,I,OP is conservatively calculated as the total area of forest in the Chaco after removing protected areas, indigenous area, and forested areas which would be protected according to plan de uso laws.
NewRi,t	New calculated forest clearance in stratum i at time t by the baseline agent of the planned deforestation where no leakage is occurring; ha	See table below for calculations.	Calculated.
LKAplanned,i,t	The area of activity shifting leakage in stratum i at time t; ha	See table below for calculations.	Calculated.
AdefLK,i,t	The total area of deforestation by the baseline agent of the planned deforestation in stratum i at time, t; ha	151,447	This parameter is monitored. Ex-ante, it is conservatively assumed to be the amount of land converted from forest to pasture in the Chaco Region of

			Paraguay in the time frame 2015-2016. Source: Larrosa, Carlos Antonio Giménez. 2018. Descripción de procesos y métodos utilizados para la reclasificación de ‘‘Tierras de cultivo’’ a ‘‘Cultivos Agrícolas’’, ‘‘Pasturas implantadas’’ y ‘‘Mosaico Agropecuario’’ de todo el territorio nacional, periodo 2000-2016. Proyecto “Colaboración para los Bosques y la Agricultura”. Report prepared for WWF, Instituto Forestal Nacional, and the Gobierno Nacional.

Table 3.35. Calculation of the area of activity shifting leakage (LKAplanned).

Year	Aplanned,I, OP (ha)	D%planned,i,t, OP	NewRi,t (ha)	AdefLK,i,t (ha)	$LKA_{planned}$ (ha)
2021	4,503,571	14.3%	642,813	151,447.2	0
2022	4,503,571	14.3%	642,813	151,447.2	0
2023	4,503,571	14.3%	642,813	151,447.2	0
2024	4,503,571	14.3%	642,813	151,447.2	0
2025	4,503,571	14.3%	642,813	151,447.2	0
2026	4,503,571	14.3%	642,813	151,447.2	0
2027	4,503,571	14.3%	642,813	151,447.2	0
2028	4,503,571	14.3%	642,813	151,447.2	0
2029	4,503,571	14.3%	642,813	151,447.2	0
2030	4,503,571	14.3%	642,813	151,447.2	0

Estimation of Market Leakage

Market leakage (ΔCLK-ME) is equal to the sum of market effects leakage through decreased timber harvest (LKMarketEffects,timber) and decreased harvest for fuelwood / charcoal production (LKMarketEffects,FW/C) and emissions due to market-effects leakage through decreased timber, fuelwood and charcoal harvest resulting in increased peatland drainage (LKMarketEffects,Peat).

There is no anticipated market leakage for this project as the process of deforestation does not involve timber harvesting for commercial markets and further, the baseline is not calculated using BL-DFW where fuelwood or charcoal is harvested for commercial markets. As there is no fuelwood or charcoal collection by the baseline agent of deforestation and no peatland in the country,[90] market leakage is limited to leakage through decreased timber harvest as calculated in Equation 3.16.

Market leakage values calculated ex-ante are also used ex-post. No market leakage is calculated for the initial project instance as there is no harvesting of timber for commercial markets.

[90]The Global Peatland Map 2.0 indicates there are no peatlands within Paraguay. See United Nations Environment Programme. 2021. THE GLOBAL PEATLAND MAP 2.0. https://wedocs.unep.org/20.500.11822/37571.

Equation 3.16. Equation for Estimation of Market Leakage.

ΔCLK-ME =

$$LK_{Market\ Effects,timber} = \sum_{i=1}^{M}\left(LF_{ME} \times LK_{MAF} \times AL_{T,i}\right)$$

Table 3.36. Parameters and Values used to Estimation of Market Leakage.

Parameter	Description	Value	Justification
LKMarketEffects, timber	Total GHG emissions due to market- effects leakage through decreased timber harvest; t CO_2-e	See table below for calculations.	Calculated below.
LK_{ME}	Leakage factor for market-effects calculations; dimensionless	0.4	Should harvesting of timber for commercial markets occur in the baseline, this parameter will be assessed for each project instance. LFME is assumed to be 0.4, where mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type is equal to merchantable biomass as a proportion of total aboveground tree biomass within the project boundary (i.e., similar commercial component of tree structure in the project area as in areas where harvest could be displaced).
LK_{MAF}	Leakage management adjustment factor (dimensionless)	1	Ex-ante this value is conservatively set to 1. This value is project instance and project strata dependent and will be calculated for each project instances where timber harvesting occurs for commercial markets in the baseline.
ALT,i	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of carbon project; t CO_2-e	See table below for calculations.	Calculated below.

The summed emissions from timber harvest in the baseline case potentially displaced through implementation of carbon project (*ALT,i*) is calculated using Equation 3.17.

Equation 3.17. Equation for summing emissions from timber harvest potentially displaced.

$$AL_{T,i} = \sum_{t=1}^{t}\left(C_{BSL,XBT,i,t}\right)$$

The carbon emission due to the displaced logging (*CBSL,XBT,i,t*) has two components: the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction. Equation 3.18 is used to calculate *CBSL,XBT,i,t.*

$$C_{BSL,XBT,i,t} = \left(\left[V_{BSL,XE,i,t} * D_{mn} * CF\right] + \left[V_{BSL,XE,i,t} * LDF\right] + \left[V_{BSL,XE,i,t} * LIF\right]\right) * \frac{44}{12}$$

Table 3.37. Parameters and Values used to Estimate Carbon Emission Due to Timber Harvests.

Parameter	Description	Value	Justification
CBSL,XBT,i,t	Carbon emission due to timber harvests in the baseline scenario in stratum i at time t; t CO_2-e	See table below for calculations.	Calculated below.
VBSL,EX,i,t	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i at time t; m3	Monitored	Sources may include: 1. Timber harvest records and/or 2. Estimates derived from field measurements and/or 3. Assessments with aerial photography or satellite imagery.
Dmn	Mean wood density of commercially harvested species; t d.m.m-3. The value must be the same as that used in the module CP-W if this pool is included in the baseline.	0.695	Default regional value for tropical America from LK-ME
CF	Carbon fraction of biomass for commercially harvested species j; t C t d.m.$^{-1}$.	0.47	Default value from LK-ME
LDF	Logging damage factor; t C m-3 (default 0.53 t C m-3 for broadleaf and mixed forests; 0.25 t C m-3 for coniferous forests)	0.53	Default value from LK-ME
LIF	Logging infrastructure factor; t C m-3 (default 0.29 t C m-3)	0.29	Default value from LK-ME

Table 3.38. Calculation of Market Leakage and Intermediate Parameters.

Year	VBSL,EX,i,t (m3)	$C_{BSL,XBFWC,i,t}$	$AL_{T,i}$	$LK_{MarketEffects, timber}$	$LK_{MarketEffects, FW/C}$	ΔCLK-ME (t CO_2-e)
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0
2030	0	0	0	0	0	0

Estimation of Net GHG Emissions due to Leakage

Net GHG emissions due to leakage can be estimated using Equation 3.19 and parameters in Table 3.39.

Equation 3.19. Equation for Estimation of Leakage.

$$\Delta C_{LK} = \Delta C_{LK-AS,planned} + \Delta C_{LK-AS,unplanned} + \Delta C_{LK-AS,degrad-FW/C} + \Delta C_{LK-ME}$$

Table 3.39. Parameters and Values used to Estimate Net Leakage.

Parameter	Description	Value	Justification
ΔCLK	Net greenhouse gas emissions due to leakage; t CO_2-e	See table below for calculations.	Calculated below
ΔCLK-AS, planned	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation; t CO_2-e	See Table 3.33.	Calculated above
ΔCLK-AS,unplanned	Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation; t CO_2-e	Not applicable.	Not applicable as this is not an unplanned REDD project.
ΔCLK-ME	Net greenhouse gas emissions due to market-effects leakage; t CO_2-e	See Table 3.38.	Calculated above
ΔCLK- AS,degrad-FW/C	Net greenhouse gas emissions due to activity shifting leakage for degradation caused by extraction of wood for fuel; t CO_2-e	Not applicable.	There is no fuelwood and charcoal collected from the initial project area as evidence in the PRAs.

Table 3.40. Calculation of the net GHG emissions due to leakage.

Year	ΔCLK-AS,planned (t CO_2-e)	ΔCLK-ME (t CO_2-e)	ΔCLK (t CO_2-e)
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0

3.2.4 Net GHG Emission Reductions and Removals

Uncertainty will be assessed applying module X-UNC.

Uncertainty in the baseline rate, parameter $Uncertainty_{BSL,RATE}$, is equal to 0.26%. Per the X-UNC module, $Uncertainty_{BSL,RATE}$ has been calculated as "the 95% confidence interval as a percentage of the mean of the area deforested in each proxy (*D%pn*) divided by the number of years over which deforestation occurred in each proxy (*Yrspn*)."

Table 3.41. Calculations of uncertainty in the baseline.

D%pn 95% Confidence Interval as % of mean	Yrspn	UncertaintyBSL,Rate (%)
11.7%	45	0.26%

Total uncertainty in carbon stocks in forest (parameter $Uncertainty_{REDD\text{-}BSL,SS}$) is equal to combined uncertainty of forest carbon pool stock estimates, calculated using propagation of errors (equation 5 of VM0007 module X-UNC). Parameter $Uncertainty_{REDD,SS}$ is thus calculated to be 3.70% at the 95% confidence level (calculations detailed in Forest Biomass Carbon Inventory Report) for the initial forest inventory. Results of overall uncertainty calculations are presented below.

Table 3.42 Summary of uncertainty calculations.

X-UNC Eq. 1	X-UNC Eq. 5	X-UNC Eq. 6	X-UNC Eq. 15	X-UNC Eq. 16
$Uncertainty_{BSL,Rate}$ (%)	$Uncertainty_{REDD\text{-}BSL,SS}$ (%)	$Uncertainty_{REDD\_BSL,t}$ (%)	$NER_{REDD+ERROR}$	$Adjusted\_NER_{REDD+}$
0.26%	3.70%	3.71%	3.71%	100%

Estimates of GHG credits eligible for issuance as VCUs were calculated in Table 3.43, below; where:

Estimated GHG emission reduction credits =

Baseline emissions, fixed for 10 years at validation *minus*

Project emissions *minus*

Leakage *minus*

Non-permanence Risk Buffer withholding (calculated as a percent of net change in carbon stocks prior to deduction of leakage, see Appendix 2).

Post-2030 baseline emissions result from the delayed decay of belowground biomass and deadwood associated with the clearing of the project area in line with the VM0007 methodology. These emissions have been included in the Table below to inform interested parties of the full scope of baseline emissions.

Table 3.43a. Ex-Ante Estimated of Net Emission Reduction Credits.

Years	Estimated baseline emissions or removals (tCO_{2e})	Estimated project emissions or removals (tCO_{2e})	Estimated leakage emissions (tCO_{2e})	Risk buffer (%)	Deductions for AFOLU pooled buffer account (tCO_{2e})	GHG credits eligible for issuance as VCUs (tCO_{2e})
2021	572,263	0	0	13.5%	77,256	495,008
2022	849,161	0	0	13.5%	114,637	734,524
2023	1,698,687	0	0	13.5%	229,323	1,469,364
2024	1,738,776	0	0	13.5%	234,735	1,504,041
2025	963,608	0	0	13.5%	130,087	833,521
2026	130,617	0	0	13.5%	17,633	112,983
2027	130,617	0	0	13.5%	17,633	112,983
2028	130,617	0	0	13.5%	17,633	112,983
2029	130,617	0	0	13.5%	17,633	112,983
2030	130,617	0	0	13.5%	17,633	112,983

2031	118,786	0	0	13.5%	16,036	102,750
2032	100,682	0	0	13.5%	13,592	87,090
2033	60,593	0	0	13.5%	8,180	52,413
2034	20,504	0	0	13.5%	2,768	17,736
2035	0	0	0	13.5%	0	0
2036	0	0	0	13.5%	0	0
2037	0	0	0	13.5%	0	0
2038	0	0	0	13.5%	0	0
2039	0	0	0	13.5%	0	0
2040	0	0	0	13.5%	0	0
Total	6,776,145	0	0		914,780	5,861,365

The above ex-ante estimates have been split in the table below to represent calendar year vintages.

Table 3.43b. Split year Ex-Ante Estimated of Net Emission Reduction Credits.

Years	**Estimated GHG emission reductions (tCO_2e) for the first crediting period**	**Estimated GHG emission reductions (tCO_2e) for the first and second crediting period**
2020	247,504	247,504
2021	614,766	614,766
2022	1,101,944	1,101,944
2023	1,486,702	1,486,702
2024	1,168,781	1,168,781
2025	473,252	473,252
2026	112,983	112,983
2027	112,983	112,983
2028	112,983	112,983
2029	112,983	112,983
2030	56,492	107,867
2031	0	94,920
2032	0	69,752
2033	0	35,074
2034	0	8,868
2035	0	0
2036	0	0
2037	0	0
2038	0	0
2039	0	0
Total estimated ERs	5,601,376	5,861,365
Total number of crediting years	10	20
Average annual ERs	560,138	293,068

Over the first 10-year baseline period, the initial Project Area is expected to result in 6,475,579 tCO_2e reductions with a buffer pool contribution of 874,203 tCO_2e and a total expected emission reduction of 5,601,376tCO_2e after accounting for leakage.

Table 3.44. Emissions Reductions (t CO_2-e) expected to be generated by the initial project instance over the 10 Year Crediting Period.

Aspect of Emission Reductions Estimate	t CO_2e
Net forest carbon sequestration (t CO_2) (Baseline-With project scenario)	6,475,579
Buffer pool contribution	874,203
Leakage	0
Total Emission Reductions	5,601,376

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data and parameters calculated during the course of project development include those listed in this section.

Data Unit / Parameter:	$\Delta C_{BSL,PAplanned}$
Data unit:	t CO_2-e
Description:	Net greenhouse gas emissions in the baseline from planned deforestation
Source of data:	Derived in Section 3.2 of PD
Value applied:	Year / ΔCBSL,PA,unplanned 2021 / 572,263 2022 / 849,161 2023 / 1,698,687 2024 / 1,738,776 2025 / 963,608 2026 / 130,617 2027 / 130,617 2028 / 130,617 2029 / 130,617 2030 / 130,617
Justification of choice of data or description of measurement methods and procedures applied:	Derived and justified in Section 3 of PD in which baseline is set
Purpose of Data	Calculation of baseline emissions
Comments	

Data Unit / Parameter:	CFn
Data unit:	t C t^{-1} d.m.
Description:	Carbon fraction of biomass
Source of data:	IPCC 2006GL
Value applied:	0.47

Justification of choice of data or description of measurement methods and procedures applied:	Global default
Purpose of Data	Calculation of baseline emissions
Comments	

Data Unit / Parameter:	fj(X,Y)
Data unit:	t d.m. tree^{-1}
Description:	Allometric equation for species j linking measured tree variable(s) to aboveground biomass of living trees.
Source of data:	Data resulting from the forest inventory.
Value applied:	See forest inventory excel workbook.
Justification of choice of data or description of measurement methods and procedures applied:	Chave, Jérôme, Christophe Andalo, Sandra Brown, Michael A. Cairns, Jeffrey Q. Chambers, Derek Eamus, Horst Fölster et al. "Tree allometry and improved estimation of carbon stocks and balance in tropical forests." Oecologia 145, no. 1 (2005): 87-99.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data Unit / Parameter:	Root Biomass Density
Data unit:	t d.m. ha^{-1}
Description:	Allometric equation for predicting root biomass density as a function of aboveground biomass density.
Source of data:	Data resulting from the forest inventory.
Value applied:	See forest inventory excel workbook.
Justification of choice of data or description of measurement methods and procedures applied:	Cairns et al. 1997 is a widely accepted peer reviewed scientific publication. Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world's upland forests. Oecologia 111, 1-11.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data Unit / Parameter:	LIF
Data unit:	t C m-3
Description:	Logging infrastructure factor;
Source of data:	LK-ME
Value applied:	0.29

Justification of choice of data or description of measurement methods and procedures applied:	Default value in LK-ME
Purpose of data	Calculation of leakage emissions
Comments	

Data Unit / Parameter:	BEF
Data unit:	Dimensionless
Description:	Biomass expansion factor for conversion of merchantable volume to total aboveground tree biomass
Source of data:	N/A
Value applied:	N/A
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Purpose of data	Calculation of baseline emissions Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	LDF
Data unit:	t C m-3
Description:	Logging damage factor
Source of data:	LK-ME
Value applied:	0.53
Justification of choice of data or description of measurement methods and procedures applied:	Default value for broadleaf and mixed forests in LK-ME
Purpose of data	Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	LFME
Data unit:	Dimensionless
Description:	Leakage factor for market-effects calculations
Source of data:	LK-ME
Value applied:	0.4

Justification of choice of data or description of measurement methods and procedures applied:	The species that would be extracted in the project area are Chaco species and could only be sourced from other native forest in the area.
Purpose of data	Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	SLFs
Data unit:	Dimensionless
Description:	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest for sawn wood
Source of data:	CP-W module
Value applied:	0.2
Justification of choice of data or description of measurement methods and procedures applied:	Default value from the CP-W module
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	OFts
Data unit:	Dimensionless
Description:	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest for sawn wood
Source of data:	CP-W module
Value applied:	0.84
Justification of choice of data or description of measurement methods and procedures applied:	Default value from the CP-W module
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	WWs
Data unit:	Dimensionless
Description:	The fraction immediately emitted through mill inefficiency for sawn wood

Source of data:	CP-W module
Value applied:	0.24
Justification of choice of data or description of measurement methods and procedures applied:	Default value from the CP-W module
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	VBSL,EX,i,t
Data unit:	m^3
Description:	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i at time t
Source of data:	Calculated
Value applied:	Year / VBSL,EX,i,t (m3) 2021 / 0 2022 / 0 2023 / 0 2024 / 0 2025 / 0 2026 / 0 2027 / 0 2028 / 0 2029 / 0 2030 / 0
Justification of choice of data or description of measurement methods and procedures applied:	Derived using Equation 4 of the LK-ME module
Purpose of data	Calculation of leakage emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	Dmn
Data unit:	t d.m. m-3
Description:	Mean wood density of commercially harvested species
Source of data:	Calculated
Value applied:	N/A

Justification of choice of data or description of measurement methods and procedures applied:	This value uses site specific data on commercial log volume and estimates of wood density as found in Chave et al. 2006.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	PMLFT
Data unit:	%
Description:	Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type
Source of data:	Feldpausch, T. R., McDonald, A. J., Passos, C. A., Lehmann, J., & Riha, S. J. (2006). Biomass, harvestable area, and forest structure estimated from commercial timber inventories and remotely sensed imagery in southern Amazonia. Forest Ecology and Management, 233(1), 121-132
Value applied:	8%-12%
Justification of choice of data or description of measurement methods and procedures applied:	Volumetric weighted wood density as suggested by the methodology and volume by species.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	While no timber harvest occurred in the baseline for the initial project instance, there is potential for timber harvest as part of the baseline land clearing for future project instances.

Data Unit / Parameter:	COMF i
Data unit:	dimensionless
Description:	Combustion factor for stratum i
Source of data:	Derived from Table 2.6 of IPCC, 2006.
Value applied:	0.50
Justification of choice of data or description of measurement methods and procedures applied:	Value is for primary moist tropical forest.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comment	For all new project instances located in areas with an average annual precipitation of less than 1000 mm/yr, a COMF value of 0.36 derived for “All primary tropical forests” will be used as there is no specific value listed in Table 2.6 for “Primary tropical dry forest”.

Data Unit / Parameter:	Gg,i
Data unit:	kg t^{-1} dry matter burnt
Description:	Emission factor for stratum i for gas g
Source of data:	Derived from Table 2.5 of IPCC, 2006.
Value applied:	G,N20 (kg/t d.m. burnt): 0.2; G,CH4 (kg/t d.m. burnt): 6.8
Justification of choice of data or description of measurement methods and procedures applied:	Default parameter from IPCC
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comment	None

3.3.2 Data and Parameters Monitored

Details on data and parameters monitored are provided below.

Data Unit / Parameter:	$\Delta C_{P,Def,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year / ΔCP,DefPA,i,t (t CO_2-e): 2021: 0; 2022: 0; 2023: 0; 2024: 0; 2025: 0; 2026: 0; 2027: 0; 2028: 0; 2029: 0; 2030: 0
Monitoring equipment:	None.
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 3, VMD0015

Comments	None

Data Unit / Parameter:	$\Delta C_{P,DistPA,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum i at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year / ΔCP,DistPA,i,t (t CO_2-e) 2021 / 0 2022 / 0 2023 / 0 2024 / 0 2025 / 0 2026 / 0 2027 / 0 2028 / 0 2029 / 0 2030 / 0
Monitoring equipment:	None.
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 20, VMD0015
Comments	None

Data Unit / Parameter:	$A_{DefPA,u,i,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the project area stratum i converted to land use u at time t
Source of data:	Monitored at each monitoring/verification event through the use of classified satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures are provided below under monitoring plan description. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year / ADefPA,u,i,t (ha)

	2021	0.0
	2022	0.0
	2023	0.0
	2024	0.0
	2025	0.0
	2026	0.0
	2027	0.0
	2028	0.0
	2029	0.0
	2030	0.0

Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$A_{DefLK,,i,t}$
Data unit:	Ha
Description:	The total area of deforestation by the baseline agent of the planned deforestation in stratum i at time, t
Source of data:	Monitored at each monitoring/verification
Description of measurement methods and procedures to be applied:	Detailed procedures are provided below under monitoring plan description. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every $\leq$ 5 years

Value applied:	Year	$A_{DefLK,,i,t}$ (ha)
	2021	151,447
	2022	151,447
	2023	151,447
	2024	151,447
	2025	151,447
	2026	151,447
	2027	151,447
	2028	151,447
	2029	151,447
	2030	151,447

Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of leakage emissions

Calculation method:	Calculated as per LK-ASP
Comments	None

Data Unit / Parameter:	$A_{DistPA,q,i,t}$
Data unit:	Ha
Description:	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum i, at time t
Source of data:	Monitored at each monitoring/verification event through the use of classified satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	

Year	$A_{DistPA,q,i,t}$ (ha)
2021	0.0
2022	0.0
2023	0.0
2024	0.0
2025	0.0
2026	0.0
2027	0.0
2028	0.0
2029	0.0
2030	0.0

Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$C_{BSL,i}$
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in all pools in the baseline case in stratum i
Source of data:	Estimated from forest carbon inventory.
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years.

