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PARACEL ESIAs
EXECUTIVE SUMMARY

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PARACEL

Eucalyptus Plantation, Pulp Mill, Transmission Line, Substation and River Port
Departments of Concepción and Amambay – Paraguay

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SUMMARY

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1 INTRODUCTION

PARACEL was established by the independent entrepreneurs Copetrol (Paraguay) and Girindus Investments (Sweden).

Copetrol Group is a leader in Paraguay in the importation and commercial distribution of fuels, it began the acquisition of land for afforestation and reforestation. Girindus Investments is a group of entrepreneurs based in Sweden, with long experience in investments and development of pulp mill projects and sustainable forestry projects. Together, these companies combined their expertise and founded PARACEL, to build a high-tech pulp mill, meeting most rigorous national and international socio-environmental and sustainability standards, as well as employing efficient logistics modes for the global market.

PARACEL plans to build a world-class pulp mill in the Concepción region of Paraguay, through compliance with the highest sustainability standards and one of the most efficient logistics for regional and global markets. Concepción lies at the margins of the Paraguay river and it is located around 400 km north of Asunción and about 15 km (in a straight line) from the Concepción city center, as showed in the figure below.

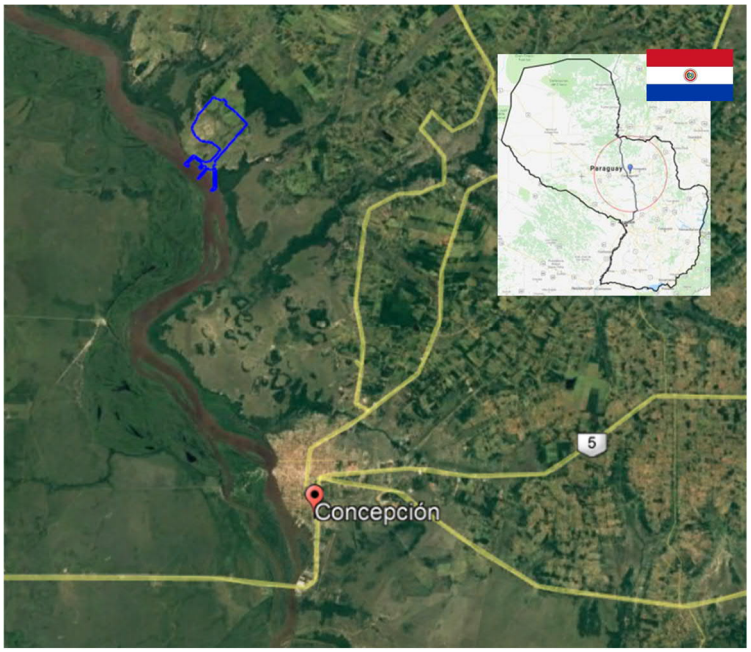

Figure 1 – Paracel pulp mill project (in blue)

The mill was conceived to produce 1,500,000 air-dried tons per annum (ADt/a) of bleached eucalyptus pulp. The mill is expected to produce 200 MW of renewable energy, generating a surplus of 100 MW. To obtain greater autonomy for wood supply, PARACEL has purchased 21 parcels totaling approximately 190,000 hectares (ha) of former cattle ranch lands in the Departments of Concepción and Amambay (as showed in the next figure) that will be partially converted to eucalyptus plantations to supply the mill in future years, with a significant portion (~47 percent) of this land to remain under existing, natural land cover in preservation.