Value applied:	<table><tr><td>Strata</td><td>CBSL,i (t CO_2-e ha^{-1})</td></tr><tr><td>Paleo-Drainage</td><td>132.1</td></tr><tr><td>Palm Savanna</td><td>136.7</td></tr><tr><td>Forest</td><td>433.2</td></tr></table>
Monitoring equipment:	dbh tape, measuring tape, GPS, clinometer
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Chave et al. (2005), Cairns et al. (1997), Van Wagner (1968)
Comments	None

Data Unit / Parameter:	ΔCpools,Def,u,i,t
Data unit:	t CO_2-e ha^{-1}
Description:	Net carbon stock changes in all pools in the project case in land use u in stratum i at time t
Source of data:	Calculated.
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	317.2
Monitoring equipment:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Equation 5, VMD0015
Comments	None

Data Unit / Parameter:	$A_{DegW,i,t}$
Data unit:	Ha
Description:	Area potentially impacted by degradation processes in stratum i
Source of data:	Delineated based on survey results indicating general area of project potentially accessed and typical depth of penetration of illegal harvest activities from points of access.
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. Monitoring responsibilities are listed in section 3.3, below.

Frequency of monitoring/recording:	Repeated each time the PRA indicates a potential for degradation. PRA conducted every < 5 years or if verification occurs on a frequency of less than every 5 years PRA must occur prior to any verification event".
Value applied:	

Year	$A_{DegW,i,t}$ (ha)
2021	0.0
2022	0.0
2023	0.0
2024	0.0
2025	0.0
2026	0.0
2027	0.0
2028	0.0
2029	0.0
2030	0.0

Monitoring equipment:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	PRAs indicated no degradation

Data Unit / Parameter:	$C_{DegW,i,t}$
Data unit:	t CO_2-e
Description:	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum i at time t
Source of data:	Estimated from diameter measurements of cut stumps in sample plots
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	

Year	$C_{DegW,i,t}$ (t CO_2-e)
2021	0.0
2022	0.0
2023	0.0
2024	0.0
2025	0.0
2026	0.0
2027	0.0
2028	0.0
2029	0.0
2030	0.0

Monitoring equipment:	None.

QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 8, VMD0015
Comments	PRAs indicated no degradation

Data Unit / Parameter:	AP_i
Data unit:	Ha
Description:	Total area of degradation sample plots in stratum i
Source of data:	Calculated as 3% of $A_{DegW,i,t}$
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	N/A
Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$\Delta C_{P,Deg,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock changes as a result of degradation in stratum i in the project area at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	0
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 8, VMD0015
Comments	PRAs indicated no degradation

Data Unit / Parameter:	Aburn,q,i,t.
Data unit:	Ha
Description:	Area burnt in post-natural disturbance stratum q in stratum i, at time t;

Source of data:	See parameter $A_{DistPA,q,i,t}$ and ADefPA,u,i,t
Description of measurement methods and procedures to be applied:	Monitored as part of $A_{DistPA,q,i,t}$ Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	

Year	Paleo-Drainage ADefPA,u,i,t (ha)	Palm Savanna ADefPA,u,i,t (ha)	Forest ADefPA,u,i,t (ha)
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	0	0	0
2027	0	0	0
2028	0	0	0
2029	0	0	0
2030	0	0	0

Monitoring equipment:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Aburn,q,i,t.= $A_{DistPA,q,i,t}$ (area burnt in natural disturbance) + ADefPA,u,i,t (area burnt via deforestation in project ex post)
Comments	None

Data Unit / Parameter:	dbh
Data unit:	cm
Description:	diameter at breast height
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	See forest inventory excel sheet.
Monitoring equipment:	dbh tape, measuring tape,
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	dbasal
Data unit:	cm
Description:	Basal diameter
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	See forest inventory excel sheet.
Monitoring equipment:	dbh tape, measuring tape,
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	Dbh may be used as a conservative estimate of dbasal

Data Unit / Parameter:	H
Data unit:	m
Description:	Height of tree
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	See forest inventory excel sheet.
Monitoring equipment:	measuring tape, clinometer
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	Dn
Data unit:	cm
Description:	Diameter of piece n of dead wood along the transect
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years

Value applied:	See forest inventory excel sheet.
Monitoring equipment:	dbh tape, measuring tape
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	N
Data unit:	dimensionless
Description:	Total number of wood pieces intersecting the transect
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	See forest inventory excel sheet.
Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	L
Data unit:	m
Description:	Length of the transect
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	200 m
Monitoring equipment:	measuring tape,
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$U_{P,SS,i,pool\#}$
Data unit:	%
Description:	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the with-project case (1,2…n represent different carbon pools and/or GHG sources)
Source of data:	Calculations arising from field measurement data
Description of measurement methods and procedures to be applied:	Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence level. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Monitored at least once every 10 years (on re-measurement of forest carbon stocks)
Value applied:	Same as UBSL,SS,i,pool# values below.
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	Same as UBSL,SS,i,pool# values below as forest carbon stock growth was not tracked.

Data Unit / Parameter:	EBSL SS,i, pool#
Data unit:	t CO_2-e
Description:	Carbon stock or GHG sources (e.g., trees, dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the baseline case
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	See nested table below
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.

Strata	Live abovegroun d tree biomass	Belowgroun d biomass	Litter	Dead wood
EBSL,SS,Paleo-Drainage,pool# (tCO_2e)	59,651	14,981	4,755	9,116
EBSL,SS,PalmSavanna,pool# (tCO_2e)	784,689	196,111	96,826	12,049
EBSL,SS,Forest,pool# (tCO_2e)	6,890,151	1,573,708	242,007	282,083

Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	UBSL,SS,i,pool#
Data unit:	%
Description:	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the baseline case (1,2…n represent different carbon pools and/or GHG sources)
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	

Strata	Live aboveground tree biomass	Belowground biomass	Litter	Dead wood
UBSL,SS,Paleo-Drainage,pool# (%)	95.9%	88.4%	45.7%	169.1%
UBSL,SS,PalmSavanna,pool# (%)	24.9%	23.2%	100.2%	0.0%
UBSL,SS,Forest,pool# (%)	4.1%	3.8%	18.1%	22.2%

Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	See equation 4 in the X-UNC module.
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	EBSL SS,i
Data unit:	t CO_2-e
Description:	Sum of combined carbon stocks and GHG sources in stratum i multiplied by the area of stratum i (Ai) in the baseline case
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years.

Value applied:	Strata: EBSL,SS,t,I (tCO_2e) Paleo-Drainage: 88,503 Palm Savanna: 1,089,676 Forest: 8,987,949
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	UBSL,SS,i
Data unit:	%
Description:	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in stratum i in the baseline case
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	Strata: UncertaintyBSL,SS,I (%) Paleo-Drainage: 68.6% Palm Savanna: 20.5% Forest: 3.3%
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	See equation 5 in the X-UNC module.
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	Bi,t
Data unit:	tonnes d. m. ha^{-1}
Description:	Average aboveground biomass stock before burning stratum i, time t
Source of data:	Calculated using forest inventory data
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.

Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	<table><tr><td>Paleo-Drainage B,i,t (t d.m./ha)</td><td>Palm Savanna B,i,t (t d.m./ha)</td><td>Forest B,i,t (t d.m./ha)</td></tr><tr><td>63.7</td><td>65.0</td><td>207.3</td></tr></table>
Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Chave et al. (2005), Cairns et al. (1997), Van Wagner (1968)
Comments	Ex-ante Bi,t is the weighted average across all strata

Data Unit / Parameter:	AGB
Data unit:	tonnes d. m. ha^{-1}
Description:	Aboveground biomass density
Source of data:	Calculated using forest inventory data
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Plot level values can be found in the Forest Inventory Report
Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Chave et al. (2005), Cairns et al. (1997), Van Wagner (1968)
Comments	None

Data Unit / Parameter:	Asp
Data unit:	ha
Description:	Area of sample plots in ha
Source of data:	Recording and archiving of number and size of sample plots
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	0.1385 ha or a 21m radius circle
Monitoring equipment:	M

QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	Hsdw
Data unit:	M
Description:	Height of standing dead tree in m
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	See forest inventory excel workbook.
Monitoring equipment:	measuring tape, clinometer
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	DDWdc
Data unit:	t d.m. m-3
Description:	Mean wood density of dead wood in the density class (dc) – sound (1),intermediate (2), and rotten (3); t d.m. m-3
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the standard operating procedures of the project document. Monitoring responsibilities are listed in section 3.1.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Density Class: Density (t d.m. m-3) Rotten (P): 0.358 Intermediary (I): 0.622 Solid (S): 0.716
Monitoring equipment:	dbh tape, measuring tape, drying oven
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant

Comments	None

Data Unit / Parameter:	CP,Dist,q,i
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in all pools in post-natural disturbance q in baseline stratum i
Source of data:	Monitored
Description of measurement methods and procedures to be applied:	Detailed procedures provided in the Standard Operating Procedures. Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Prior to each verification event and at least every 5 years.
Value applied:	0
Monitoring equipment:	dbh tape, measuring tape, GPS, clinometer
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Chave et al. (2005), Cairns et al. (1997), Van Wagner (1968). Carbon stocks must be measured and estimated using the methods given in module CP-AB and CP-D.
Comments	Alternatively, it can be conservatively assumed that a post-natural disturbance live and dead vegetation pool is equal to zero

Data Unit / Parameter:	Ai
Data unit:	ha
Description:	Total area of stratum i
Source of data:	GIS coverages
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	<table><tr><th>Strata in Initial Project Area</th><th>Ai (ha)</th></tr><tr><td>Paleo-Drainage</td><td>548.2</td></tr><tr><td>Palm Savanna</td><td>7,470.5</td></tr><tr><td>Forest</td><td>12,496.3</td></tr></table>
Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions

	Calculation of leakage
Calculation method:	N/A
Comments	Ex-ante, it shall be assumed that stratum area will remain constant for the baseline period

Data Unit / Parameter:	AAplanned,i,t
Data unit:	Ha
Description:	Annual area of baseline planned deforestation for stratum i at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Year / Actual AAplanned,i,t 2021 / 4,547 2022 / 4,547 2023 / 4,547 2024 / 4,547 2025 / 2,326 2026 / 0 2027 / 0 2028 / 0 2029 / 0 2030 / 0
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of data	Calculation of baseline emissions
Calculation method:	Uses Equation 3 in BL-PL
Comments	None

Data Unit / Parameter:	Aplanned,i
Data unit:	Ha
Description:	Total area of planned deforestation over the baseline period for stratum i
Source of data:	Monitored
Description of measurement methods and procedures to be applied:	Determined using a GIS
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	31,858.6
Monitoring equipment:	GIS

QA/QC procedures to be applied:	None
Purpose of data	Calculation of baseline emissions
Calculation method:	N/A
Comments	This is the total area of the initial project property.

Data Unit / Parameter:	CWP100,i
Data unit:	t CO_2/ha
Description:	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i; t CO_2-e ha^{-1}
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	0
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Uses Equation 2 in the CP-W module
Comments	None

Data Unit / Parameter:	CWP,i
Data unit:	t CO_2/ha
Description:	Carbon stock entering wood products pool at time of deforestation from stratum i
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	0
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Uses Equation 2 in the CP-W module

Comments	None

3.3.3 Monitoring Plan

This monitoring plan has been developed in close conjunction with module VMD0015 of the REDD Methodological Module, "Methods for monitoring of greenhouse gas emissions and removals (M-REDD)." This section focuses on establishing procedures for monitoring deforestation, illegal degradation, natural disturbance, and project emissions ex-post in the Project Area and leakage areas. Further, procedures for updating the forest carbon stocks and revising the baseline are also provided below.

For accounting purposes, the Project conservatively assumes stable stocks and no biomass monitoring is conducted in areas undergoing carbon stock enhancement, as permitted in the methodology monitoring module VMD0015, hence $\Delta C_{P,Enh,i,t}$ is set to 0.

Further, as no commercial harvest of timber (including FSC selective logging) occurs in the with-project case, the degradation due to harvest of timber will not be monitored, thus parameter $\Delta C_{P,SelLog,i,t}$ is set to 0.

A separate section on quality assurance/quality control and data archiving procedures covers all monitoring tasks.

Organizations responsible for monitoring are listed below in Table 3.51. These organizations are responsible for implementing all aspects of a particular monitoring task, as described in the monitoring sub-sections below.

Estimation of Ex-Post Net Carbon Stock Changes and Greenhouse Gas Emissions

Ex-post net carbon stock changes and greenhouse gas emissions can only be calculated after monitoring:

- The net carbon stock change as a result of deforestation in the Project Area;
- The net carbon stock change as a result of degradation in the Project Area;
- The net carbon stock change as a result of natural disturbance in the Project Area; and
- The greenhouse gas emissions as a result of deforestation and degradation activities within the Project Area.

<u>Monitoring Deforestation and Natural Disturbance</u>

Forest cover change due to deforestation and natural disturbance is monitored through periodic assessment of classified satellite imagery, see below, covering the Project Area. Emissions ($\Delta C_{P,Def,i,t}$ and $\Delta C_{P,DistPA,i,t}$ for deforestation and natural disturbance, respectively) are estimated by the multiplying areas $A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$, for deforestation and natural disturbance, respectively, by average forest carbon stock per unit area. Note that $A_{DistPA,q,i,t}$, is limited to the area where credits have been issued and is identified as the overlap between the delineated area of the disturbance and the summed area of deforestation in the Project Area to the year in which the disturbance occurred. Stock estimates from the initial field inventory are valid for 10 years (per VM0007). Table 3.45 shows the data and parameters monitored.

Table 3.42. Data and Parameters for Monitoring Deforestation and Natural Disturbance.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
$\Delta C_{P,Def,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t	t CO_2e	Calculated
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum i at time t	t CO_2e	Calculated
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u at time t	Ha	Monitored for each verification event
$A_{DistPA,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum i, at time t	Ha	Monitored for each verification event
$C_{BSL,i}$	Carbon stock in all pools in the baseline case in stratum i	t CO_2e ha^{-1}	Estimated from the forest carbon inventory

Changes in forest cover ($A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$) will be monitored via classification of remotely sensed imagery and land use change detection procedures completed as part of each monitoring event. The definition of forest used in the classified dataset is in broad agreement with the Paraguayan definition of a forest,[91] as set by the Clean Development Mechanism Designated National Authority.

The classification methodology will outline atmospheric and geometric correction procedures and uses a supervised classification approach. Where Landsat Imagery is used, only images with cloud cover covering less than 10% of a scene will be downloaded. These images will be corrected for any atmospheric problems (using Carlotto HAZE algorithm) and geometric correction issues. Georeferencing will be conducted with the nearest neighbor method, using a minimum of 20 points, and had an error (RMS) of less than 1 pixel. The image processing phase will include image segmentation (into statistically homogeneous areas) using Landsat bands 3, 4 & 5 (Blue, green and red). Then representative samples (training sites) of Forest, Non-Forest, Water, Cloud and Cloud Shadow will be selected using expert knowledge whereby training sites are distributed throughout the image and represent the variability within each class. A supervised classification[92] approach will be used with the Support Vector Machine (SVM) classification algorithm. All processing will be implemented in ENVI + IDL 4.6 except georeferencing

[91] The Clean Development Mechanism Designated National Authority in Paraguay has set the forest definition as:
1. Minimum tree crown cover of 25 per cent;
2. Minimum land area of 0.5 hectare; and
3. Potential to reach a minimum tree height of 5 meters at maturity
See http://cdm.unfccc.int/DNA/ARDNA.html?CID=30, accessed March 5, 2012.

[92] There is no overlap between the accuracy assessment points and the data used for classification.

which will be carried out using ERDAS IMAGINE 9. Any deviations from the above approach will be detailed in the monitoring report.

Deforestation and natural disturbance will be distinguished using ancillary data which may include but is not limited to high resolution imagery, digital elevation models (to identify steep areas prone to landslides), information from local land managers, etc.

The Project Area as set in the Project Description (PD), will serve as the initial "forest cover benchmark map" against which changes in forest cover will be assessed over the interval of the first monitoring period; the entire Project Area has been demonstrated to meet the forest definition at the beginning of the crediting period. For subsequent monitoring periods, change in forest cover will be assessed against the preceding classified forest cover map marking the beginning of the monitoring interval. Thus, the forest benchmark map is updated at each monitoring event.

Monitoring Illegal Degradation

Emissions due to illegal logging will be tracked by conducting surveys in the surrounding areas every two years. Locations surveyed will include:

- Families residing in areas adjacent to the project property; and
- Communities within 20 km of the project property.

Degradation surveys will be conducted for communities who give consent to being interviewed and are reliant on the project area. Surveys will produce information on wood consumers (fuel wood and wood for construction and charcoal production) in the surroundings areas, as well as general indications on the areas where wood is sourced from and maximum depth of penetration of harvest activities from access points. In the event that any potential of illegal logging occurring in the Project Area is detected from the surveys (i.e., ≥ 10% of those interviewed/surveyed believe that degradation may be occurring within the project boundary), then an estimation of emissions associated with illegal logging will be produced from the survey data and the T-SIG tool applied. The information collected in the Participatory Rural Assessments (PRAs) will be used to calculate logging emissions in conjunction with conservative assumptions/estimates including that all wood collected was live (unless otherwise stated), use of a regional charcoal recovery rate, use of a logging damage factor from the methodology, and that trees harvested were in the 99th percentile in terms of dbh (for the harvested species, if known).

In the event that the initial assessment indicated that illegal logging is occurring and significant in the area, the potential degradation area within the Project Area ($A_{DegW,i}$) will be delineated based on survey results, incorporating general area information and depth of penetration. Degradation monitoring plots will be allocated to achieve a 3% sample of this area. Rectangular plots 10 meters by 1 kilometer (1 ha area) will be randomly or systematically allocated in the area, sufficient to produce a 3% sample of the area, and any recently cut stumps or other indications of illegal harvest will be noted and recorded. Diameter at breast height, or diameter at height of cut, whichever is lower, of cut stumps will be measured. Biomass will be estimated from measured diameters (conservatively assuming that diameters of stumps cut below breast height are equivalent to diameter at breast height) applying the allometric equations and analytical procedures in the original forest inventory report. Emissions due to illegal logging ($\Delta C_{P,DegW,i,t}$) are

estimated by multiplying area ($A_{DegW,i}$) by average biomass carbon of trees cut and removed per unit area ($C_{DegW,i,t}/AP_i$).

The 3% sample will be conducted once every 5 years where initial surveys continue to indicate possibility of illegal logging in the Project Area to produce an estimate of emissions resulting from illegal logging ($\Delta C_{P,DegW,i}$). Estimates of emissions will be annualized (to produce estimates in t CO_2e per year) by dividing the emission for the monitoring interval by the number of years in the interval.

Table 3.43 Data and Parameters for Monitoring Illegal Degradation.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
$A_{DegW,i,t}$	Area potentially impacted by degradation processes in stratum i	Ha	Delineated based on survey results indicating general area of project potentially accessed and typical depth of penetration of illegal harvest activities from points of access
$C_{DegW,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum i at time t	t CO_2e	Estimated from diameter measurements of cut stumps in sample plots
AP_i	Total area of degradation sample plots in stratum i	Ha	Calculated as 3% of $A_{DegW,i,t}$
$\Delta C_{P,DegW,i,t}$	Net carbon stock changes as a result of degradation in stratum i in the project area at time t	t CO_2e	Calculated

Monitoring Project Emissions

With-project emissions are calculated as the sum of emissions from fossil fuel combustion (EFC,i,t) + non-CO_2 emissions due to biomass burning (EBiomassBurn,i,t) + direct N_2O emissions as a result of nitrogen application (N2Odirect-N,i,t.). As stipulated in the methodology, fossil fuel combustion in all situations is an optional emission source. Further, no nitrogen is applied on pastureland in the with-project case and hence project emissions therefore equal EBiomassBurn and are calculated using the VMD0013, "Estimation of greenhouse gas emissions from biomass and peat burning (E-BPB)" of the AD Partners modular REDD Methodology.

Non-CO_2 emissions from biomass burning in the project case include emissions from burning associated with deforestation and burning associate with natural disturbance, i.e., forest fire. It will be conservatively assumed that the total area burnt during the deforestation process is equal to the area deforested,

ADefPA,u,i,t. Thus, the area used when calculating E-BPB is equal to Aburn,i,t. (area burnt) = Aburn,q,i,t. (area burnt in natural disturbance) + ADefPA,u,i,t (area burnt via deforestation in project ex post).

Also, it is conservatively assumed that burning is a part of the forest conversion process in all incidents of deforestation taking place in the activity shifting leakage areas. Thus, the parameter $A_{burn,i,t}$ (Area burnt for stratum *i* at time *t*; ha) will be set equal to monitored parameter $A_{DefLK,i,t}$ (Area of recorded deforestation in the activity shifting leakage areas at time t; ha). The T-SIG tool can then be applied, and if parameter $E_{BiomassBurn,t}$ (Greenhouse emissions due to biomass burning as part of deforestation activities in stratum *i* in year *t*) is determined to be insignificant, $E_{BiomassBurn,t}$, can be assumed equal to zero.

Table 3.44 Data and Parameters for Monitoring Emissions from Biomass Burning.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
E BiomassBurn,t	Greenhouse emissions due to biomass burning as part of deforestation activities in stratum i in year t	tCO_2e of each GHG (CH_4, N_2O)	Calculated
Aburn,i,t	Area burnt for stratum i at time t	Ha	Monitored for each verification event
Bi,t	Average aboveground biomass stock before burning stratum i, time t	tonnes d. m. ha^{-1}	Conservatively assumed to be the carbon stock in all pools in the baseline case (CBSL,i).
COMF i	Combustion factor for stratum i; dimensionless	dimensionless	0.50 for primary moist tropical forest. Derived from Table 2.6 of IPCC, 2006.
Gg,i	Emission factor for stratum i for gas g	kg t^{-1} dry matter burnt	GCH_4 = 6.8 g kg^{-1} and GN_2O = 0.2 g kg^{-1}. Derived from Table 2.5 of IPCC, 2006.
GWPg	Global warming potential for gas g	t CO_2/t gas g	Default values from IPCC 2014 AR5 GWP100: CH_4 = 28; N_2O = 265).

Monitoring of Leakage Carbon Stock Changes and Greenhouse Gas Emissions

Two sources of leakage will be monitored: activity-shifting leakage and market leakage.

Activity-Shifting Leakage

Activity-shifting leakage will be monitored by identifying all the areas that may be expected to be converted to non-forest land by the agent/class outside the project boundaries during the baseline period (Aplanned,i,OP). Further, the total area of deforestation by the baseline agent or class of agent of the

planned deforestation (AdefLK,i,t) will be estimated for each monitoring period. This will be accomplished by examining remote sensing data, legal records, and/or survey information.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
Aplanned,i,OP	Total area of planned deforestation outside the project boundaries over the entire project lifetime for stratum i	ha	Must be re-evaluated whenever the baseline is revised
AdefLK,i,t	The total area of deforestation by the baseline agent or class of agent of the planned deforestation in stratum i in year t	ha	Must be reexamined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event. Must be re-evaluated whenever the baseline is revised

Market Leakage

Market leakage values calculated ex-ante are also used ex-post. No market leakage is calculated for the initial project instance as there is no harvesting of timber for commercial markets.

Table 3.45 Data and Parameters for Leakage.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
VBSL,EX,i,t	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i in year t (m3)	ha	Sources may include: 1. Timber harvest records and/or 2. Estimates derived from field measurements and/or 3. Assessments with aerial photography or satellite imagery.

Monitoring of Actual Carbon Stock Changes and Greenhouse Gas Emissions

Forest carbon stock estimates, including aboveground and belowground live tree, litter stocks, and dead wood stocks, will be derived from field measurements less than or equal to 10 years old. For each stratum, where the re-measured estimate is within the 90% confidence interval of the t=0 estimate, the t=0 stock estimate takes precedence and is re-employed, and where the re-measured estimate is outside (i.e., greater than or less than) the 90% confidence interval of the t=0 estimate, the new stock estimate takes precedence and is used for the subsequent period.

Sample plots will be randomly located and measured following the Project's standard operating procedures. Biomass will be estimated applying the following allometric equations and otherwise maintain consistency with analytical procedures applied in the original inventory.
For live trees, biomass is calculated as a function of diameter at breast height (DBH; in cm) and specific gravity (*SG*, g/cm^3) using the predictive model developed by Chave et al. (2005)[93] for tropical moist forest stands. Application of the "dry" equation reflects the annual precipitation for the inventoried area, 1000-1100mm/yr.

aboveground biomass (kg) Equation 3.20

=(*SG**EXP((-0.667)+(1.784*LN(DBH))+(0.207*(LN(DBH))^2)-(0.0281*LN((DBH))^3)))

For palms, height and basal diameter measurements are used to estimate the aboveground volume of a paraboloid and then species level specific gravity (SG, estimated by Chave[94] et al. 2006) will be applied. The estimate of biomass for palms is therefore to be limited to the main trunk (bole) of the palm. Thus, for palms

aboveground biomass (Mg) = 0.5*Π*(basal diameter(cm)/200)^2*height(m)*SG Equation 3.21

Root biomass density is estimated at the cluster sample level applying the equation developed by Cairns et al.[95] , where:

Root Biomass Density (t/ha) = EXP (-1.085 + 0.925 LN(aboveground biomass density)) Equation 3.22

The volume of lying dead wood per unit area is estimated using the equation (Warren and Olsen[96]) as modified by Van Wagner[97] separately for each dead wood density class:

$$V_{LDW} = \frac{\pi^2 * \left(\sum_{n=1}^{N} D_n^{\,2} \right)}{8 * L}$$

Equation 3.23

where:

V_{LDW} Volume of lying dead wood per unit area; $m^3\ ha^{-1}$

D_n Diameter of piece n of dead wood along the transect; cm

N Total number of wood pieces intersecting the transect; dimensionless

[93]Chave, Jérôme, Christophe Andalo, Sandra Brown, Michael A. Cairns, Jeffrey Q. Chambers, Derek Eamus, Horst Fölster et al. "Tree allometry and improved estimation of carbon stocks and balance in tropical forests." Oecologia 145, no. 1 (2005): 87-99.
[94] Chave, Jérôme, Helene C. Muller-Landau, Timothy R. Baker, Tomás A. Easdale, Hans ter Steege, and Campbell O. Webb. "Regional and phylogenetic variation of wood density across 2456 neotropical tree species." Ecological applications 16, no. 6 (2006): 2356-2367.
[95] Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world's upland forests. Oecologia 111, 1-11.
[96] Warren, W.G. and Olsen, P.F. (1964) A line intersect technique for assessing logging waste. Forest Science 10: 267-276.
[97] Van Wagner, C.E. (1968). The line intersect method in forest fuel sampling. Forest Science 14: 20-26.

L Length of the transect; m

Length of each transect was corrected for slope. The volumes per unit area of each dead wood density class are then multiplied by their respective densities to convert to a mass per unit area.

Biomass of standing dead wood is estimated using the allometric equation for live trees in the decomposition class 1. In decomposition class 2, the estimate of biomass was limited to the main trunk (bole) of the tree, in which case the biomass was calculated converting volume to biomass using dead wood density classes. Volume was estimated as the volume of a cone, as specified in the VM0007 module, "Estimation of carbon stocks in the dead wood pool."

Density of dead wood is determined through sampling and laboratory analysis. Discs are collected in the field and decomposition class and green volume determined as per standard operating procedures. The resulting dry weight is recorded and used to calculate dead wood density as oven-dry weight (g) / green volume (cm^3) for each sample.

Dry mass is converted to carbon using the default carbon fraction of 0.47 t C/t d.m. (as recommended by IPCC[98] Guidelines for National Greenhouse Gas Inventories).

Table 3.46 Data and Parameters for Monitoring Carbon Stocks Changes and GHG Emissions.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
CWP100,i	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i	t CO_2-e ha^{-1}	Calculated
ΔCAB_tree,i	Baseline carbon stock change in aboveground tree biomass in stratum i	t CO_2-e ha^{-1}	Estimated from the forest carbon inventory
ΔCBB_tree,i	Baseline carbon stock change in belowground tree biomass in stratum i	t CO_2-e ha^{-1}	Estimated from the forest carbon inventory
ΔCDW,i	Baseline carbon stock change in dead wood in stratum i	t CO_2-e ha^{-1}	Estimated from the forest carbon inventory

Revision of the Baseline

The baseline will be revised every 10 years from the Project's start date. Should an analysis of proxy areas be warranted to estimate a rate of deforestation, the BL-PL module will be consulted. Data collection procedures in regard to revision of the baseline will include Participatory Rural Appraisals, along with interviews and collaboration with MADES, INFONA, and municipal officials, where warranted. Deforestation maps will be prepared by classifying remotely sensed imagery, if warranted, to assist with development of the revised baseline. Other datasets used to substantiate aspects of the baseline will be from official government sources, peer reviewed publications, or other reputable sources.

[98] IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Chapter 4 AFOLU (Agriculture, Forestry and Other Land-use).

Table 3.47 Data and Parameters for Revising the Baseline.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
ΔCBSL,planned	Net greenhouse gas emissions in the baseline from planned deforestation	t CO_2e	Calculated every 10 years
ΔCBSL,i,t	Net carbon stock changes in all pools in the baseline stratum i at time t	t CO_2-e	Calculated every 10 years
GHGBSL-E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i during project year t	t CO_2-e yr^{-1}	Calculated every 10 years
AAplanned,i,t,	Annual area of baseline planned deforestation for stratum i at time t	ha	Calculated every 10 years
ΔCstocks,i	Baseline carbon stock change in stocks in stratum i	t CO_2-e ha^{-1}	Estimated from the forest carbon inventory.

Quality Assurance/Quality Control and Data Archiving Procedures

Monitoring Deforestation, Natural Disturbance, and Leakage

To ensure consistency and quality results, spatial analysts carrying out the imagery processing, interpretation, and change detection procedures will strictly adhere to best practices and good practice guidelines, when using the alternative method for quantifying deforestation. All data sources and analytical procedures will be documented and archived (detailed under data archiving below).

Accuracy of the classification, for both the baseline and monitoring, will be assessed by comparing the classification with ground-truth points or samples of high-resolution imagery. Any data collected from ground-truth points will be recorded (including GPS coordinates, identified land-use class, and supporting photographic evidence) and archived. Any sample points of high-resolution imagery used to assess classification accuracy will also be archived. Samples used to assess classification accuracy should be well-distributed throughout the Project Area (as far as is possible considering availability of high-resolution imagery and/or logistics of acquiring ground-truth data), with a minimum sampling intensity of 50 points each for the forest and non-forest classes.

The classification will only be used in the forest cover change detection step if the overall classification accuracy, calculated as the total number of correct samples / the total number of samples, is equal to or exceeds 90%.

All data sources and processing, classification and change detection procedures will be documented and stored in a dedicated long-term electronic archive.

Information related to monitoring deforestation maintained in the archive will include:

- Forest / non-forest maps;

- Documentation of software type and procedures applied (including all pre-processing steps and corrections, spectral bands used in final classifications, and classification methodologies and algorithms applied), if applicable; and
- Data used in accuracy assessment - ground-truth points (including GPS coordinates, identified land-use class, and supporting photographic evidence) and/or sample points of high-resolution imagery.

Forest Carbon Stocks and Degradation

The following steps will be taken to control for errors in field sampling and data analysis:

1. Trained field crews will carry out all field data collection and adhere to standard operating procedures. Pilot sample plots shall be measured before the initiation of formal measurements to appraise field crews and identify and correct any errors in field measurements. Field crew leaders will be responsible for ensuring that field protocols are followed to ensure accurate and consistent measurements. To ensure accurate measurements, the height of diameter at breast height (1.3 m) will be periodically re-assessed by personnel during the course of the inventory.
2. Field measurement data will be recorded on standard field data sheets and entered into an excel database for data management and quality control. Potential errors in data entry (anomalous values) will be verified or corrected consulting the original data sheets or personnel involved in measurement. Original data sheets will be permanently archived in a dedicated long-term electronic archive. The electronic database will also archive GIS coverages detailing forest and strata boundaries and plot locations.

Quality control procedures for sampling degradation will include steps 1 and step 3, above.

Personnel involved in the revising of the baseline will have detailed knowledge in regard to spatial modeling and land use change and deep familiarity with REDD methodologies. Remote sensing data used will include officially published dataset, or classified imagery, which meets accuracy assessment requirements as laid out in the methodology.

All measurement and monitoring equipment requiring calibration will be calibrated according to the equipment's specifications and/or relevant national or international standards.

Data Archiving

Data archived will be maintained through at least two years beyond the end of the Project's crediting period. All project records are secure and retrievable. This includes project documents saved on Quadriz staff computers. An identical version of the project documents is remotely saved on an external hard drive or in the cloud via DropBox (or a similar online storage platform). Furthermore, many project documents (e.g., VCS Project Description, Monitoring Reports, CCBS Project Design Document, Project Implementation Reports, Validation and Verification Reports, etc.) are publicly available and stored on both the Standards' and Quadriz's website.

Organization, Responsibilities, and Monitoring Frequency

For all aspects of project monitoring, Quadriz staff will ensure that data collection, processing, analysis, management and archiving are conducted in accordance with the monitoring plan.

Table 3.48. Type of Monitoring and Party Responsible for Monitoring.

Variables to be monitored	Responsible	Frequency
Monitoring deforestation and natural disturbance	Quadriz Paraguay S.A.	Prior to each verification
Monitoring illegal degradation	Quadriz Paraguay S.A.	Every two years
Monitoring project emissions	Quadriz Paraguay S.A.	Prior to each verification
Activity shifting leakage assessment	Quadriz Paraguay S.A.	Prior to each verification
Updating forest carbon stocks estimates	Quadriz Paraguay S.A.	At least every 10 years.
Revision of the baseline	Quadriz Paraguay S.A.	At least every 10 years.

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

The climate monitoring plan and its results, in addition to being incorporated in the CCB-VCS Monitoring Reports, will also be incorporated into the Spanish and English Summary Documents. These Summary Documents will be shared with stakeholders, including local communities, and will be made physically available at Quadriz's Asuncion and Estancia Santa Rosanna offices. All of the Project's project documents, including monitoring results, will be available online at the Verra Registry. Further, weblinks to the project documents will be publicly distributed during the CCBS Public Comment Period and will be available on Quadriz's websites.

3.4 Optional Criterion: Climate Change Adaptation Benefits

The Project does not seek to be validated to the Gold Level for climate change adaptation benefits.

3.4.1 Regional Climate Change Scenarios (GL1.1)

Not applicable.

3.4.2 Climate Change Impacts (GL1.2)

Not applicable.

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

Not applicable.

4 COMMUNITY

4.1 Without-Project Community Scenario

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

To the best of the Project Proponent's knowledge, there are no local communities or Indigenous Peoples who live in, or use, the initial Project Area.

In regard to Corazón Verde del Chaco Project, there are two local communities within 20 kilometers of the initial Project Area. These communities are two small indigenous communities, known as the Maria Auxiliadora and San Isidro. Maria Auxiliadora has approximately 20 families, while San Isidro has approximately 14 families.[99]

The Maria Auxiliadora community consists of five ethnic groups including Maskoi, Angaite, Zanapana, Guana, and Toba. While these are all distinct ethnic groups, they all live within one community. These groups have lost their traditional languages and they all speak Guarani. Of note, dance, particularly the women's Kuna dance and the Mbyky dance on August 7th to remember the deceased persons, is very important to their culture.

Within the Maria Auxiliadora community, there appear to be more young people and women, than men. Community meetings, called by the community leader Hermenegildo Vera, are held at the school and decisions are made by the community. The community prefers in-person meetings on Sundays.

Many families at Maria Auxiliadora have lived in the area for 10+ years. Families collect fuelwood as opposed to making or purchasing charcoal. Further, families collect their own timber, as opposed to purchasing timber. The local families do not access the initial Project Area and the families do not believe degradation is occurring throughout their area.

The families at Maria Auxiliadora primarily grow subsistence crops, including pumpkin, manioc, and sweet potatoes. Some of the families sell their crops to a nearby town of Puerto Casado. In addition to growing crops, some of the families raise cattle, goats, and/or chickens. Access to food and work is considered essential to their well-being. Throughout the region, there are community members who are considered ranchers, farmers, merchants (or traders), and subsistence hunters.

The families at Maria Auxiliadora understand the Chaco Forest, specifically the Chaco Forest within their approximately 30,000 hectares community lands,[100] is important to their livelihoods and see the Chaco Forest as a High Conservation Value. However, the families are experiencing the impacts of global climate change with flooding in 2020 followed by severe droughts in 2021. Some concerns of the Maria Auxiliadora community include potential for illegal loggers and illegal hunters.

The community at San Isidro have been visited twice by Quadriz but the community would like more time to decide whether to participate in the Project.

[99] Federation for Self-Determination of Indigenous Peoples. "Map." Available: https://www.tierrasindigenas.org/Mapa
[100] The official land area for the Maria Auxiliadora, as recognized by the Paraguayan Government and as reported by LandMark, is actually 90.71 hectares. The 30,000 hectares, which was reported by the Maria Auxiliadora community, might be in reference to their historical lands. See: LandMark. "Maps." Available: http://www.landmarkmap.org/map/.

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

The community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – are harmonious as all groups are considered community members of Maria Auxiliadora. These community groups are not being considered independently of each other because these community groups are harmonious and all these community groups are considered community members of Maria Auxiliadora.

The community at San Isidro have been visited twice by Quadriz, but the community would like more time to decide whether to participate in the Project.

Quadriz, while meeting with the Maria Auxiliadora community, was informed that there are interactions between the Maria Auxiliadora community and the San Isidro community.

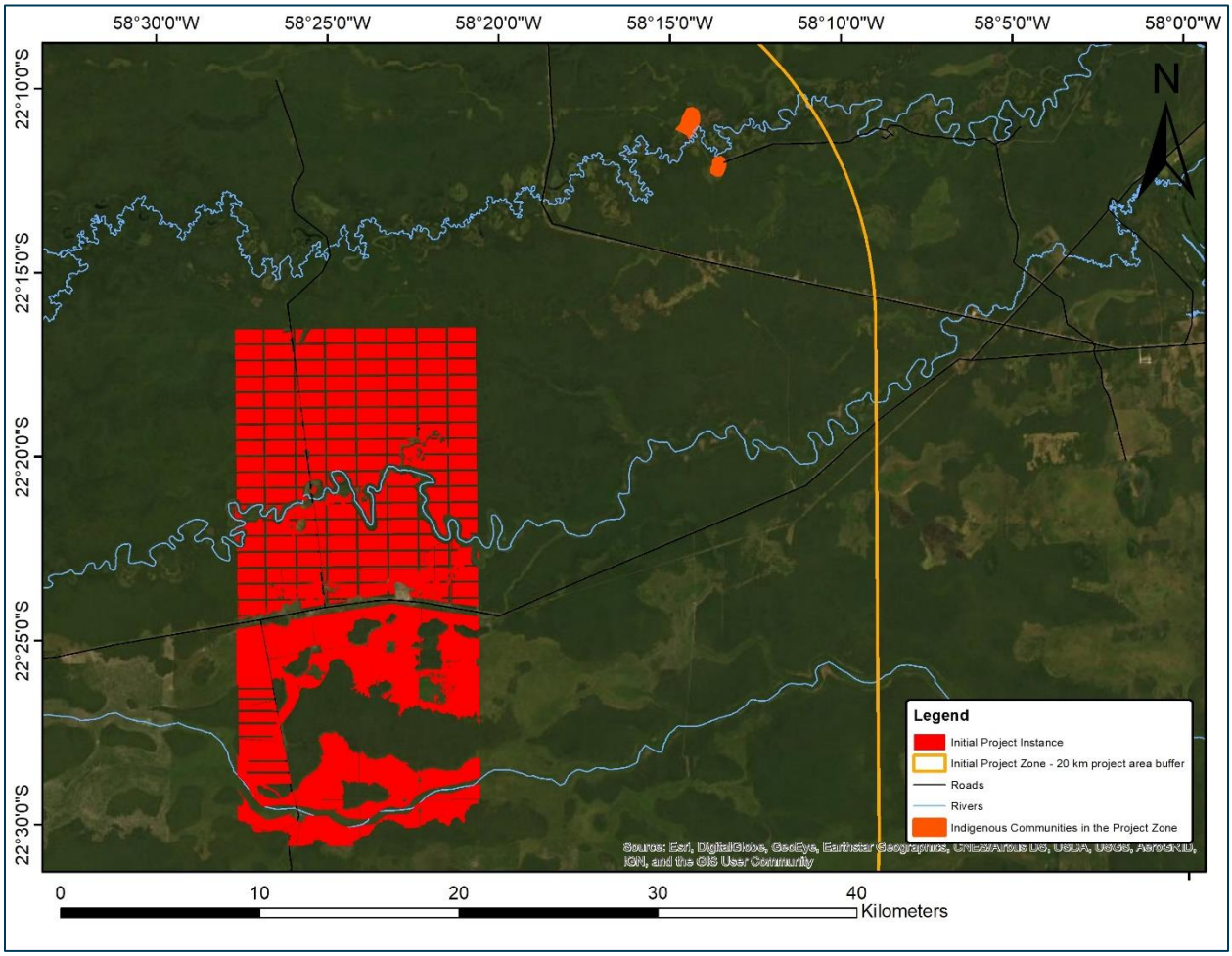
4.1.3 High Conservation Values (CM1.2)

High Conservation Value	The Chaco Forest
Qualifying Attribute	For the community at Maria Auxiliadora, the main High Conservation Value identified was the Chaco Forest, specifically the Chaco Forest within their approximate 30,000 hectares community lands.[101] The Chaco Forest provides a range of critical ecosystem services, is fundamental for their livelihoods, and is critical for their traditional cultural identify. For example, the Chaco Forest within their community lands provides wood (i.e., fuelwood to cook and timber for construction) and provides food (i.e., subsistence hunting for deer and wild pigs, and honey collection, etc.). The San Isidro community would like more time to decide whether they want to participate in the Project, but it is believed the San Isidro community would also identify the Chaco Forest within their community lands as an HCV for food and fuel (see Figure 4.1).
Focal Area	Although the Maria Auxiliadora community do not use the initial Project Area, the entire Chaco Forest needs to be conserved. Thus, the entire initial project area needs to be managed to maintain this HCV. For example, if the initial project area were sold and converted to a cattle ranch or commercial agriculture, this could harm the community lands of Maria Auxiliadora (and presumably the community lands of San Isidro) due to a reduction in water quality (e.g., such as due to runoff of manure from a cattle ranch) and a reduction in the populations of mobile animals that are hunted by community members, such as peccaries and brocket deer.