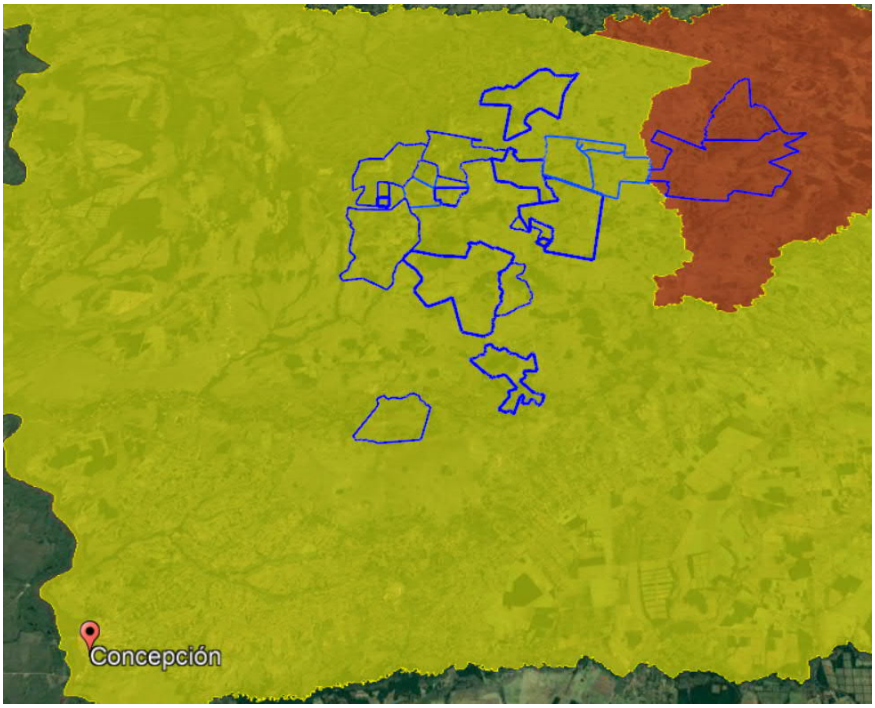

Figure 2 – Paracel farms (in blue) for eucalyptus plantation (Department of Concepción in yellow and Department of Amambay in orange)

PARACEL's projects includes also the following elements:

- A 220 kV transmission line of 33 km that will supply power to the mill from the Concepción Substation and the new Estancia Zapatero Cue Substation;
- A river port on the left bank of the Paraguay River, built as an elevated platform on a structure composed of an operating platform, an access bridge for vehicles and people, and a shed structure for the pulp transport area; and
- Access roads to bring wood from the forest plantation areas to the pulp mill.

The port will transport pulp by river barges at an average rate of 1,500,000 t/year and receive logs with volumes varying between 2 and 5 million underbarked m³/year besides other inputs for the pulp mill (liquid or bulk) up to 450,000 t/year.

The following figure shows the project location considering the industry component (pulp mill in white, river port in green, access roads in orange and transmission line and substation in yellow) and the forestry component (farms for plantations areas in blue).