[101] The official land area for the Maria Auxiliadora, as recognized by the Paraguayan Government and as reported by LandMark, is actually 90.71 hectares. The 30,000 hectares, which was reported by the Maria Auxiliadora community is in reference to land they share with several other communities but is not titled to any one community. See: LandMark. “Maps.” Available: http://www.landmarkmap.org/map/.

	Likewise, the Project is seeking to conserve the Chaco Forest within the Project Areas, starting with the initial project instance, to help mitigate global climate change, to conserve the area's unique biodiversity, and to help preserve the community's important local and cultural resources.

Figure 4.1. Map of the Maria Auxiliadora and San Isidro communities' land and their HCV in the initial Project Zone.



Additional areas within the initial project zone which may meet criteria to be considered HCVs by other communities may include: the Chaco Forest within the San Isidro's community lands; specific streams or other bodies of water; specific animal species that have cultural significance and specific animal species that are preferred for eating (e.g., such as peccaries and brocket deer); and specific tree species that are preferred to building.

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

In the without-project scenario, the Project Area's Chaco Forest would be deforested and converted to cattle ranches. First, this deforestation increases greenhouse gas emissions, which contributes to global climate change, and the community at Maria Auxiliadora is already experiencing the impacts of climate change due to droughts and floods. Thus, in the without-project scenario, more greenhouse gas emissions could lead to more droughts and floods impacting the Maria Auxiliadora community. This is presumably also true for the community at San Isidro. Second, ongoing deforestation at the Project Areas would further shrink and degrade the habitat provided by the Chaco Forest, which could lead to fewer opportunities for subsistence hunting. For example, white-lipped peccaries are wide-ranging species that require large contiguous areas and are hunted for subsistence purposes. Third, and similarly, without the Project's monitoring for outside encroachment, there could be an increase in poaching and illegal logging in the without-project scenario both at the Project Area and at the community of Maria Auxiliadora, which would have detrimental impacts on the local community. Fourth, in the without-project scenario, there would not be the establishment of Chaco Med and local employment opportunities offered. Thus, with the establishment of Chaco Med in particular, the community at Maria Auxiliadora will have greater access to doctors and potentially life-saving medicine (i.e., such as anti-venom). Fifth, in the without-project scenario, the conversion of the Project Areas to cattle ranches would increase soil erosion and degrade local water quality (i.e., due to the runoff of manure) and this would likely impact the local community at Maria Auxiliadora and presumably at the San Isidro community.

The community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – were identified through community engagement, community consultations, and via the PRAs. These community groups are not being considered independently of each other because these community groups are harmonious and all these community groups are considered community members of Maria Auxiliadora. However, it is assumed that ongoing deforestation at the Project Areas (i.e., which would further shrink and degrade the habitat provided by the Chaco Forest) would lead to fewer opportunities for subsistence hunting and this would particularly harm the subsistence hunters' community group. Similarly, increasing droughts and floods, along with decreasing water quality, would particularly impact ranchers and farmers.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

The community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – are not being considered as distinct community groups because these community groups are all considered as harmonious community members of Maria Auxiliadora. Thus, the following will refer to all community groups living at the Maria Auxiliadora community:

Community Group	All community groups living throughout the Project Zone. This will initially include the Maria Auxiliadora community and possibly include

	the San Isidro community in the future, if the community choses to participate in the Project.
Impact	The initial project instance's impact on the Maria Auxiliadora community will be better access to health services and improved health as a result of the Chaco Med Program. This includes access to doctors and potentially life-saving medicine (i.e., anti-venom).
Type of Benefit/Cost/Risk	Chaco Med is a predicted, direct benefit to the local community at Maria Auxiliadora as it will provide potentially life-saving health services.
Change in Well-being	The community's change in well-being will be the result of having access to professional doctors, dentists and nurses, along with evacuation services with the emergency airplane.

Community Group	All community groups living throughout the Project Zone. This will initially include the Maria Auxiliadora community and possible include the San Isidro community in the future, if the community choses to participate in the Project.
Impact	The initial project instance's impact on the Maria Auxiliadora community will be increased and diversified income through employment opportunities, such as forest guards, offered to the Maria Auxiliadora community.
Type of Benefit/Cost/Risk	Employment opportunities are a predicted, direct benefit to the community at Maria Auxiliadora as it will provide both increased and diversified incomes.
Change in Well-being	The community's change in well-being will be the result of having access to professional employment opportunities, increased and diversified incomes, trainings, and promotional opportunities.

Community Group	All community groups living throughout the Project Zone. This will initially include the Maria Auxiliadora community and possible include the San Isidro community in the future, if the community choses to participate in the Project.
Impact	The initial project instance's impact on the Maria Auxiliadora community will be increased awareness and educational opportunities as a result of the Project's outreach and visitor center.
Type of Benefit/Cost/Risk	The visitor center is a direct and indirect benefit to the community at Maria Auxiliadora as it will provide a range of educational opportunities about the Chaco, the local cultures, and the local biodiversity.
Change in Well-being	The community's change in well-being will be the result of having access to educational opportunities provided at the visitor center.

4.2.2 Negative Community Impact Mitigation (CM2.2)

There are no negative community impacts expected to result from the Project. Likewise, there are no communities living in the initial Project Area and through the Participatory Rural Assessment, it does not appear the communities are reliant on the initial Project Area for their livelihoods (i.e., communities do not collect fuelwood or use the area to hunt, etc.).

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

Although there are few communities living in the region, the Project will have an overall net positive impact on community well-being at Maria Auxiliadora. This will result from the Project's employment opportunities provided to local community members, the establishment of a visitor center and its educational opportunities, and through the Chaco Med program. In contrast, in the without-project scenario, the Project Area's Chaco Forest would be deforested and converted to cattle ranches. First, this deforestation increases greenhouse gas emissions, which contributes to global climate change and more greenhouse gas emissions could lead to more droughts and floods impacting the Maria Auxiliadora community. This is presumably also true for the community at San Isidro. Second, ongoing deforestation at the Project Areas would further shrink and degrade the habitat provided by the Chaco Forest, which could lead to fewer opportunities for subsistence hunting. Third, and similarly, without the Project's monitoring for outside encroachment, there could be an increase in poaching and illegal logging in the without-project scenario both at the Project Area and at the community of Maria Auxiliadora. Fourth, in the without-project scenario, there would not be the establishment of Chaco Med and local employment opportunities offered. Thus, with the establishment of Chaco Med in particular, the community at Maria Auxiliadora will have greater access to doctors and potentially life-saving medicine (i.e., such as anti-venom). Fifth, in the without-project scenario, the conversion of the Project Areas to cattle ranches would increase soil erosion and degrade local water quality (i.e., due to the runoff of manure) and this would likely impact the local community at Maria Auxiliadora and presumably at the San Isidro community.

The community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – were identified through community engagement, community consultations, and via the PRAs. These community groups are not being considered independently of each other because these community groups are harmonious and all these community groups are considered community members of Maria Auxiliadora. However, it is assumed that ongoing deforestation at the Project Areas (i.e., which would further shrink and degrade the habitat provided by the Chaco Forest) would lead to fewer opportunities for subsistence hunting and this would particularly harm the subsistence hunters' community group. Similarly, increasing droughts and floods, along with decreasing water quality, would particularly impact ranchers and farmers.

Thus, the Project is expected to have net positive community well-being impacts.

4.2.4 High Conservation Values Protected (CM2.4)

As an avoided deforestation, forest conservation project, the Project will not have any negative impact on the community's High Conservation Values.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

Some of the general, positive impacts on Other Stakeholders include:

- The Project is seeking to reduce deforestation and the associated GHG emissions, which should have a positive impact on all stakeholders;
- The ability to learn more about forest conservation projects and the carbon markets, along with learning about the local cultures and biodiversity of the Chaco;
- Potential employment or partnership opportunities to provide services to the Project; and
- Ability to gather lessons learned in order to implement additional conservation projects in the Chaco.

There are unlikely to be any negative impacts on Other Stakeholders. This said, one general negative impact might include:

- Land values could go up, or down, as a result of conservation projects and this might impact Other Stakeholders in the vicinity of the Project.

More specific to the initial project instance, the following positive impacts of the Project and potential negative impacts of the Project on Other Stakeholders, as described in Appendix 1, are as follows:

Stakeholder	Stakeholder Category	Positive Impacts of Project	Potential Negative Impacts of Project
MADES	Secondary Stakeholder	The Project will complement MADES' forest carbon initiatives for Paraguay; Project will provide additional insights into private forest carbon projects.	Project might lead to additional, unwanted work for MADES to act as third-party ombudsman. If the Project were to fail, this might negatively impact MADES. However, there are no major, negative impacts envisioned for MADES as a result of the Project.
INFONA	Secondary Stakeholder	Project will complement INFONA's work with sustainable forestry management; Project will provide additional	If the Project were to fail, this might negatively impact INFONA. However, there are no major, negative impacts

		insights into private forest carbon projects. The Project's forest carbon inventory, including its design and its results, are of relevance for INFONA.	envisioned for INFONA as a result of the Project.
Livieres Guggiari	Secondary Stakeholder	The Project has provided additional and diversified revenue to Livieres Guggiari , which has advised on how to structure Quadriz Paraguay and has conducted due diligence on the agreements.	If the Project were to fail, this might reduce revenues for Livieres Guggiari. Project could generate a reputational risk for Livieres Guggiari if the firm's opinions are found to be incorrect. However, there are no major, negative impacts envisioned for Livieres Guggiari as a result of the Project.
UNDP	Other Stakeholder	The Project will seek to align with Paraguay's Forest Reference Emission Level of deforestation (FREL), for which UNDP was a partner; The Project will provide additional insights into private forest carbon projects.	There are no negative impacts envisioned for UNDP as a result of the Project.
Verra	Secondary Stakeholder	The Project will generate revenue for Verra through issuance fees; the Project will expand Verra's overall project portfolio; and the Project will further contribute to Verra's mission. The Project's activities associated with validation and ongoing monitoring, reporting and verification are particularly relevant for Verra.	If the Project were to fail, this might have some negative impacts (such as reputational risks) on Verra.
WWF Paraguay	Other Stakeholder	The Project will complement WWF Paraguay's vision of wildlife conservation.	Quadriz might be in competition with WWF Paraguay for grants, carbon finance, and

		The Project's monitoring of medium-to-large mammals is particularly relevant for WWF Paraguay. Such work could contribute to WWF Paraguay's research, to its understanding of the Chaco's biodiversity, and to their conservation strategies.	other conservation financing. Quadriz might also be in competition for strategic partners, services providers, landowners, etc. However, there are no major, negative impacts envisioned for WWF Paraguay as a result of the Project.
Solidaridad Network	Other Stakeholder	The Project may complement Solidaridad's work to make the soy and cattle industries in Paraguay more sustainable. The Project's partnership with private landowners is likely of particular interest to Solidaridad.	Quadriz might be in competition with Solidaridad to partner with the same landowners in Paraguay. However, there are no major, negative impacts envisioned for the Solidaridad Network as a result of the Project.
Guyra Paraguay / BirdLife International	Other Stakeholder	The Project may compliment Guyra Paraguay / BirdLife International's mission to conserve birds, their habitats, and the biodiversity / natural wealth of Paraguay.	Quadriz is a competitor of Guyra Paraguay for future VCS AFOLU projects in Paraguay; Quadriz might also be in competition for carbon finance. However, there are no major, negative impacts envisioned for Guyra Paraguay / Birdlife International as a result of the Project.

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

As mentioned above, there are unlikely to be any major, negative impacts on Other Stakeholders. This said, general negative impacts might include surrounding land values could go up, or down, as a result of Quadriz's conservation projects. Specific negative impacts, for example, would be additional work for MADES and competition with WWF Paraguay, Solidaridad Network, and/or Guyra Paraguay / BirdLife International for partners and financing. If such a scenario occurs, Quadriz will dedicate more time to understanding the ramifications. This said, the measures needed to mitigate the specific, negative well-being impacts on Other Stakeholders are as follows:

- Quadriz will participate in ongoing consultations and dialogue with Other Stakeholders; and
- Quadriz will provide regular updates on the Project by providing ongoing updates and by providing the ongoing project documentation, such as summary reports and monitoring reports.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

The net impacts on Other Stakeholders, due to the Project's reduction in deforestation, reduction in greenhouse gas emissions, along with the preservation of the Chaco's biodiversity and cultural heritage within the project areas, is likely to be positive. In contrast, there are no major, specific negative impacts envisioned for Other Stakeholders. Thus, the net impact on Other Stakeholders is expected to be positive.

4.4 Community Impact Monitoring

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

The main community objective of the Project is to provide social programs to improve the livelihoods of community members living in the vicinity of the Project. Improving the livelihoods of community members living in the vicinity of the Project (i.e., the community objective) will be accomplished through providing healthcare services, raising project awareness, and through establishing a project headquarters.

There will be four community surveys used for the community monitoring plan. One survey is known as a Participatory Rural Assessment (PRA), one survey is known as a Degradation Survey, another survey will be eventually used at the visitor center, and the fourth survey will be eventually used with Chaco Med.

The Participatory Rural Assessment (PRA; also known as a Participatory Rural Appraisal) survey and the Degradation Survey were developed, reviewed in detail, and were then translated into Spanish throughout 2020-2021. The first Degradation Survey was administered to communities near the Corazón Verde del Chaco Project's initial project instance in March 2021, while the first PRA surveys were conducted in August 2021. The plan is to administer the Degradation Survey and the PRA every two years with communities near the Corazón Verde del Chaco Project's initial project instance, as well as communities near additional parcels.

The Degradation Survey asks questions about the communities' consumption of fuelwood, charcoal, and timber, including whether these are collected or purchased, and whether the communities sell any of the items.

The results of the first Degradation Survey indicated that:

- Many families have lived in the area for 10+ years;
- Families collect fuelwood (i.e., as opposed to charcoal);
- Families collect their own timber (i.e., as opposed to purchasing from a merchant);
- The local families do not access the initial Project Area; and
- The families do not believe degradation is occurring throughout their area.

The Degradation Survey is not intended to monitor indicators of the Project's community objective. Rather, the Degradation Survey is a requirement of the VCS climate monitoring aspect of the Project.

The Participatory Rural Assessment is a guide to inform the communities about numerous aspects of the Project, along with to gather insights into their livelihoods and to solicit their comments about the Project. For example, the communities are informed about the:

- Overall Project description and the Project Proponent;
- Potential social projects and programs planned;
- Hiring process, potential vacant positions, and worker risks;
- Grievance Procedure; and
- Validation, verification, CCBS public comment period, and independent audit process.

The communities, as part of the ongoing PRA, are asked questions, including:

- How community-wide decisions are made,
- The community ranking of potential social projects and programs planned;
- What are your desired outcomes from the Project? How do you hope this project will improve your lives? What benefits are you hoping for from the project for your family and/or community? What would make this project a success for you?
- What are your concerns about the Project's potential negative impacts? How could this project make your lives worse? What would make this project a failure for you? What are your main concerns for the future without the project? What are your main concerns or issues with the project?
- Which areas provide critical ecosystem services (for example: hydrological services, erosion control, fire control, etc.) to your family and/or your community? What are these critical ecosystem services?
- Which topics or activities are most important for women?
- What is the best procedure for ongoing consultations? For example, would you prefer community-wide meetings or individual meetings? Prefer meetings on the weekends, in the morning, or in the evening? Would you like to be informed on the radio or in person by the local project manager?

The results of the initial Participatory Rural Assessment surveys provided a wide-range of information about the local community. This includes, but is not limited to:

- Community meetings, called by the community leader, are held at the school and decisions are made by the community;
- The community prefers in-person, face-to-face meetings, particularly on Sundays;
- The families at Maria Auxiliadora speak Guarani and there appear to be more young people and women, than men;
- The families at Maria Auxiliadora primarily grow subsistence crops, particularly pumpkin, manioc, and sweet potatoes. Some of the families sell their crops to Puerto Casado;
- In addition to growing crops, some of the families raise cattle, while others raise goats and chickens; and
- Throughout the region, there are community members who are considered ranchers, farmers, merchants, and subsistence hunters.

The PRA contributes to the community objective, for example, by enabling Quadriz to better understand the community and to provide a formal process for the community to share their desired benefits from the

Project. In addition, the process of identification and analysis of community groups within each community will be done through community engagement, community consultations, and via the Participatory Rural Assessment (PRA). For instance, the community groups at Maria Auxiliadora – which could be categorized as ranchers, farmers, merchants (or traders), and subsistence hunters or as the five ethnic groups known as the Maskoi, Angaite, Zanapana, Guana, and Toba – were identified through community engagement, community consultations, and via the PRAs. These community groups are not being considered independently of each other because these community groups are harmonious and all these community groups are considered community members of Maria Auxiliadora.

The visitor center and Chaco Med surveys were drafted in January 2021. The surveys will be administered on a regular basis once the visitor center is established and once the Chaco Med program is officially established.

The visitor survey will ask:

- Your name:
- Today's date:
- Your age:
- Where do you live:
- What brought you to the visitor center today:
- What are the top 3 things you most liked about your visit to the visitor center? Please briefly explain why you liked these three things.
- What are the top 3 things you would like to see added to the visitor center?
- What are the top 3 things you least liked about the visitor center? Why did you not like these three things?
- Do you have any other suggestions, recommendations, or comments for Quadriz's visitor center?
- On a scale of 1 to 10 (1 being the least favorable and 10 being the most favorable), how would you rate your visit to the Visitor Center today?
- Would you like to receive ongoing updates about Quadriz's Reducing Emissions from Deforestation and forest Degradation Project? If yes, please provide your contact information.

Similarly, the Chaco Med survey will ask:

- Your name:
- Today's date:
- What is your role with Chaco Med (are you a doctor, pilot, a patient, etc.):
- Your age:
- Where do you live:
- What services were provided today by Chaco Med:
- What are the top 3 things you most liked about Chaco Med? Please briefly explain why you liked these three things.
- What are the top 3 things you would like to see added to Chaco Med?
- What are the top 3 things you least liked about Chaco Med? Why did you not like these three things?

- Do you have any other suggestions, recommendations, or comments for Quadriz's Chaco Med?
- On a scale of 1 to 10 (1 being the least favorable and 10 being the most favorable), how would you rate your experience with Chaco Med?
- Would you like to receive ongoing updates about Quadriz's Reducing Emissions from Deforestation and forest Degradation Project? If yes, please provide your contact information.

Quadriz will also keep record of how many people have been hired to assist with the Project.

Furthermore, the Project will also regularly monitor forest canopy cover using satellite imagery analysis to demonstrate the ongoing efforts to mitigate deforestation in the project areas' Chaco Forest (i.e., a High Conservation Value).

The Chaco Forest within the project areas is one of the Project's HCVs and the Chaco Forest within the Maria Auxiliadora community lands was identified as an HCV for the Maria Auxiliadora community for the provisioning of food and fuel. To assess the effectiveness of the measures taken to maintain all identified HCVs related to community well-being (i.e., large contiguous forested areas near their communal lands), the following is needed:

- Quadriz needs (and has) a legally binding agreement in place with the private landowner to forego deforesting or selling of the property to a buyer who would covert the forest to a cattle ranch.
- Quadriz will also monitor forest canopy cover via on-the-ground forest guards and via regular review of satellite imagery to help ensure the Chaco Forest within the project areas is protected.
- The Project will also protect medium-to-large mammals, including wide-ranging species such as white-lipped peccaries that are hunted for subsistence. Thus, Quadriz will not allow hunting or illegal logging in the Project and Quadriz will monitor for deforestation (i.e., which would lead to a loss of contiguous, forested habitat for these trigger species) and monitor for illegal hunting (i.e., which would lead to further population decreases).

With these measures in mind, Quadriz has been very effective. Thus, Quadriz has a legally binding agreement already in place with the private landowner, Quadriz has put in actions to ensure the project areas are protected (i.e., such as hiring forest guards), and Quadriz has identified numerous medium-to-large mammals in the project zone using wildlife cameras. This said, the combination of monitoring forest cover via satellite imagery and using wildlife cameras should be very effective at assessing the measures taken to maintain all identified HCVs (i.e., the Chaco Forest, particularly the Chaco Forest within the communal lands of the Maria Auxiliadora community) related to community well-being. Likewise, ongoing satellite imagery analysis will determine the project area's remaining forest cover vis-à-vis the deforestation baseline, and the wildlife cameras will help to monitor whether there are healthy populations of medium-to-large mammals (i.e., some of which require large, contiguous blocks of forest and some of which are hunted for subsistence by the Maria Auxiliadora community).

To clarify the frequency of monitoring and reporting of monitoring results for all aspects of the community monitoring plan, the plan is as follows:

- The Degradation Survey will be administered at least once every two years;

- The Participatory Rural Assessment (PRA) will be administered at least once every two years;
- The visitor center surveys will be administered on a regular basis. For instance, if there are visitors to the visitor center once a week, then the surveys will be administered once a week.
- The surveys with the Chaco Med program will also be administered on a regular basis.
- The reporting of the monitoring results from all four surveys will be done at each verification event. The initial monitoring, reporting of monitoring results, and verification is expected to be undertaken in May 2022, with subsequent monitoring, reporting of monitoring results, and verifications to take place at least every five years thereafter. Thus, the results of all four community surveys will be reporting in the Project's Monitoring Reports and in the Project's Summary Documents.

4.4.2 Monitoring Plan Dissemination (CM4.3)

The community monitoring plan and its results, in addition to being incorporated in the CCB-VCS Monitoring Reports, will also be incorporated into the Spanish and English Summary Documents. These Summary Documents will be shared with stakeholders, including local communities, and will be made physically available at Quadriz's Asuncion and Estancia Santa Rosanna offices. All of the Project's project documents, including monitoring results, will be available online at the Verra Registry. Further, weblinks to the project documents will be publicly distributed during the CCBS Public Comment Period and will be available on Quadriz's website.

4.5 Optional Criterion: Exceptional Community Benefits

The Project does not seek to be validated to the Gold Level for exceptional community benefits because there are very few, if any, local communities using the Project Area.

4.5.1 Exceptional Community Criteria (GL2.1)

Not applicable.

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

Not applicable.

4.5.3 Community Participation Risks (GL2.3)

Not applicable.

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

Not applicable.

4.5.5 Net Impacts on Women (GL2.5)

Not applicable.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

Not applicable.

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

Not applicable.

4.5.8 Governance and Implementation Structures (GL2.8)

Not applicable.

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

Not applicable.

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The Chaco Region, where the Project is located, is one of the unique ecoregions in Paraguay. The World Wildlife Fund (WWF) estimates the Gran Chaco has approximately "3,400 species of plants, 500 species of bird, 150 species of mammals, along with 220 species of reptiles and amphibians.[102] The International Union for the Conservation of Nature (IUCN) Red List is a classification of the global conservation status of plant and animal species. The IUCN Red List contains 35 results for the Chaco Region as a whole[103] and 30 results for Paraguay.[104] These results include the endangered Chacoan peccary (*Catagonus wagneri*), the endangered Crowned solitary eagle (*Buteogallus coronatus*), and the vulnerable Chaco tortoise (*Chelonoidis chilensis*).

According to WWF:

> The Chacoan Peccary (*Catagonus wagneri*), discovered in the 1970's (Wetzel et al. 1975), is undoubtedly the most famous Chacoan (if not continental) endemic (Brooks 1992). Armadillos reach their peak diversity in the Chaco, with at least eight and ten species in the Paraguayan (Redford and Eisenberg 1992, Brooks 1995), and Argentinean (Zuleta and Bolkovic 1994) Chaco, respectively. {…} Other important species include the following: lesser mara (*Pediolagus salinicola*), giant tuco-tuco (*Ctenomys conoveri*) (Wetzel et al. 1975, Brooks 1993); greater rhea (*Rhea americana*), brushland tinamou (*Nothoprocta cinerascens*), Chaco chachalaca (*Ortalis canicollis*), black-legged serieman (*Chunga burmeisteri*), Chaco blue-fronted amazon (*Amazona aestiva*), picui ground dove (*Columbina picui*), Guira cuckoo (*Guira guira*), little thornbird (*Phacellodomus sibilatrix*), many-colored Chaco finch (*Saltaitricula multicolor*) (Capurro and Bucher 1988, Brooks 1997, 1998, Casenave et al. 1998); Paraguayan caiman (*Caiman yacare*), southern boa (*Boa constrictor occidentalis*), false water cobra (*Hydronastes gigas*), horned frog (*Ceratophrys sp.*), Argentine walking frog (*Phyllomedusa sauvageii*) (Brooks pers. obs.). {…} Due to its central location in South America, the Chaco harbors migrant birds from both southern (Austral) and northern (Neotropical) regions of South America, as well as migrants from even further north in North America (Brooks 1997, 1998).[105]

Many of these local species are losing their habitat due to deforestation trends throughout the Paraguayan Chaco resulting in commercial agricultural lands and cattle ranches.

Specific to the initial project instance and the initial project zone, the following mammals were photographed between June and November 2021:

[102] World Wildlife Fund, "Paraguay," Available: https://www.worldwildlife.org/places/gran-chaco
[103] IUCN, "Search: Chaco," Available: https://www.iucnredlist.org/search
[104] IUCN, "Search: Paraguay," Available: https://www.iucnredlist.org/search
[105] World Wildlife Fund, "Southern South America: Bolivia, Paraguay, and Argentina," Available: https://www.worldwildlife.org/ecoregions/nt0210

- 1. Collared peccary (*Pecari tajacu*);
- 2. Gray brocket deer (*Mazama gouazoubira*);
- 3. Giant anteater (*Myrmecophaga tridactyla*);
- 4. Southern Tamandua (*Tamandua tetradactyla*);
- 5. Lowland tapir (*Tapirus terrestris*);
- 6. Crab-eating racoon (*Procyon cancrivorus*);
- 7. Crab-eating fox (*Cerdocyon thous*);
- 8. Maned wolf (*Chrysocyon brachyurus*)
- 9. Ocelot (*Leopardus pardalis*);
- 10. Geoffroy's cat (*Leopardus geoffroyi*);
- 11. Puma (*Puma concolor*);
- 12. Jaguar (*Panthera onca*);
- 13. Jaguarundi (*Puma yagouaroundi*);
- 14. Lesser grison (*Galictis cuja);*
- 15. Tayra (*Eira barbara*);
- 16. Yellow armadillo (*Euphractus sexcinctus*);
- 17. Southern three-banded armadillo (*Tolypeutes matacus*);
- 18. Giant armadillo (*Priodontes maximus*); and
- 19. Azara's agouti (*Dasyprocta azarae*).

While several of these species, such as the collared peccary (*Pecari tajacu*),[106] the giant anteater (*Myrmecophaga tridactyla*),[107] and jaguar (*Panthera onca*)[108] are adaptable to living in either forested landscapes, such as the Chaco Forest, or open grasslands, there is still a threat to these species if the initial project instance were converted to a cattle ranch. For example, large cats, such as jaguars (*Panthera onca*)[109] and pumas (*Puma concolor*),[110] are at times shot by ranchers because the cats present a direct threat to cattle and their calves.

Other species, such as the gray brocket deer (*Mazama gouazoubira*) and lowland tapir (*Tapirus terrestris*),[111] in the absence of protective forest cover and with the introduction of more roads, could become more susceptible to hunting pressures in the open grasslands.[112] For instance:

> Tapirs are ecologically more prone to be impacted by hunting due to long gestation and generational time. Reproduction is slow enough to make recovery difficult for the species in areas where there is any prolonged hunting activity. Hunting is a serious threat along the numerous new road systems, settlement and along the agricultural frontier in the Amazon basin. Hunting also occurs around logging camps and can completely eliminate the species from seemingly viable habitat.[113]

[106] IUCN Red List, "Collared Peccary," Available: https://www.iucnredlist.org/species/41777/10562361
[107] IUCN Red List, "Giant Anteater," Available: https://www.iucnredlist.org/species/14224/47441961
[108] IUCN Red List, "Jaguar: Population," Available: https://www.iucnredlist.org/species/15953/123791436#population
[109] IUCN Red List, "Jaguar: Population," Available: https://www.iucnredlist.org/species/15953/123791436#population
[110] IUCN Red List, "Puma: Population," Available: https://www.iucnredlist.org/species/18868/97216466#population
[111] IUCN Red List, "Lowland Tapir: Population," Available: https://www.iucnredlist.org/species/21474/45174127#population
[112] IUCN Red List, "Gray Brocket Deer: Population," Available: https://www.iucnredlist.org/species/29620/22154584#population
[113] IUCN Red List. "Lowland tapir: Habitat and Ecology." Available: https://www.iucnredlist.org/species/21474/45174127

The process of rapidly clearing land with bulldozers, including the potential use of fires to clear land, can quickly overcome slow-moving animals such as the yellow armadillo (*Euphractus sexcinctus*), the southern three-banded armadillo (*Tolypeutes matacus*) and the giant armadillo (*Priodontes maximus*). This also includes reptiles and amphibians, which are not being formally monitored by the Project. Regarding the threat of fire and the giant anteater, "population loss of at least 30% over the past 10 years has been estimated based on local extinctions, habitat loss, and deaths caused by fires and road kills."[114] Similarly, nesting birds and burrowing animals would likely have their homes bulldozed in the process of converting the land to a cattle ranch. Further, depending on the when the clearing took place, the clearing could harm eggs, hatchlings, and other young offspring.

Finally, it is important to note that many species, according to Andrea Weiler, would not thrive in grasslands. This includes the giant armadillo (*Priodontes maximus*), the southern tamandua (*Tamandua tetradactyla*), the tayra (*Eira barbara*) and the lowland tapir (*Tapirus terrestris*).

By conserving the Chaco Forests, the Project will help maintain forest canopy cover, wildlife corridors, and habitat for terrestrial biodiversity dependent on forested landscapes.

5.1.2 High Conservation Values (B1.2)

The Project's High Conservation Values (HCVs) related to biodiversity are as follows:

High Conservation Value	Chaco Forest
Qualifying Attribute	The Chaco Forest is the second largest forest in South America after the Amazon Rainforest and qualifies as an HCV due it being a threatened ecosystem. Its status as a threatened ecosystem is due to extensive deforestation resulting from the conversion to commercial agriculture and cattle ranching.[115] The Gran Chaco Forest is mainly located in Argentina, Paraguay and Bolivia, thus making the Paraguayan Chaco a globally important landscape-level area. The location of the initial project instance is the site of one of the largest and last contiguous parcels of Chaco Forest in Paraguay. Thus, this initial project instance represents a "nationally significant large landscape-level area where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance." This is especially the case as this grouped project seeks to expand up to 300,000 hectares.
Focal Area	The Project seeks to help conserve the Chaco Forest, starting with the Chaco Forest within the initial project instance. Further, the Project will reduce the pressure on the Chaco Forest by creating economic alternatives to clearing forest for agriculture and livestock.

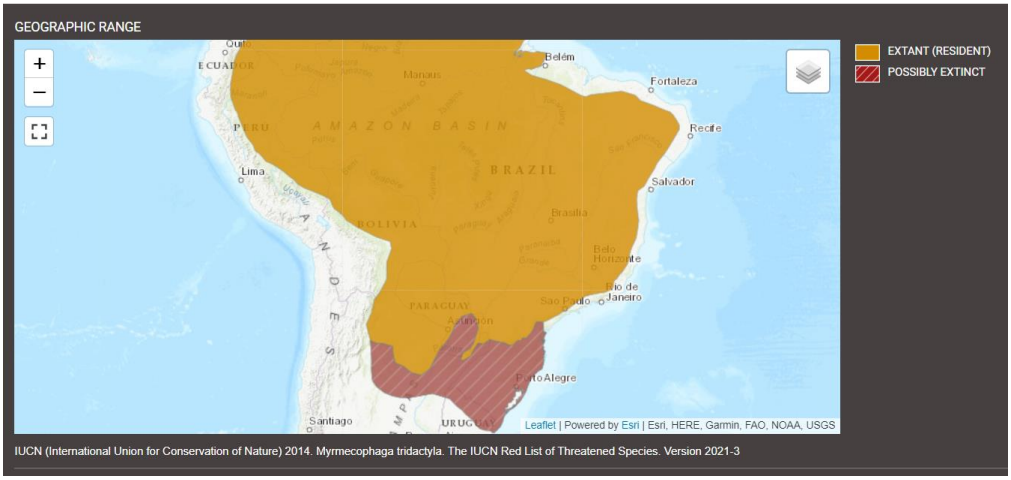
[114] IUCN Red List, "Giant Anteater: Habitat and Ecology." Available: https://www.iucnredlist.org/species/14224/47441961#habitat-ecology
[115] Mongabay. "Gran Chaco: South America's second-largest forest at risk of collapsing." Available: https://news.mongabay.com/2019/09/gran-chaco-south-americas-second-largest-forest-at-risk-of-collapsing/

High Conservation Value	Vulnerable, Threatened and Endangered Species
Qualifying Attribute	There are several vulnerable, threatened, and endangered species throughout the Chaco Forest, including the endangered Chacoan peccary (*Catagonus wagneri*) and crowned solitary eagle (*Buteogallus coronatus*). Specific to the initial project instance, several threatened species according to the IUCN Red List have been photographed. Such species include the giant anteater (*Myrmecophaga tridactyla*; considered Vulnerable on the IUCN Red List), the white-lipped peccary (*Tayassu pecari*; considered Vulnerable), the giant armadillo (*Priodontes maximus*; considered Vulnerable) and the lowland tapir (*Tapirus terrestris*; considered Vulnerable). The range maps of some of these species can be found below and please section 5.5.1 for the associated photographs. Although the jaguar is only considered near threatened,[116] and the giant armadillo is considered vulnerable,[117] according to Andrea Weiler, the concentration of these species would qualify as HCVs at the national and regional levels. Furthermore, according to MADES, the following mammalian species which have been photographed at the initial project instance, are considered nationally endangered: the maned wolf (*Chrysocyon brachyurus*); the ocelot (*Leopardus pardalis*); the jaguar (*Panthera onca*); and the giant armadillo (*Priodontes maximus*).[118]
Focal Area	The Project will seek to conserve the Chaco Forest and reduce deforestation, starting with the Chaco Forest within the initial project instance, which would further shrink the habitat of these threatened and endangered species. For example, the white-lipped peccaries require a large range, including the large range provided by the initial project instance, and white-lipped peccaries are said to feed on a variety of plants and animals, which would be less commonly found in a cattle ranch or within commercial agriculture: > Peccaries are primarily frugivorous (Husson 1978, Kiltie 1981, Beck 2005, Desbiez et al. 2009a, Keuroghlian and Eaton 2008a), but will eat other plant resources, invertebrates, fungi and even occasional fish (Fragoso 1994, D. Fernandes pers. comm.). Beck (2006) determined that White-lipped Peccaries fed on 144 plant species belonging to 36 families across their range. The species plays an important role as prey for large felines, ecosystem engineers, and in the function and structure of Neotropical forests as a major predator and disperser of

[116] IUCN Red List. “Jaguar.” Available: https://www.iucnredlist.org/species/15953/123791436
[117] IUCN Red List. “Jaguar.” Available: https://www.iucnredlist.org/species/18144/47442343
[118] MADES. “Endangered Species.” Available: http://www.mades.gov.py/wp-content/uploads/2018/06/peligro_de_extincion.pdf

	seeds (Altrichter et al. 1999, Beck 2005, Keuroghlian and Eaton 2008a, Desbiez 2009a, Desbiez and Keuroghlian 2009, Keuroghlian et al. 2009a, Cavalcanti and Geese 2010, Beck et al. 2010). {…} The consensus is that white-lipped peccaries are clearly wide-ranging and require large areas for survival (Altrichter and Almeida 2002, Keuroghlian et al. 2004, Reyna-Hurtado 2007). Their movements respond in part to changes in the availability of fruit patches and water sources (Kiltie and Terborgh 1983; Mendez 1970; Sowls 1984; Bodmer 1990; Altrichter et al. 2001; Keuroghlian et al. 2004; Beck 2005; Reyna-Hurtado and Tanner 2009b; Keuroghlian and Eaton 2008a, 2008b, 2009b).[119] In addition, tapirs, including the lowland tapir, are said to not be tolerant of large-scale habitat change and thus, this is in part why the initial project instance seeks to conserve its entire forested area: The degree to which tapir are tolerant to habitat degradation varies regionally, but generally tapir are a forest dependent species. To date, no conclusion has been drawn as to why tapirs may thrive in one partially logged or disturbed area and be absent from others, however, it can be inferred based on other tapir species that Lowland Tapir cannot tolerate large scale habitat change in combination with hunting pressure.[120]

Figure 5.1. Range Map of Giant Anteater (*Myrmecophaga tridactyla*; Credit: IUCN)



[119] IUCN Red List. "White-lipped peccaries: Habitat and Ecology." Available: https://www.iucnredlist.org/species/41778/44051115
[120] IUCN Red List. "Lowland tapir: Habitat and Ecology." Available: https://www.iucnredlist.org/species/21474/45174127

Figure 5.2. Range Map of White-Lipped Peccary (*Tayassu pecari*; Credit: IUCN)

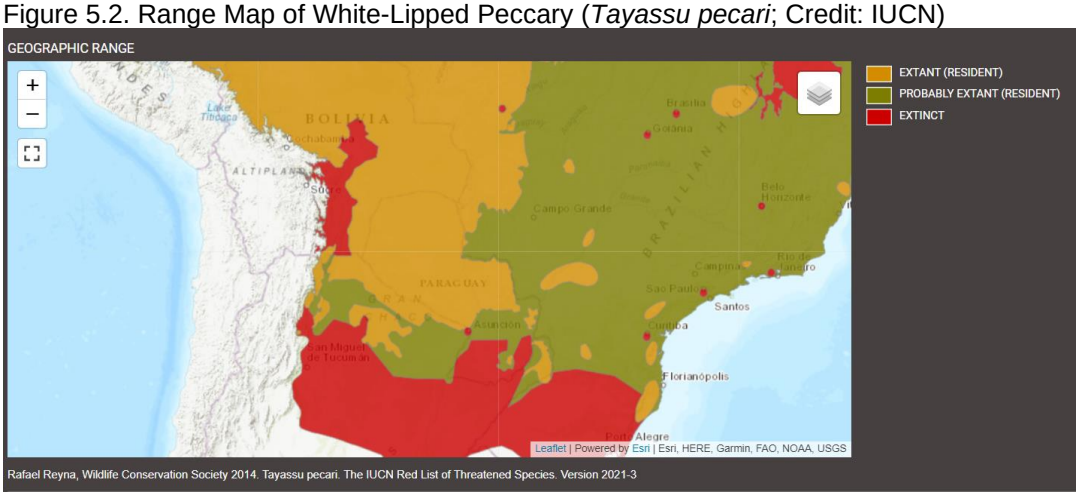


Figure 5.3. Range Map of Lowland Tapir (*Tapirus terrestris*; Credit: IUCN)

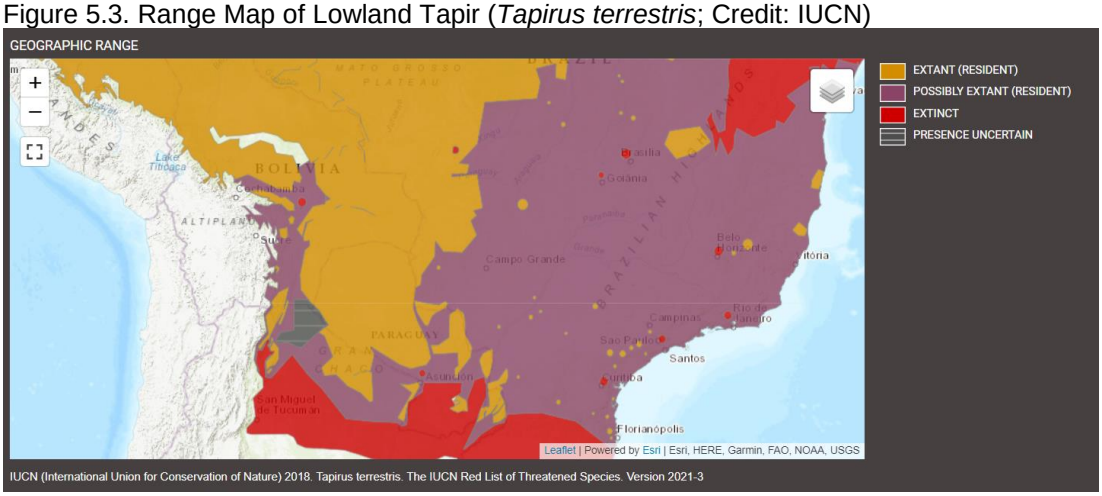
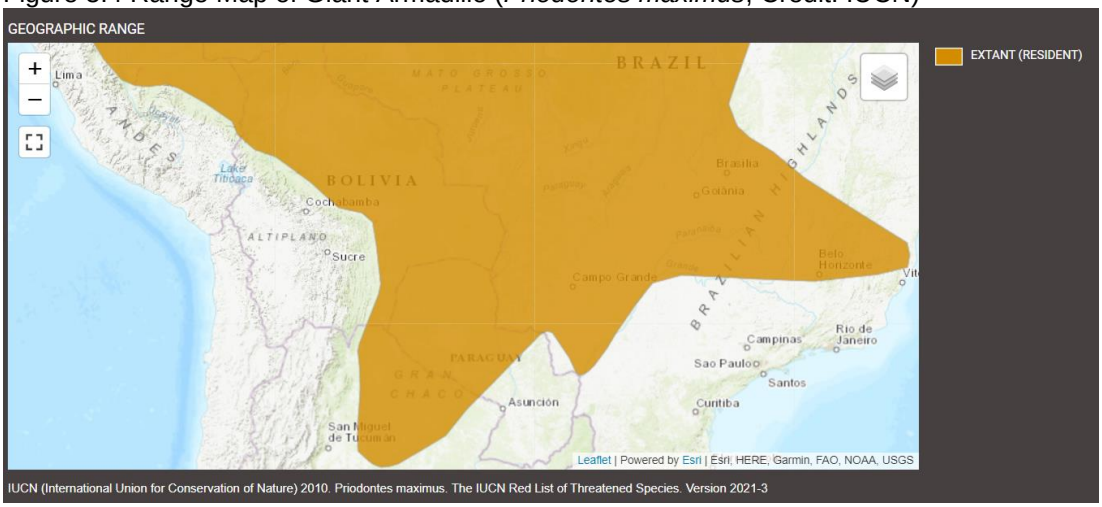


Figure 5.4 Range Map of Giant Armadillo (*Priodontes maximus*; Credit: IUCN)



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

Historically, there was massive deforestation in Paraguay that began in the Atlantic forests in the Eastern part of the country. More recently, this deforestation, largely a result of the shifting agricultural frontier, has shifted to the Chaco region:

> Massive deforestation and the loss of biodiversity {in the Chaco} are chiefly the result of on the one hand past government policy and a legal system that have actually provided incentives for deforestation, and on the other of the absence of measures preventing increased land clearance for logging, livestock production, and large-scale mechanized soybean farming…Deforestation is leading to soil erosion, loss of soil fertility, and a decrease in the quantity and quality of water resources, thus constraining the livelihoods and economic productivity of farmers in the region. Both deforestation and land degradation have been reduced throughout eastern Paraguay over the last decade but are still happening at an alarming rate.
>
> Until very recently, the Chaco, and in particular the Western Chaco, represented one of the last undisturbed wilderness areas in Latin America. However, the current minimum estimated rate of deforestation is around 200,000 to 300,000 hectares per year (2005 - 2009). Land clearance for ranching is now at rates often exceeding 1,000 hectares per day. By mid-2009, 19.1 percent of the whole Chaco region had already been converted to pasture, and further licenses for forest clearance had been issued to landowners. A recent analysis of economic drivers indicates the very strong likelihood that all suitable land (i.e., land not located within national or private protected areas or reserved for indigenous communities) will have been turned over to cattle production by 2025.[121]

Forest dependent species, such as the Chaco peccary, and canopy dependent species, such as the wide variety of bird species found throughout the Chaco, including the Crowned solitary eagle, would be negatively impacted in the without-project land use scenario as their habitat availability would shrink, their food sources and mating ability would decrease, and their population numbers would likely continue to decline. While some species can thrive in either grasslands or forested landscapes, such as giant anteaters, it is the abrupt change from forest to non-forest that might not be tolerable for these species.