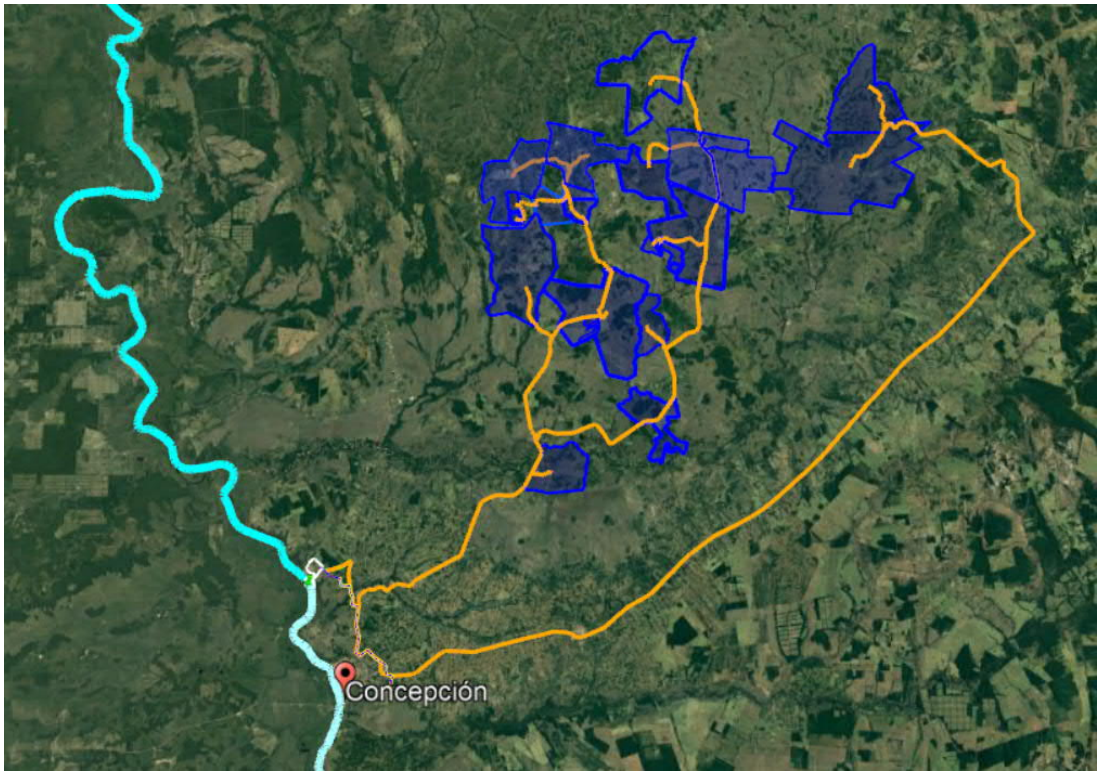

Figure 3 – Project location

Two Environmental and Social Impact Assessments (ESIAs) for the PARACEL project were prepared by Pöyry Technology to meet the IFC Performance Standards (PS) (2012) and applicable EHS Guidelines: 1-ESIA of industry component: pulp mill, river port, access and transmission line and substation, and 2- ESIA of forestry component: forest plantations areas. PARACEL has already received the Paraguayan authorization to install a pulp mill, a river port, a transmission line and a substation, as well as 10 of the 19 plantations, while the rest is under permitting.

Both ESIAs documents (industry component and forestry component) are aligned to the IFC -PS, more specifically to:

- IFC PS 1 on "Assessment and management of environmental and social risks and impacts";
- IFC PS 2 “Labor and working conditions”;
- IFC PS 3, “Resource Efficiency and Pollution Prevention”;
- IFC PS 4 “Community Health, Safety and Security”;
- IFC PS 5 “Land Acquisition and Involuntary Resettlement”;
- IFC PS 6 “Biodiversity Conservation and Sustainable Management of Living Natural Resources”;
- IFC PS 7 “Indigenous People”;
- IFC PS 8 “Cultural Heritage”.

The Project followed the requirements of PS 7 on Indigenous Peoples .Indigenous communities. Therefore, all the necessary steps required by this standard were taken to identify any adverse impacts that, as a consequence of project activities, could threaten

IP living in the direct area of influence of the Project, including their integrity, identity, culture, and livelihoods. Likewise, the Project embarked in a Free, Prior and Informed Consent process with the IP communities.

IFC PS 7 is aligned with the Paraguayan legal framework that requires consultation of IP. and other international conventions such as the United Nations Declaration on the Rights of Indigenous Peoples and the International Convention on the Elimination of All Forms of Racial Discrimination, among others.

In relation to PS5, it should be noted that the Project both in its industrial component and in its forestry component, does not occupy lands with population settlements, and does not require the physical or economic displacement of any person, family, group or community.

Regarding PS6, is the Project is to be developed on territory that has already been largely anthropized with cattle farming and its production, and does not occupy national protected areas or RAMSAR convention areas. Paracel proposes measures for the conservation and protection of existing native areas on its forest properties, and revegetation and management programs in already degraded areas, as a measure to compensate for impacts, consistent with PS6 requirements. The Project is likely to contribute positively to the recovery and protection of a significant area of central Latin America's biodiverse but threatened Cerrado biome – a tropical savannah and dry forest ecoregion that exists primarily in Brazil but extends into Paraguay and Bolivia. According to WWF around half the native savannah and forest of the Cerrado has been converted to agriculture since the late 1950s. Unsustainable agricultural activities, particularly soy production and cattle ranching, as well as burning of vegetation for charcoal, continue to pose a major threat to the Cerrado's biodiversity. Just eight per cent of the Cerrado is officially protected – less than 3% under strict protection - and landowners are required to conserve just 20 per cent of their land, a rule that unfortunately has not been enforced in many regions.