Specific to the initial project instance, in the without-project land use scenario, the property would be sold and then converted to a cattle ranch or commercial agriculture. This without-project land use scenario would affect biodiversity conditions in the initial project zone by reducing the overall habitat available for mobile animals (e.g., brocket deer), by reducing the overall habitat available for species with a wide range (e.g., jaguars and white-lipped peccaries), and by possibly reducing the water quality (e.g., such as due to runoff of manure from a cattle ranch).

[121] Alberto Yanosky, "The Challenge of Conserving a Natural Chaco Habitat in the Face of Severe Deforestation Pressure and Human Development Needs," Page 378.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

The following tables describe the anticipated changes in biodiversity resulting from the Project activities under the with-project scenario in the Project Zone and over the Project Lifetime.

Biodiversity Element	Tree canopy cover and availability of Chaco Forest habitat.
Estimated Change	The tree canopy cover and availability of Chaco Forest habitat will be more extensive in the initial project area and in the initial project zone than in the without-project scenario of deforestation. Thus, in the baseline scenario, in the event of no REDD+ project, the landowner would have sold the land to a land purchaser who would have submitted a request to convert up to 75% of the native forest into a cattle ranch.
Justification of Change	The core activity of the Project is to conserve the Chaco Forest, particularly the Chaco Forest within the Project Areas, and reduce deforestation. The tree canopy cover, and thus availability of Chaco Forest habitat, will be regularly monitored via satellite imagery.

Biodiversity Element	Population of endemic, threatened and endangered species
Estimated Change	The population of endemic, threatened, and endangered species dependent on forested habitats, particularly the availability of Chaco Forest habitat, will be greater in the with-project scenario, including within the initial project instance and within the initial project zone.
Justification of Change	Conserving the Chaco Forest and avoiding deforestation will help maintain tree canopy cover and expand availability of Chaco Forest habitat for endemic, threatened, and endangered species. For example, according to Andrea Weiler, species such as the giant armadillo (*Priodontes maximus*; considered Vulnerable by the IUCN Red List) and the lowland tapir (*Tapirus terrestris*; considered Vulnerable by the IUCN Red List) would not thrive in grasslands. Additional species which depend on the Project's forested habitats and which are of the greatest concern (in addition to the giant armadillo and lowland tapir) due to their conservation status are the jaguar and the ocelot. According to Andrea Weiler, as the initial project area would be deforested, the population of these four species would decrease until they disappeared entirely from the area. Furthermore, according to MADES, the following mammalian species which have been photographed at the initial project instance, are considered nationally endangered: the maned wolf (*Chrysocyon brachyurus*); the ocelot (*Leopardus pardalis*); the jaguar (*Panthera onca*); and the giant armadillo (*Priodontes maximus*).[122] According to Andrew Weiler, endemic birds that could be

[122] MADES. "Endangered Species." Available: http://www.mades.gov.py/wp-content/uploads/2018/06/peligro_de_extincion.pdf

	lost due to ongoing deforestation are: the brushland tinamou (*Nothoprocta cinerascens*) and the black-bodied woodpecker (*Dryocopus schulzi*). The presence of endemic, threatened, and endangered species will be monitored using wildlife cameras.

5.2.2 Mitigation Measures (B2.3)

As a forest conservation and avoided deforestation project, the Project is unlikely to have any negative impacts on biodiversity.

The measures needed to maintain the biodiversity HCV attributes, being the Chaco Forest and the vulnerable, threatened and endangered species, and to be consistent with the precautionary principle are as follows:

1. The landowner needs to forego deforesting or selling their land to a buyer who would covert the initial project instance's Chaco Forest to a cattle ranch. This includes installing little-to-no roads. This will maintain large areas of forested, contiguous habitat for jaguars and the white-lipped peccary and should reduce to impact of illegal hunting of species such as the lowland tapir. This is despite the Project not knowing how many jaguars and white-lipped peccaries exist in the initial project zone;

2. Ideally, additional project instances are added to the grouped project to further expand the forested habitat available for wide-ranging species, such as jaguars and white-lipped peccaries;

3. The Project needs to continue monitoring medium-to-large mammals using wildlife cameras to better understand the population and distribution of the trigger species throughout the project zone; and

4. In addition to monitoring medium-to-large mammals, the Project also needs to monitor forest canopy cover to make sure deforestation is not taking place and the Project needs to monitor for illegal hunting (i.e., which is currently being done by the forest guards), even though the extent of illegal hunting is not fully understood.

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

The Project is expected to have net positive biodiversity impacts due to the Project's conservation of the Chaco Forest within the project areas, conservation of important habitat, and its role in reducing topsoil runoff and its associated impact on water quality. In addition, the project will monitor for deforestation and for illegal hunting. In contrast, without the Project, the likely land use scenario would have been forest clearing for cattle ranching. While some forest areas would remain in the without-project scenario (i.e., such as buffers around riparian areas), the impact would still largely be negative for biodiversity in the without-project scenario. For example, jaguars and white-lipped peccaries are species that require, large contiguous areas. Other species, such as the lowland tapir (*Tapirus terrestris*),[123] in the absence of protective forest cover and with the introduction of more roads, could become more susceptible to hunting pressures in the open grasslands.[124] The process of rapidly clearing land with bulldozers, including the potential use of fires to clear land, can quickly overcome slow-moving animals photographed at the initial

[123] IUCN Red List, "Lowland Tapir: Population," Available: https://www.iucnredlist.org/species/21474/45174127#population
[124] IUCN Red List, "Gray Brocket Deer: Population," Available: https://www.iucnredlist.org/species/29620/22154584#population

project instance such as the yellow armadillo (*Euphractus sexcinctus*), the southern three-banded armadillo (*Tolypeutes matacus*) and the giant armadillo (*Priodontes maximus*). It is also important to note that many species, according to Andrea Weiler, would not thrive in grasslands (i.e., the without project land use scenario). This includes the giant armadillo (*Priodontes maximus*), the southern tamandua (*Tamandua tetradactyla*), the tayra (*Eira barbara*), and the lowland tapir (*Tapirus terrestris*).

5.2.4 High Conservation Values Protected (B2.4)

The Project is a conservation project and thus, no HCVs related to biodiversity are negatively affected by the Project. The Chaco Forest within the project areas, which is one of the Project's HCVs, will be protected. Thus, Quadriz has a legally binding agreement in place with the private landowner to forego deforesting or selling of the property to a buyer who would covert the forest to a cattle ranch. Quadriz will also monitor forest canopy cover via on-the-ground forest guards and via regular review of satellite imagery to help ensure the Chaco Forest within the project areas is protected. The Project will also protect vulnerable, threatened, and endangered species, which is the Project's other biodiversity HCV. Thus, Quadriz will not allow hunting in the Project and Quadriz will monitor for deforestation (i.e., which would lead to a loss of contiguous, forested habitat for these trigger species), monitor for illegal hunting (i.e., which would lead to further population decreases), and monitor the abundance and diversity of medium-to-large mammals, including vulnerable, threatened and endangered species. Furthermore, Quadriz will monitor the estimated population and population trends of jaguars.

Other project activities, such as Chaco Med, the visitor center, and the forest carbon inventory work, are not expected to have any impacts on the Project's HCVs.

5.2.5 Species Used (B2.5)

No species are used during the course of this REDD+ project.

5.2.6 Invasive Species (B2.5)

According to the Global Invasive Species Database, the following invasive species have been identified in the Departments of Alto Paraguay and Presidente Hayes:

- Rock pigeons (*Columba livia*; Alto Paraguay and Presidente Hayes);
- Golden mussel (*Limnoperna fortunei*; Alto Paraguay and Presidente Hayes);
- Wild tomato (*Solanum sisymbriifolium*; Alto Paraguay);
- *Oxycaryum cubense* (Cuban bulrush; Presidente Hayes); and
- Guava (*Psidium guajava*; Presidente Hayes).[125]

This said, the Project will not introduce any of these known invasive species.

[125] Global Invasive Species Database. "Search: Alto Paraguay, Presidente Hayes." Available: http://www.iucngisd.org/gisd/search.php

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

The Project will not use any non-native species in the Project Areas or Project Zones.

5.2.8 GMO Exclusion (B2.7)

The Project will not use any GMOs to generate GHG emissions reductions or removals.

5.2.9 Inputs Justification (B2.8)

The Project does not anticipate using any inputs, including fertilizers, chemical pesticides, or biological control agents during the Project Lifetime.

5.2.10 Waste Products (B2.9)

The Project will strive to use very little waste products. This includes some trash produced by the local forest guards and some trash produced by the forest inventory team. The process of identifying, classifying, and managing such limited trash will be fairly straightforward and the standard local protocols for waste management will be used by Fredy Montoya and other representatives of Quadriz. For example, the regular trash, such as from the local forest guards or from the forest inventory team (i.e., food packaging, plastic water bottles, etc.), will be collected and brought to Puerto Casado for proper disposal. Unfortunately, recycling is not common in Paraguay due to no obligatory recycling requirements and recycling is not currently done in Puerto Casado. Any specific waste products produced in the future, such as medical waste attributable to Chaco Med, will be done properly following all local protocols.

5.3 Offsite Biodiversity Impacts

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

Not applicable - There are no negative offsite biodiversity impacts on biodiversity outside of the Project Zone resulting from project activities.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The net effect of the Project, as a forest conservation project, on biodiversity is positive.

5.4 Biodiversity Impact Monitoring

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

The main biodiversity objective of the Project is the preservation of biodiversity, particularly medium-to-large mammals in the project areas. To accomplish the main biodiversity objective, the Project will reduce deforestation in the project areas and the Project's biodiversity monitoring plan will be centered around the use of wildlife cameras deployed throughout the Project Areas on a regular basis. The specific biodiversity variables to be monitored are:

- 1. The confirmed presence and diversity of medium-to-large mammalian species;
- 2. The abundance of medium-to-large mammalian species;

- 3. Habitat occupation, which incorporates species' detectability into distribution models; and
- 4. The population size and population trend will be estimated for jaguars, which is a species that can be identified at the individual level.

The first study using wildlife cameras was initiated in June 2021 by Andrea Weiler from the Universidad Nacional de Asunción (National University of Asuncion). In addition to Andrea Weiler, the team that carried out the fieldwork in June 2021 was made up of the representatives from Quadriz, including Gabriela Viñales and Federico Montoya with technical assistance from Daniela Tabilo and María Paz Albertini.

After, selecting the location for camera traps installation, ten camera traps (i.e., Browning Trail Cameras - Spec Ops Elite HP4 brand model BTC-8E-HP4) were placed on paths associated with the different ecological strata in the initial project area, including palm savannas, forests, and in riparian areas. Memory cards correspond to each camera and each photo-trapping station was georeferenced and registered in the field sheet for a better organization of the data.

Camera traps were installed in each of the sites following the monitoring protocol for medium and large mammals (Díaz-Pullido & Payán Garrido, 2012). The cameras were placed approximately 50 cm from the ground, on main roads or trails, with a minimum distance of 1 km, each camera in metal boxes with chains and padlocks in order to prevent loss. The cameras were programmed as follows: tracking camera; image quality: 8MP; multi-focus mode: two standard photos; temperature: ° C; image data: on; motion detection: normal range; battery type: alkaline; firing speed: normal; and flash power: long range.

Camera training and programming were carried out with Quadriz staff, who learned to equip each chamber with batteries, program according to the configuration established in the laboratory (FACEN-UNA) and place each chamber in the selected sites. Quadriz will be in charge of periodically checking the cameras and in the event of any technical failure, reprogram the cameras installed in the field. An installation and configuration manual were developed to outline the technical aspects to be considered during the monitoring and control of the cameras.

Going forward, every five years, the Project will deploy wildlife cameras at randomly selected, representative sites for up to one year (depending in the required trap-nights). The reporting of these monitoring results will take place after the conclusion of the monitoring (i.e., shortly after the wildlife cameras have been removed from the project instance). The results will be reported in a final report and included in both the summary reports and in the Project's monitoring report.

Photo 5.1. Installation of camera by Quadriz staff.

Every five years, the biodiversity monitoring plan using wildlife cameras will take place at one of the randomly selected project instances of this grouped project. For the specific, future location of the wildlife cameras within the randomly selected project instance, the objective of the project will be taken into account. Thus, for example, to determine the diversity and abundance of medium-to-large mammals in the selected project instance in order to observe the ecological value and suggest conservation actions within the project instance, the following measures will be followed per recommendations from Andrea Weiler:

1. Map the location of the wildlife camera stations based on the environment (i.e., such as the different ecological strata present) or the species that we want to sample. This will serve as an orientation, always taking into account the conditions in which the project area is found.
2. Define the number of wildlife cameras to be used. Quadriz will strive to use 10-12 wildlife cameras during each monitoring event.
3. Regarding the sampling period and the number of trap-nights (i.e., which will define the duration of the sampling), the ideal would be to cover the different seasons of the year, as well as the different environments, to increase the possibility of detecting the species or individuals present. Quadriz will keep in mind that the closer the wildlife cameras are to each other, the less area that will be covered, but Quadriz will have a greater possibility of detecting all the individuals that are in that particular area.
4. To maximize the probability of photographing medium-to-large mammals, the participation of local personnel who know the area and the species is required, as well as the experience of a biodiversity specialist, such as Andrea Weiler, to identify the ideal sites at each project instance to be monitored. Thus, the wildlife cameras can be placed unsystematically in places where one

would expect it to be more likely to detect more species, such as by trails used by fauna, burrows, nests, salt ponds or waterholes.

5. It should be taken into account that not all the medium-to-large mammalian species present may be recorded, due to their habits.
6. Lastly, Andrea Weiler recommends that each biodiversity monitoring event should always be accompanied by analyzes such as species accumulation curves or rarefaction to have an idea of what is already recorded and when it would be appropriate to change the location of the sampling stations.

High Conservation Values (HCVs)

The two biodiversity HCVs identified for the Project are the Chaco Forest and the vulnerable, threatened and endangered species. To monitor the existing forest canopy cover of the Chaco Forest within each project instance, the Project has hired forest guards and will regularly monitor using satellite imagery analysis. This will demonstrate how effective the measures taken (i.e., agreement with private landowner, ongoing forest patrols, etc.) have been to maintain the Chaco Forest within the project areas.

As previously mentioned, the Project will also monitor the diversity, abundance, and habitat occupation of medium-to-large mammals, including that of vulnerable, threatened and endangered species, and the Project will monitor estimated population size and population trend of jaguars. Although the jaguar is only considered near threatened by the IUCN,[126] according to Andrea Weiler, the concentration of these species would qualify as HCVs at the national and regional levels. Further, according to MADES, jaguars are considered nationally endangered.[127] Thus, using wildlife cameras will demonstrate how effective the measures taken (i.e., agreement with private landowner, reducing deforestation, ongoing forest patrols, reduced hunting pressures, etc.) have been to maintain the quality of forested habitat for vulnerable, threatened and endangered species within the project areas.

Trigger Species

The Project's trigger species are the giant anteater (*Myrmecophaga tridactyla*), the lowland tapir (*Tapirus terrestris*), the giant armadillo (*Priodontes maximus*), the white-lipped peccary (*Tayassu pecari*), and the jaguar (*Panthera onca*) (see sections 5.5.1 and 5.5.2 for additional information).

As part of the biodiversity monitoring plan using wildlife cameras, the Project will monitor and estimate the population sizes and population trends of jaguars. Jaguars are selected because they are a species that can be identified at the individual level.

The main threat to all five of these trigger species is the availability of quality, forested habitat. For jaguars and white-lipped peccaries in particular, these species require, large contiguous areas. Thus, the Project will monitor the availability of forested habitat within the project areas via satellite imagery, which is the indicator of the threat (i.e., loss habitat and habitat fragmentation) to these five trigger species. The ongoing work of Quadriz with the private landowner to forego deforesting or selling of the property to a buyer who would convert the initial project instance, along with Quadriz's other activities (i.e., conducting forest patrols to reduce deforestation and illegal hunting, ongoing monitoring of forest canopy cover, and

[126] IUCN Red List. "Jaguar." Available: https://www.iucnredlist.org/species/15953/123791436
[127] MADES. "Endangered Species." Available: http://www.mades.gov.py/wp-content/uploads/2018/06/peligro_de_extincion.pdf

the monitoring and reporting of medium-to-large mammals using wildlife cameras), will demonstrate the effectiveness of these measures to maintain the population status of these trigger species.

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The biodiversity monitoring plan and its results, in addition to being incorporated in the CCB-VCS Monitoring Reports, will also be incorporated into the Spanish and English Summary Documents. These Summary Documents will be shared with stakeholders, including local communities, and will be made physically available at Quadriz's Asuncion and Estancia Santa Rosanna offices. All of the Project's project documents, including monitoring results, will be available online at the Verra Registry. Furthermore, weblinks to the project documents will be publicly distributed during the CCBS Public Comment Period and will be available on Quadriz's website.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

The Project seeks to be validated to the Gold Level for exceptional biodiversity benefits.

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

In the initial Project Zone, and in targeted areas for the grouped project, there have been:

- At least 7 individual white-lipped peccaries, Photo 5.2 (*Tayassu pecari*; listed as Vulnerable according to the IUCN Red List);[128]
- On June 15, 2021, jaguar (*Panthera onca*, listed as Near Threatened according to the IUCN Red List) tracks were photographed at the Project site, Photo 5.3;[129]
- Several jaguars were photographed by 8 of 10 wildlife cameras from June 2021 to August 2021, Photos 5.4-5.6; and
- Vulnerable giant anteaters (*Myrmecophaga tridactyla,* Photo 5.7),[130] vulnerable lowland tapirs (*Tapirus terrestris*, Photos 5.8-9), and vulnerable giant armadillos (*Priodontes maximus*, Photo 5.10) have also been photographed.[131]

[128] IUCN Red List. "White-Lipped Peccary." Available: https://www.iucnredlist.org/species/41778/44051115
[129] IUCN Red List. "Jaguar." Available: https://www.iucnredlist.org/species/15953/123791436
[130] IUCN Red List. "Giant Anteater." Available: https://www.iucnredlist.org/species/14224/47441961
[131] IUCN Red List. "Lowland Tapir." Available: https://www.iucnredlist.org/species/21474/45174127

Photo 5.2. White-lipped peccaries (*Tayassu pecari*); an IUCN Red List Vulnerable species in the initial project area. Photo by Investancia and Yluux.

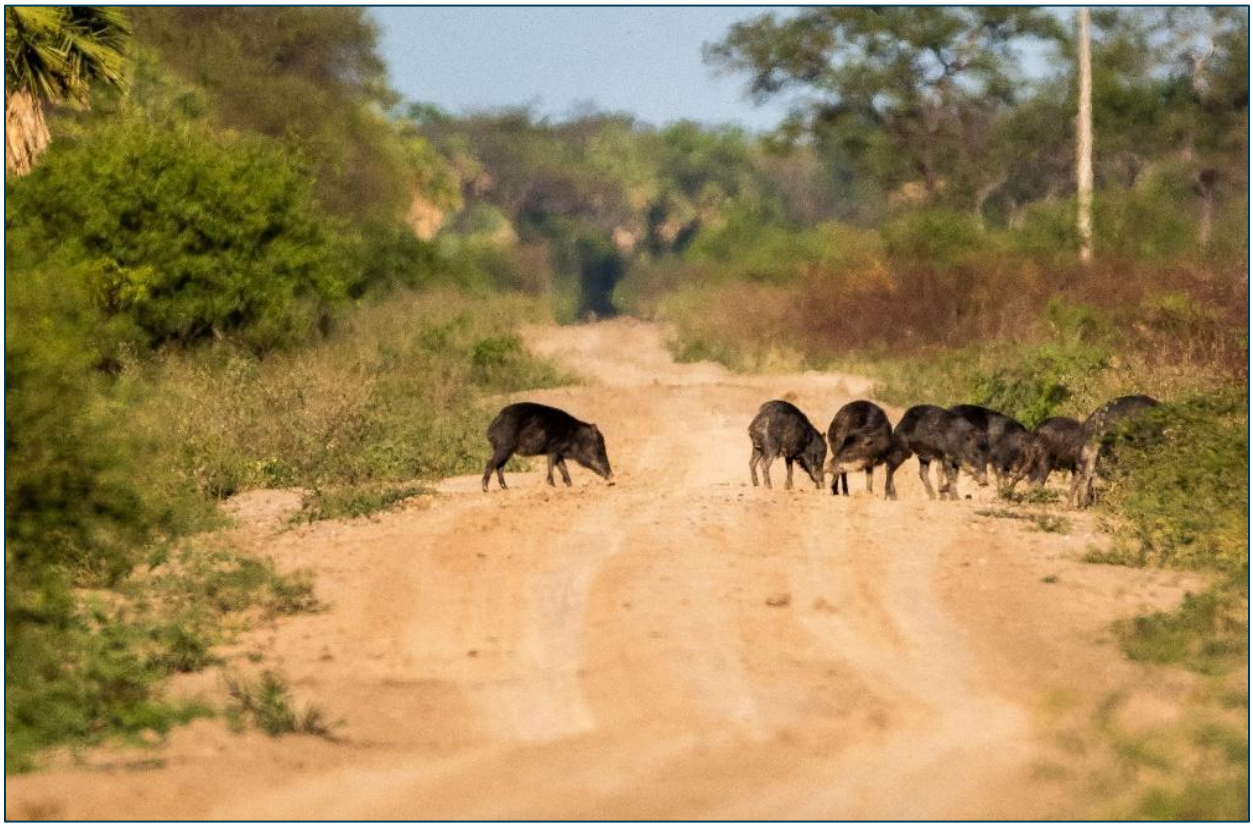


Photo 5.3. Jaguar (*Panthera onca;* an IUCN Red List Near Threatened species) track in the initial project area. Photo by Andrea Weiler.

Photos 5.4-5.6. Jaguars (*Panthera onca*) in the initial project area. Photos by Wildlife Cameras / Quadriz.


REDD+ Corazón Verde del Chaco
29.87 inHg - 17℃ 06/19/2021 04:30PM QUA 09


REDD+ Corazón Verde del Chaco
29.84 inHg - 10℃ 08/05/2021 06:57AM QUA 03

Photo 5.7. Giant anteater (*Myrmecophaga tridactyla*); an IUCN Red List Vulnerable Species in the initial project area. Photo by Wildlife Cameras / Quadriz.

Photos 5.8. Lowland Tapir (*Tapirus terrestris*); an IUCN Red List Vulnerable Species in the initial project area. Photos by Wildlife Cameras / Quadriz.

Photos 5.9. Lowland Tapir (*Tapirus terrestris*); an IUCN Red List Vulnerable Species in the initial project area. Photos by Wildlife Cameras / Quadriz.

Photo 5.10. Giant Armadillo (*Priodontes maximus*); an IUCN Red List Vulnerable Species in the initial project area. Photos by Wildlife Cameras / Quadriz.

It is very difficult to say conclusively how many individuals inhabit a particular project area, since for various reasons such as hunting, the state of the habitat, and other aspects beyond our knowledge, the numbers with respect to the populations can vary. However, given the health of the project's forested habitat and the role of forest patrols to help, amongst many things, to reduce hunting, it is believed that within the initial project instance and its initial project zone, there are at least 30 individuals or 10 pairs of Vulnerable species, according to the IUCN Red List. The following table outlines the four Vulnerable species, along with the Near Threatened jaguar, and based off the approximate 30,000-hectare[132] initial project property, the estimated number of each species is provided.

Species	IUCN Red List Category	Number Photographed at Site	Range of Species	Estimated Number at Site Due to Range
Giant anteater (*Myrmecophaga tridactyla*)	Vulnerable	1-2+	According to Andrea Weiler's research, authors estimated population density for the species giant anteater (*Myrmecophaga tridactyla*) varies according to the ecosystems, from 0.18 ind/km2 (Plains of Venezuela) to 1.3 ind/km2 (Parque Serra da Canastra, Brazil).	54 to 390 individuals (300 km^2 x 0.18 to 1.3 ind/km^2)
Lowland tapir (*Tapirus terrestris*)	Vulnerable	2-3+	According to Andrea Weiler's research, in the case of the lowland tapir, it also varies according to the ecosystem and whether or not it is hunted in the area, in the Chaco (Bolivia) it was estimated at 0.22-0.80 ind/km2, in another study it is estimated that the density in constant hunting sites it is 0.4 ind/km2 and sites with low pressure with 0.6 ind/km2. Similarly, the IUCN states "a variety of density estimates have been proposed ranging from 0.20 to 3.7 individuals/km^2 (P. Medici pers. comm). "[133]	60 to 1,110 individuals (300 km^2 x 0.20 to 3.7 ind/km^2)
Giant armadillo (*Priodontes maximus*)	Vulnerable	1+	With the giant armadillo, according to the studies carried out, a population density of 3.36 ind/100 km2 has been estimated in grasslands of the Brazilian Cerrado to 6.28 ind/100 km2 in the dry Chaco and the Bolivian Chiquitanía. Similarly, the IUCN states "the density has been estimated to be from 5.77 to 6.28 per 100 km^2 using camera trapping in Bolivia (Noss et al. 2004) and 3.36 per 100 km^2 using	1,008 to 1,884 individuals (300 km^2 x 3.36 to 6.28 ind/km^2)

[132] 30,000 hectares = 300 square kilometers
[133] IUCN Red List. "Lowland tapir: population." Available: https://www.iucnredlist.org/species/21474/45174127#population

			radiotracking in Brazil (Silveira et al. 2009)."[134]	
White-lipped peccary (*Tayassu pecari*)	Vulnerable	7+	As reported by the IUCN Red List, "in the Brazilian Pantanal, Desbiez et al. (2004) found 7.5 ind./km² and 9.6 ind./km² in two different locations in southern the southern Pantanal. Desbiez et al. (2010) documented the importance of habitat in peccary density estimates: peccary density estimates in forested areas was 13.7 ind/km², and in the open Cerrado habitat it was 3.0 ind/km². Lower densities have been found in dry forests. Altrichter (2005) found White-lipped Peccary densities in the Argentine Gran Chaco dry forest to be 0.33 ind/km² in hunted sites and 1.04 ind/km² in non-hunted sites; while Reyna-Hurtado and Tanner (2007) found similar densities of 0.43 ind/km² in the semi-dry forest of the Calakmul Biosphere Reserve in Mexico."[135]	99 to 2,880 individuals (300 km² x 0.33 to 9.6 ind/km²)
Jaguar (*Panthera onca*)	Near Threatened	3-4+	As reported by the IUCN Red List, "jaguar density in the Brazilian Pantanal has been estimated as 6.6-6.7 /100 km², or 10.3-11.7/100 km² depending on the method used (telemetry versus camera traps, respectively, Soislao and Cavalcanti (2006). In the Bolivian Amazon, Jaguar density was estimated at 2.8/100 km² (Madidi National Park Silver et al. 2004), and in the Colombian Amazon, Jaguar density was estimated at 4.5/100 km² and 2.5/100 km² (Amacayacu National Park and unprotected areas respectively; Payan 2008). Estimates of Jaguar density are 2/100 km² in the savannas of the Brazilian Cerrado, 3.5/100 km² in the semiarid scrub of the Caatinga, and 2.2/100 km² in the Atlantic Forest (Silveira 2004), and 2.2-5 per 100 km² in the Bolivian Gran Chaco (Maffei et al. 2004)."[136]	6 to 8 individuals (2-2.5 ind./100 km² x 3)

[134] IUCN Red List. "Giant armadillo: Population in detail." Available: https://www.iucnredlist.org/species/18144/47442343#population
[135] IUCN Red List. "White-lipped peccary: population." Available: https://www.iucnredlist.org/species/41778/44051115
[136] IUCN Red List. "Jaguar: population." Available: https://www.iucnredlist.org/species/15953/123791436#assessment-information

Further, according to MADES, the following mammalian species which have been photographed at the initial project instance, are considered nationally endangered:[137]

- 1. Maned wolf (*Chrysocyon brachyurus*);
- 2. Ocelot (*Leopardus pardalis*);
- 3. Jaguar (*Panthera onca*); and
- 4. Giant armadillo (*Priodontes maximus*).

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

The following will describe the population trends the following trigger species: giant anteater (*Myrmecophaga tridactyla*), lowland tapir (*Tapirus terrestris*), giant armadillo (*Priodontes maximus*), white-lipped peccary (*Tayassu pecari*), and jaguar (*Panthera onca*).

Trigger Species	Giant anteater (*Myrmecophaga tridactyla*)
Population Trend at Start of Project	The giant anteater (*Myrmecophaga tridactyla*) is a Vulnerable species according to the IUCN Red List and its population trend is decreasing. This population trend is likely similar for the project zone. According to the IUCN, the giant anteater has experienced "population loss of at least 30% over the past 10 years {which} has been estimated based on local extinctions, habitat loss, and deaths caused by fires and road kills."[138] While 1-2+ giant anteaters have been photographed at the initial project instance from June to November 2021, there could be 54 to 390 individuals present.
Without-project Scenario	While several of the species photographed at the initial project instance, such as the giant anteater (*Myrmecophaga tridactyla*),[139] are adaptable to living in either forested landscapes, such as the Chaco Forest, or open grasslands, there is still a threat to these species if the initial project instance were converted to a cattle ranch. According to the IUCN, the giant anteater "(*Myrmecophaga tridactyla*) is locally uncommon to rare. Habitat loss, road kills, hunting, and wildfires have been substantially affecting the populations over the past 10 years, and there have been many records of population extirpation, especially in Central America and in the southern parts of its range."[140] Thus, the without-project scenario would involve loss of forested habitat and potentially more roads, which could lead to greater hunting pressures. This, in turn, would likely further decrease the population of giant anteaters in the project zone.
With-project Scenario	The measures needed and designed to maintain the giant anteater's population and to reduce threats are as follows:

[137] MADES. "Endangered Species." Available: http://www.mades.gov.py/wp-content/uploads/2018/06/peligro_de_extincion.pdf
[138] IUCN Red List, "Giant Anteater: Habitat and Ecology." Available: https://www.iucnredlist.org/species/14224/47441961#habitat-ecology
[139] IUCN Red List, "Giant Anteater," Available: https://www.iucnredlist.org/species/14224/47441961
[140] IUCN Red List. "Giant Anteater: population in detail." https://www.iucnredlist.org/species/14224/47441961#population

	• The landowner needs to forego deforesting or selling their land to a buyer who would covert the initial project instance's Chaco Forest to a cattle ranch. This includes installing little-to-no roads. This will maintain forested habitat for the giant anteater; • The Project needs to continue monitoring medium-to-large mammals using wildlife cameras to better understand the population and distribution of giant anteaters throughout the project zone; and • In addition to monitoring medium-to-large mammals, the Project also needs to monitor forest canopy cover to make sure deforestation is not taking place and the Project needs to monitor for illegal hunting (i.e., which is currently being done by the forest guards). At this time, it is not possible to estimate the number of giant anteaters in the project zone at the end of the project lifetime.

Trigger Species	Lowland tapir (*Tapirus terrestris*)
Population Trend at Start of Project	The lowland tapir (*Tapirus terrestris*) is a Vulnerable species according to the IUCN Red List and its population trend is decreasing. This population trend is likely similar for the project zone. According to the IUCN, "very little is known of lowland tapir populations. Populations are decreasing across its range, though numerous strongholds exist. However, there is insufficient information available to extrapolate population sizes across these regions."[141] While 2-3+ lowland tapirs have been photographed at the initial project instance from June to November 2021, there could be 60 to 1,110 individuals present.
Without-project Scenario	The without-project scenario would involve loss of forested habitat and potentially more roads, which could lead to greater hunting pressures. In the absence of protective forest cover and with the introduction of more roads, the lowland tapir could become more susceptible to hunting pressures in the open grasslands.[142] For instance: > Tapirs are ecologically more prone to be impacted by hunting due to long gestation and generational time. Reproduction is slow enough to make recovery difficult for the species in areas where there is any prolonged hunting activity. Hunting is a serious threat along the numerous new road systems, settlement and along the agricultural frontier in the Amazon basin. Hunting also occurs around logging camps and can completely eliminate the species from seemingly viable habitat.[143] According to Andrea Weiler, the lowland tapir (*Tapirus terrestris*) would not thrive in the without-project scenarios of grasslands. Thus, in the without-project scenario, there would likely be a further decrease in the population of lowland tapirs.

[141] IUCN Red List. "Lowland tapir: population in detail." Available: https://www.iucnredlist.org/species/21474/45174127#population
[142] IUCN Red List, "Gray Brocket Deer: Population," Available: https://www.iucnredlist.org/species/29620/22154584#population
[143] IUCN Red List. "Lowland tapir: Habitat and Ecology." Available: https://www.iucnredlist.org/species/21474/45174127

With-project Scenario	The measures needed and designed to maintain the lowland tapir's population and to reduce threats are as follows: • The landowner needs to forego deforesting or selling their land to a buyer who would covert the initial project instance's Chaco Forest to a cattle ranch. This includes installing little-to-no roads. This will maintain forested habitat for the lowland tapir; • The Project needs to continue monitoring medium-to-large mammals using wildlife cameras to better understand the population and distribution of lowland tapirs throughout the project zone; and • In addition to monitoring medium-to-large mammals, the Project also needs to monitor forest canopy cover to make sure deforestation is not taking place and the Project needs to monitor for illegal hunting (i.e., which is currently being done by the forest guards). At this time, it is not possible to estimate the number of lowland tapirs in the project zone at the end of the project lifetime.

Trigger Species	Giant armadillo (*Priodontes maximus*)
Population Trend at Start of Project	The giant armadillo (*Priodontes maximus*) is a Vulnerable species according to the IUCN Red List and its population trend is decreasing. This population trend is likely similar for the project zone. According to the IUCN, "*Priodontes maximus* appears to be naturally rare where it occurs, with a very patchy distribution. {…} The wild population is decreasing."[144] While 1+ giant armadillos have been photographed at the initial project instance from June to November 2021, there could be 1,008 to 1,884 individuals present.
Without-project Scenario	The without-project scenario would involve loss of forested habitat in the initial project instance. The process of rapidly clearing land with bulldozers, including the potential use of fires to clear land, can quickly overcome slow-moving animals photographed at the initial project instance such as the giant armadillo (*Priodontes maximus*). Thus, in the without-project scenario, there would likely be a further decrease in the population of giant armadillos.
With-project Scenario	The measures needed and designed to maintain the giant armadillo's population and to reduce threats are as follows: • The landowner needs to forego deforesting or selling their land to a buyer who would covert the initial project instance's Chaco Forest to a cattle ranch. This includes installing little-to-no roads. This will maintain forested habitat for the giant armadillo; • The Project needs to continue monitoring medium-to-large mammals using wildlife cameras to better understand the population and distribution of giant armadillos throughout the project zone; and • In addition to monitoring medium-to-large mammals, the Project also needs to monitor forest canopy cover to make sure deforestation is not taking place

[144] IUCN Red List. "Giant armadillo: population in detail." Available: https://www.iucnredlist.org/species/18144/47442343#population

	and the Project needs to monitor for illegal hunting (i.e., which is currently being done by the forest guards). At this time, it is not possible to estimate the number of giant armadillos in the project zone at the end of the project lifetime.

Trigger Species	White-lipped peccary (*Tayassu pecari*)
Population Trend at Start of Project	The white-lipped peccary (*Tayassu pecari*) is a Vulnerable species according to the IUCN Red List and its population trend is decreasing. This population trend is likely similar for the project zone. While 7+ white-lipped peccaries have been photographed at the initial project zone from June to November 2021, there could be 99 to 2,880 individuals present.
Without-project Scenario	The without-project scenario would involve loss of forested habitat, habitat fragmentation, and potentially more roads, which could lead to greater hunting pressures for white-lipped peccaries. This, in turn, would likely further decrease the population of white-lipped peccaries in the project zone. Further, according to the IUCN Red List, "the consensus is that white-lipped peccaries are clearly wide-ranging and require large areas for survival (Altrichter and Almeida 2002, Keuroghlian et al. 2004, Reyna-Hurtado 2007)."[145] Thus, in the without-project scenario, there would likely be a further decrease in the population of white-lipped peccaries.
With-project Scenario	The measures needed and designed to maintain the white-lipped peccary's population and to reduce threats are as follows: • The landowner needs to forego deforesting or selling their land to a buyer who would covert the initial project instance's Chaco Forest to a cattle ranch. This includes installing little-to-no roads. This will maintain forested, contiguous habitat for the white-lipped peccary; • Ideally, additional project instances are added to the grouped project to further expand the forested habitat available for this wide-ranging species; • The Project needs to continue monitoring medium-to-large mammals using wildlife cameras to better understand the population and distribution of white-lipped peccaries throughout the project zone; and • In addition to monitoring medium-to-large mammals, the Project also needs to monitor forest canopy cover to make sure deforestation is not taking place and the Project needs to monitor for illegal hunting (i.e., which is currently being done by the forest guards). At this time, it is not possible to estimate the number of white-lipped peccaries in the project zone at the end of the project lifetime.

[145] IUCN Red List. "White-lipped peccaries: habitat and ecology." Available: https://www.iucnredlist.org/species/41778/44051115#population."

Trigger Species	Jaguar (*Panthera onca*)
Population Trend at Start of Project	The jaguar (*Panthera onca*) is a Near Threatened species according to the IUCN Red List, an endangered species according to MADES, and its population trend is decreasing. This population trend is likely similar for the project zone. While 3-4+ jaguars have been photographed at the initial project zone from June to November 2021, there could be 6-8 individuals present.
Without-project Scenario	While several of the species photographed at the initial project instance, such as the jaguar (*Panthera onca*),[146] are adaptable to living in either forested landscapes, such as the Chaco Forest, or open grasslands, there is still a threat to these species if the initial project instance were converted to a cattle ranch. For example, jaguars (*Panthera onca*) are at times shot by ranchers because the cats present a direct threat to cattle and their calves. According to the IUCN, "jaguar populations in the Chaco region of northern Argentina and Brazil, and the Brazilian Caatinga, are low-density and highly threatened by livestock ranching and persecution (Altrichter et al. 2006, T. de Oliveira pers. comm. 2008)."[147] This is similar to the Paraguay Chaco and thus, in the without-project scenario, there would likely be a further decrease in the population of jaguars.
With-project Scenario	The measures needed and designed to maintain the jaguar's population and to reduce threats are as follows: • The landowner needs to forego deforesting or selling their land to a buyer who would covert the initial project instance's Chaco Forest to a cattle ranch. This includes installing little-to-no roads. This will maintain large, contiguous, forested habitat for jaguars; • Ideally, additional project instances are added to the grouped project to further expand the forested habitat available for this wide-ranging species; • The Project needs to continue monitoring medium-to-large mammals using wildlife cameras to better understand the population and distribution of jaguars throughout the project zone; and • In addition to monitoring medium-to-large mammals, the Project also needs to monitor forest canopy cover to make sure deforestation is not taking place and the Project needs to monitor for illegal hunting (i.e., which is currently being done by the forest guards) of jaguar's prey (i.e., such as lowland tapirs and white-lipped peccaries). At this time, it is not possible to estimate the number of jaguars in the project zone at the end of the project lifetime.

[146] IUCN Red List, "Jaguar: Population," Available: https://www.iucnredlist.org/species/15953/123791436#population
[147] IUCN Red List, "Jaguar: Population," Available: https://www.iucnredlist.org/species/15953/123791436#population

APPENDICES

Appendix 1. Stakeholder Identification Table

As previously mentioned, the Project Proponent has conducted a detailed stakeholder identification and engagement process.

First, Quadriz, with assistance from Ostrya Conservation, brainstormed all of the potential stakeholders related specifically to the initial project instance as well as hypothetical future stakeholders for future project instances. This includes using Quadriz's local and national expertise in Paraguay, using Ostrya Conservation's extensive experience with forest carbon projects, reviewing other VCS AFOLU projects in Paraguay, and by reviewing maps. For the initial project instance, these potential stakeholders were:

- Local communities within 20-kilometers of the initial project instance;
- Local landowner(s);
- MADES;
- INFONA;
- Livieres Guggiari;
- United Nations Development Programme (UNDP);
- Inter-American Development Bank;
- Verra;
- WWF Paraguay;
- Solidaridad Network; and
- Guyra Paraguay / BirdLife International.

Stakeholders were then categorized according to Project Proponent(s), Other Entities, Community, Primary Stakeholders, Secondary Stakeholders, and Other Stakeholders based off of CARE's "Relative Influence and Importance of Key Stakeholders" framework. This Framework categorizes stakeholders based off their influence and importance, along with their rights, interests and relevance to the Project.

Relative Influence and Importance of Key Stakeholders (Credit: CARE 2002)[148]

Influence of Stakeholder	**Importance of Stakeholder to Project Achievement**				
	Unknown	Low	Moderate	Significant	Critical
Low	Other	Other	Other	Secondary	Secondary
Moderate	Other	Other	Other	Secondary	Secondary
Significant	Secondary	Secondary	Secondary	Secondary	Secondary
Highly Influential	Secondary	Secondary	Secondary	Secondary	Primary

[148] Richards, M. 2011. Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: Part 2 – Social Impact Assessment Toolbox. Climate, Community & Biodiversity Alliance and Forest Trends with Rainforest Alliance and Fauna & Flora International. Washington, DC. https://www.profor.info/sites/profor.info/files/ForestTrends-SBIA-Part2_0.pdf. Page 29.

Following CARE's "Relative Influence and Importance of Key Stakeholders" framework, the following stakeholder mapping for the initial project instance took place:

- Quadriz (Project Proponent / Primary Stakeholder);
- Quadriz's Service Providers (i.e., Other Entitles / Primary Stakeholder);
- Maria Auxiliadora and San Isidro, local communities within 20-kilometers of the initial project instance (Community / Other Stakeholder as the communities are not reliant on the initial Project Area):
- Atenil, local landowner (Other Entity / Primary Stakeholder);
- MADES (Secondary Stakeholder);
- INFONA (Secondary Stakeholder);
- Livieres Guggiari (Secondary Stakeholder);
- United Nations Development Programme (UNDP) (Other Stakeholder);
- Verra (Secondary Stakeholder);
- WWF Paraguay (Other Stakeholder);
- Solidaridad Network (Other Stakeholder); and
- Guyra Paraguay / BirdLife International (Other Stakeholders).

Influence of Stakeholder	**Importance of Stakeholder to Project Achievement**				
	Unknown	Low	Moderate	Significant	Critical
Low	Other (Solidaridad Network, Guyra Paraguay / Birdlife International)	Other	Other	Secondary	Secondary
Moderate	Other	Other (UNDP and WWF Paraguay)	Other (Maria Auxiliadora, San Isidro, and Livieres Guggiari)	Secondary	Secondary
Significant	Secondary	Secondary	Secondary	Secondary (MADES, INFONA, and Verra)	Secondary
Highly Influential	Secondary	Secondary	Secondary	Secondary	Primary (Quadriz, Quadriz's service providers such as Ostrya Conservation, and Atenil, the private landowner)

Further, the following are the stakeholder descriptions as well as their rights, interest and overall relevance to the Project.

Stakeholder	Rights, Interest and Overall Relevance to the Project
Local communities	There are two communities in the initial Project Zone (the indigenous communities of Maria Auxiliadora and San Isidro) and no communities in the initial Project Area. The communities of Maria Auxiliadora and San Isidro are considered an "Other Stakeholder" because neither community uses the initial Project Area. These local communities were identified using Quadriz's local knowledge and through the use of maps. In addition, the community groups within Maria Auxiliadora were determined through community engagement, community consultations, and through the use of the Participatory Rural Assessment. Although the communities do not use the initial Project Area, the local communities are an important stakeholder (with moderate influence and with moderate importance to project achievement) and the Project is relevant to them as the Project will provide local employment, health extension services, and environmental education and project awareness.
Local landowner	The Project is directly relevant to Atenil, the local landowner, and Atenil has a direct interest in the Project as their land is being used for the conservation activities and in exchange, the local landowner will receive a portion of the revenues from VER sales from the initial project instance. Atenil was identified using Quadriz's local and national expertise. The landowner is considered both a "Primary Stakeholder" due to their high influence and to their critical importance to the project achievement.
MADES	MADES is the acronym for the Ministerio del Ambiente y Desarrollo Sostenible (Ministry of Environment and Sustainable Development: http://www.mades.gov.py/). MADES used to be known as Secretaria del Ambiente (SEAM; Environmental Secretary), which was the principal focal point for the Clean Development Mechanism (CDM): Ulises Lovera, National Climate Change Director Email: ulises.lovera@mades.gov.py Phone: +595 971702494 Antonella Piacentini Email: mitigacion.dncc@gmail.com Phone: +595 986486047 MADES will act as the Project's third-party ombudsman. Further, as MADES overseas Paraguay's forest carbon initiatives, MADES has a direct interest in the Project and the Project is directly related to MADES' work. MADES was identified using Quadriz's local and national expertise. With significant influence on the

	Project and with significant importance to project achievement, MADES is considered a “Secondary Stakeholder.”
INFONA	INFONA is the acronym for the Instituto Forestal Nacional (National Forestry Institute: http://www.infona.gov.py/). INFONA’s mission is "promoting sustainable forest management through participatory and inclusive policy and in compliance with competition laws, providing products, services and technologies that contribute to the economic, social and environmental development of the country,"[149] and thus, has a direct interest in the Project. The Project is directly related to INFONA’s work and more specifically, the Project’s forest carbon inventory, including its design and its results, are of particular relevancy for INFONA. INFONA was identified using Quadriz’s local and national expertise. Similar to MADES, INFONA has a significant influence on the Project and has significant importance to project achievement, and thus, INFONA is considered a “Secondary Stakeholder.”
Livieres Guggiari	Livieres Guggiari is a law firm based in Asunción, Paraguay. Livieres Guggiari provides legal and strategic guidance, has advised on how to structure Quadriz Paraguay, and has conducted due diligence on the agreements. Livieres Guggiari was identified using Quadriz’s local and national expertise. Livieres Guggiari is a “Secondary Stakeholder” due to their moderate influence and moderate importance to project achievement.
United Nations Development Programme (UNDP)	The United Nations Development Programme (UNDP) is an agency of the United Nations. UNDP, along with other UN agencies, has “provided support to Paraguay to submit its first Forest Reference Emission Level of deforestation (FREL). This collaboration also resulted in a new a National Forest Monitoring System.”[150] Thus, UNDP has an interest in the Project. UNDP was identified using Quadriz’s local and national expertise. UNDP is considered an “Other Stakeholder” due to their moderate influence and low importance to project achievement.
Verra	Verra is the parent nonprofit organization that oversees the Verified Carbon Standard (VCS) and the Climate, Community & Biodiversity Standards (CCBS). The initial project instance and subsequent project instances are being designed, validated and verified to the VCS and CCBS. The use of the VCS and CCBS was identified via Ostrya Conservation’s extensive experience in the forest carbon industry. The Project’s activities associated with validation and ongoing monitoring, reporting and verification are particularly relevant for Verra. With their significant influence and their significant importance, Verra is consider a “Secondary Stakeholder.” Further, the Project is directly relevant to Verra as the Project is using its standards.
WWF Paraguay	WWF's work “in Paraguay began in the mid-90s with the development of a Biodiversity Vision for the Atlantic Forest of Alto Paraná, a trinational vision

[149] INFONA, “Mission and Vision,” Available: http://www.infona.gov.py/index.php?cID=179
[150] UN-REDD Programme, “Why Paraguay can be “beacon state” for forest management,” Available: https://www.un-redd.org/post/paraguay-demonstrates-benefits-of-forests-as-a-nature-based-solution-to-climate-change

	developed by Brazil, Argentina and Paraguay. In 2000, WWF established a Project Office in Paraguay that has since become a Country Office. During these years, WWF's work has spread from the Atlantic Forest to the entire country, working on different issues. WWF-Paraguay is part of the WWF Latin America and the Caribbean (LAC) Program, being part of the Southern Cone of the Amazon (SASC). {WWF's vision is to} maintain landscapes and biodiversity by promoting sustainable production models together with society and stimulating cooperation between producers, government and civil society and communities."[151] Due to WWF Paraguay's conservation work and its mission, WWF Paraguay has a direct interest in Quadriz's work to conserve the Chaco Forest. Likewise, the Project's monitoring of medium-to-large mammals, including the monitoring design and its results, is particularly relevant for WWF Paraguay. Although WWF Paraguay does not any direct role or rights in the initial project instance, WWF Paraguay is considered an "Other Stakeholder" because of their moderate influence and low importance to project achievement.
Solidaridad Network	Solidaridad, with its International Secretariat based in The Netherlands, works in South America, including in Paraguay. Solidaridad works with soy and cattle in Paraguay and throughout South America, its mission "is to transform sectors to make them sustainable. This requires alignment from value chain actors, and implementation of practical innovations in the field and at the national level."[152] Although the Solidaridad Network has no direct role or rights in the initial project instance, Solidaridad has an interest in the Project and the Project is relevant to their work. For instance, the Project's partnership with private landowners in the Chaco is likely of particular interest to Solidaridad. Solidaridad Network was identified via Ostrya Conservation. With their relatively low influence and their unknown importance, Solidaridad is considered an "Other Stakeholder."
Guyra Paraguay / BirdLife International	Guyra Paraguay (http://guyra.org.py/) has developed several forest carbon projects in Paraguay. In addition, Guyra Paraguay is the local, in-country partner of BirdLife International.[153] BirdLife International is a "a global partnership of conservation organizations (NGOs) that strives to conserve birds, their habitats and global biodiversity, working with people towards sustainability in the use of natural resources."[154] Although both organizations do not have any direct roles or rights in the initial project instance, both organizations have an interest in the Project and the Project is relevant to their work. Guyra Paraguay / BirdLife International was identified via a review of other VCS AFOLU projects in Paraguay. With their relatively low influence and their unknown importance, both Guyra Paraguay and BirdLife International are considered "Other Stakeholders."

[151] WWF Paraguay. "Our Vision," Available: https://www.wwf.org.py/wwf_paraguay/
[152] Solidaridad, "South America," Available: https://www.solidaridadnetwork.org/region/south-america/
[153] BirdLife International, "News Paraguay," Available: https://www.birdlife.org/news/country/paraguay
[154] BirdLife International, "About BirdLife International," Available: https://www.birdlife.org/worldwide/partnership/about-birdlife

Appendix 2. VCS Non-Permanence Risk Report

The risk analysis has been conducted in accordance with the VCS AFOLU Non-Permanence Risk Tool version 4.0, dated 19 September 2019. This tool assesses a project's internal risk, external risk, natural risk and mitigation measures which help to reduce risk. The risk ratings and supporting evidence are detailed in Section 1, 2, and 3, below, and apply specifically to the initial project instance. Letters in the risk factor column correspond to the risk factor explained in the VCS Risk Tool.

A1. INTERNAL RISK

Project Management		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	No species have been planted as part of the project activity.	0
b)	While encroachment has not been detected on the property or revealed through participatory rural appraisals done as part of the community surveys, encroachment by local farmers is an issue in some parts of the Chaco. Encroachment is unlikely to be an issue for the initial project area in the future because the only access to the initial project area is off of a private road which has guard houses on each end of the road. As such there is no ongoing enforcement needed to prevent encroachment by outside actors on any part of the Project Area. Encroachment by outside actors is not anticipated as the Project Areas are in a sparsely populated region and property lines are well marked and respected. Regardless of the encroachment risk, the project will conduct patrols along the project boundaries and throughout the project area. The mere presence of patrols and infrastructure can deter potential encroachment by outside actors.	0
c)	The local management team includes an operations manager and a forester which are both from the region and have extensive experience managing rural lands in the Chaco.	0
d)	The management team maintains an office at Estancia Santa Rosanna Carmelo Peralta, Paraguay. An operations manager and forester are based at this location which is within a day drive to all project sites.	0
e)	The management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting under the VCS Program, including James Eaton who has over 10 years' experience designing, implementing, and operating VCS AFOLU projects.	-2
f)	**Mitigation:** Adaptive management plan in place.	0
Total Project Management (PM) [as applicable, (a + b + c + d + e + f)] Total may be less than zero.		**-2**

Financial Viability		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-d)	Project cash flow breakeven point is 4 years or less from the current risk assessment.	0
e-h)	The Project has secured 100% of funding needed to cover the total cash out before the project reaches breakeven.	0
i)	The Project has 100% of financial resources available before the project reaches breakeven.	-2

Total Financial Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] Total may not be less than zero.	**0**

Opportunity Cost		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-f)	NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated.	0
g)	The Project Proponent is not a nonprofit organization.	0
h)	All project instances are protected by a legally binding contract which protect the Project Areas' carbon stocks for 30 years, the length of the crediting period.	-2
i)	Not applicable.	0
Total Opportunity Cost (OC) [as applicable, (a, b, c, d, e or f) + (g + h or i)] Total may be less than 0.		**-2**

Project Longevity		
a)	Not applicable.	0
b)	All project instances are protected by a legally binding contract which ensures the project areas stay forested for 30 years, the length of the crediting period.	15
Total Project Longevity (PL) May not be less than zero		**15**

Internal Risk	
Total Internal Risk (PM + FV + OC + PL) Total may not be less than zero.	**11**

A2. EXTERNAL RISK

Land Tenure and Resource Access/Impacts		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-b)	Ownership and resource access/use rights are held by different entities. The Project Area is under clear private title to the landowners. These landowners have a legally-binding contract with Quadriz. Quadriz is assigned the carbon rights as described in the PD.	2
c)	No dispute over landownership or land tenure exists for any part of the project area.	0
d)	No dispute over access/use rights exists for any part of the project area.	0
e)	This is not a WRC project.	0
f)	All project instances are protected by a legally binding contract which protect the Project Areas' carbon stocks for 30 years, thus protecting the credited carbon stocks over the length of the 30-year project crediting period.	-2
g)	There are no disputes over land tenure, ownership or access/use rights.	0
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e + f + g)] Total may not be less than zero.		**0**

Community Engagement		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-b)	No people live on the initial Project Area or are reliant on the initial Project Area. To their knowledge, the Project Proponent has contacted all communities which maybe reliant on the initial Project Area.	0
c)	Not applicable.	0
Total Community Engagement (CE) [where applicable, (a + b + c)] Total may be less than zero.		**0**

Political Risk		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Not applicable.	0
b)	Paraguay's governance score (-0.37) is between -0.79 and -0.32	4
c-e)	Not applicable.	0
f)	The country has an established Designated National Authority (DNA), Secretaria del Ambiente (SEAM), under the CDM. This DNA in now likely MADES. Paraguay also has at least one registered CDM Afforestation/Reforestation project (i.e., Reforestation of croplands and grasslands in low income communities of Paraguarí Department, Paraguay), registered in September 2009. Further, Paraguay is a member of the UN-REDD Programme,[155] and a member of the World Bank's Forest Carbon Partnership Facility.[156]	-2
Total Political (PC) [as applicable ((a, b, c, d or e) + f)] Total may not be less than zero.		**2**

Table A1. Calculation of Paraguay's average governance score.

Governance Indicator	**2016**	**2017**	**2018**	**2019**	**2020**
Voice and Accountability	-0.06	-0.04	0.03	0.06	0.07
Political Stability and Absence of Violence/Terrorism	0.14	0.00	-0.08	-0.01	0.02
Government Effectiveness	-0.79	-0.81	-0.52	-0.53	-0.47
Regulatory Quality	-0.30	-0.30	-0.08	-0.20	-0.20
Rule of Law	-0.73	-0.71	-0.52	-0.56	-0.42
Control of Corruption	-0.71	-0.70	-0.83	-0.83	-0.87
Overall Mean					**-0.37**

External Risk	
Total External Risk (LT + CE + PC) Total may not be less than zero.	**2**

[155] UN-REDD Programme, "Partner Countries," Available: https://www.un-redd.org/partner-countries
[156] Forest Carbon Partnership Facility, "Paraguay," Available: https://www.forestcarbonpartnership.org/country/Paraguay

A3. NATURAL RISK

Fire Risk	
Evidence	While anthropogenic and natural fires do occur in the region, they are primarily found in palm forest. These fires primarily affect herbaceous and shrubby vegetation while leaving larger trees relatively unaffected in this fire prone ecosystem. While illegal and discouraged by forestry officials and forestry law, fire is occasionally used to clear land in the grouped project region. For the above reasons, the likelihood of a fire in the Project Area has been assessed to occur less than every 10 years. Should a fire occur, it is likely to have an insignificant effect on carbon stock (loss of less than 5%), with full stock recovery expected to occur in less than 10 years. Mitigation practices include project lands incorporating fire breaks near roads and having a fire management plan.[157] These breaks are maintained as part of the project activity. Further, project staff have a proven history of effectively eliminating fire from the area.
Significance	Insignificant (less than 5% loss of carbon stocks) or transient (full recovery of lost carbon stocks expected within 10 years of any event)
Likelihood	Less than ever 10 years
Score (LS)	2
Mitigation	0.25
Pest and Disease Risk	
Evidence	The diverse tropical forests of the Project Area are not known to be subject to catastrophic disturbance by insect pests or forest diseases. Forest pests and diseases as a source of risk are more relevant in temperate forests or plantations, with low species diversity and consequently susceptible to extensive damage due to pest and disease outbreaks, which tend to be concentrated on single host species. Further, there is no history of catastrophic forest disturbance due to forest pests or diseases in the region. Due to the fact there are no pest species that lead to full forest replacement currently in Paraguay, pest and disease in the project region are unlikely to affect more than 5% of the carbon stocks in the project area, hence the significance has been assessed as insignificant.
Significance	Insignificant
Likelihood	Every 50 to less than 100 years
Score (LS)	0
Mitigation	0
Extreme Weather Risk	

[157] See the Plan de prevención y control de incendios Proyecto Corazon Verde del Chaco 17032022.

Evidence	Extreme weather risks affecting the Project Area include blowdown due to strong winds, rain induced flooding and erosion, and drought. A local forester who has worked in Paraguay's Chaco region for over ten years has confirmed that he does not know of any instances of blowdown affecting forests on a wide scale (Fabrizio Radice Gorostiaga, pers. comm.). As such, the likelihood of an extreme wind event is thought to be in the range of once in every 100 years or more which corresponds to a score of zero risk. Further, as the land is largely flat, erosion is unlikely to be a problem as there is not enough slope to move the water quickly in the Project Area. While the return interval of gully erosion is not known, there is likely to be no loss of carbon stocks due to erosion. Forest in the Chaco are generally both flood and drought resistant and have evolved to deal with seasonal flooding and an extended dry season for part of the year. Neither flooding nor drought is likely to lead to a reduction in carbon stocks. The drought return interval is likely every 10-25 years. Extreme weather events are not expected to lead to a loss in carbon stocks if their likelihood is so infrequent the risk to stocks is zero.
Significance	No loss
Likelihood	Every 10 to less than 25 years
Score (LS)	0
Mitigation	0
Geologic Risk	
Evidence	Geologic risks including volcanoes, earthquakes, and landslides are not found in the project region due to the geologic history and topography of the land. The significance of geologic risk is estimated as minor with infrequent likelihood estimated as once every 100 years or more.
Significance	Minor
Likelihood	One every 100 years or more
Score (LS)	0
Mitigation	0

Natural risk is quantified by assessing both the significance (i.e. the damage that the project would sustain if the event occurred, expressed as an estimated percentage of average carbon stocks in the project area that would be lost in a single event) and likelihood (i.e., the historical average number of times the event has occurred in the project area over the last 100 years) of the four primary types of natural risk, including the risk of fire, pest and disease, extreme weather, and geologic hazards.

It is at times difficult to quantify the likelihood of natural risks when these risks occur infrequently. By definition likelihood is the historical average number of times an event has occurred over the last 100 years. Another term often used when referring to the likelihood of natural risk is the return interval. The return interval is common in literature pertaining to fire and flooding (e.g., the 100-year flood). While the likelihood or return interval would also be useful for geologic risk, a key feature when calculating the likelihood or return interval is that an event has occurred enough times in enough places such that there is sufficient data to calculate the return interval.

Score for each natural risk applicable to the project (Determined by (LS × M)	
Fire (F)	0.5
Pest and Disease Outbreaks (PD)	0
Extreme Weather (W)	0
Geological Risk (G)	0
Total Natural Risk (as applicable, F + PD + W + G + ON)	**0.5**

A4. OVERALL RISK RATING

The overall risk rating calculated using the VCS AFOLU Non-Permanence Risk Tool is 13.5%, as calculated below.

Risk Category	Rating
a) Internal Risk	11
b) External Risk	2
c) Natural Risk	0.5
Overall Risk Rating (a + b + c)	**13.5**

Appendix 3. Project Risks Table

The Project Proponent has identified the following, likely natural and human-induced risks to the expected climate, community, and biodiversity benefits during the project lifetime and the measures needed and designed to mitigate these risks:

Identify Risk	Potential impact of risk on climate, community and/or biodiversity benefits	Actions needed and designed to mitigate the risk
Encroachment into the Project Area by local farmers.	Encroachment by farmers could result in accidental or intentional clearing of forest areas.	All conservation sites will be regularly monitored by local staff.
Fire	Fire is a risk throughout the Paraguayan Chaco. This potential fire risk is not a natural fire risk (i.e., started naturally by lightning strike), but rather would be started by nearby farmers.	The conservation sites will be regularly monitored to quickly identify potential fires. Fire breaks have been established and will be maintained alongside access roads. Further, an online tool with fire alerts will be used. Such online tools might include the Global Forest Watch or the Global Risk Assessment Services (GRAS), which uses data based on the Fire Information for Resource Management System (FIRMS) provided by NASA.
There could be some select illegal logging or hunting.	Illegal logging could reduce the amount of carbon dioxide being stored at the Project sites. Illegal hunting could reduce biodiversity.	Illegal logging is unlikely, as the Project Area is privately owned and will be regularly monitored. In addition, illegal hunting is also unlikely given the distance of local communities from the project area. Wildlife cameras will be placed at the Project sites to monitor medium-to-large mammals and such cameras will also be capable of identifying illegal hunting.
Disease or invasive species	Disease or invasive species could reduce tree growth and result in less canopy cover and fewer carbon dioxide emissions sequestered.	There are no known risks throughout the Project Zone associated with invasive species, pest or disease infestations, or risks associated with in-migration from outside communities. According to the Global Invasive Species Database, the following invasive species have been identified in the Departments of Alto Paraguay and Presidente Hayes: ● Rock pigeons (*Columba livia*; Alto Paraguay and Presidente Hayes); ● Golden mussel (*Limnoperna fortunei*; Alto Paraguay and Presidente Hayes); ● Wild tomato (*Solanum sisymbriifolium*; Alto Paraguay); ● *Oxycaryum cubense* (Cuban bulrush; Presidente Hayes); and ● Guava (*Psidium guajava*; Presidente Hayes).[158]

[158] Global Invasive Species Database. "Search: Alto Paraguay, Presidente Hayes." Available: http://www.iucngisd.org/gisd/search.php