Paracel is developing an integrated land use development management plan for the large plantation area that commits to maintaining all forested areas (so no existing natural forest areas will be affected by the Project's plantations), restoring natural forest areas degraded by logging, protecting riparian corridors and wetlands, and creating ecological corridors to connect forest areas with riparian corridors for wildlife transit. In addition, the project will establish 1 km wide buffers where land parcels are adjacent to the National Parks Paso Bravo and Bella Vista. The plantations within the buffer zone of the Cerrado del Río Apa Biosphere Reserve will have an increased proportion of conservation areas in line with a Reserve management plan to be negotiated with stakeholders. The buffers, riparian corridors, and ecological corridors will contain a mosaic of the different habitat types , and preserve habitat diversity representative of the local Aquidabán Cerrado ecoregion. Paracel will also implement management plans to control invasive African grasses that were introduced during cattle ranching. Pending quantitative analysis of predicted Project No Net Loss or Net Gain status for important biodiversity, Paracel expects to dedicate over 90,000 hectares, or up to 47% of its total land holdings exclusively to conservation. PARACEL is exploring REDD+ and other mechanisms to assure the set aside or offset areas would be preserved in perpetuity.

The forest and industrial projects will use the best resources available in terms of technologies (BAT – Best Available Techniques) and environmental management (BPEM – Best Practices of Environmental Management).

PARACEL pulp mill, despite being designed to produce 1,500,000 t/year, it will be capable in the future, to produce up to 1,800,000 t/year of bleached pulp as a result of greater overall plant efficiency, as well as higher equipment performance without the need to increase its constructed area or include new additional equipment. In addition, no modifications will be required to the main environmental control equipment, nor will there be any loss in performance, which can guarantee the same liquid effluent and atmospheric emissions considered in this Environmental Impact Study. Therefore, in the event of an increase in pulp production to 1,800,000 t/year, there will be no changes in the environmental impacts identified and evaluated.

During the first 6 years, the wood supply for the mill will come from eucalyptus plantations in Brazil, Argentina, and Paraguay, being transported by land and river to the Paracel port. By 2029, the mill will be supplied with wood primarily from the Project's own plantations and a number of out-growers. The project foresees the reforestation with Eucalyptus varieties (*Eucalyptus urograndis, E. grandis, E. dunnii, and E. saligna*) to produce wood to supply the pulp mill located in Concepción, Department of Concepción, Paraguay. Paracel is planning to produce pulp under the Mixed Wood category (70% FSC Certified Wood, 30% FSC Controlled Wood) since the beginning.

1.1 Structure

The structure of the two ESIAs developed for this Project is as follows:

- Volume I – Project Characterization
- Volume II – Baseline Conditions
  - Part I – Physic Environment
  - Part II – Biotic Environment
  - Part III – Socioeconomic Environment
- Volume III – Identification and Impact Study

The Health, Safety, Environment and Social Management System Manual (ESMS Manual)includes both industrial and forestry components programs, for the construction and operation phase, as well as Paracel's codes, policies, ESMP plans, etc.

1.2 Environmental and Social Sustainability Policy

PARACEL is committed to carrying out its activities in an environmentally and socially responsible manner, generating value and creating opportunities for society and the country. This environmental and social commitment is based on the following guiding principles:

- Full compliance with national law and the international standards to which it adheres;
- A proactive commitment to caring for the environment in its triple dimension - physical, biotic and anthropic - within the framework of sustainable development;

- The adoption of the best industrial and forestry practices, the incorporation of the best available techniques and the practice of continuous improvement;
- The preventive and permanent management of environmental and social impacts;
- The monitoring of the health and safety of its workers, equal opportunities and the promotion of non-discrimination by gender, religion, ethnicity, race, sexual orientation, social condition or any other, within the framework of comprehensive respect for human rights;
- The establishment of long-term relationships with local communities, social actors and other interest groups, characterized by seriousness, transparency and respect.

PARACEL's sustainability strategy considers national and international regulations such as the ISO 26000 standard, the Equator Principles, the International Finance Corporation (IFC) Performance Standards (2012), the United Nations (UN) Sustainable Development Goals, and the B-company standards.

For PARACEL sustainability is a strategic issue that guides the decisions of the organization members, through an integrated vision with social, environmental and economic dimensions considering the generation of value of the company and its competitiveness without disturbing the welfare of society and the planet.

In relationship with stakeholders Paracel takes as reference on what is established in the ISO 26.000 standard: *"an organization should respect, consider and respond to the interests of its stakeholders. Although the organization's objectives may be limited to the interests of its respective owners, members or constituents, other individuals or groups may also have specific rights, demands or interests, which should be taken into account"*.

Relationship principles:

- Ethical behavior;
- Transparency;
- Respect for the interests of stakeholders;
- Respect for the principle of legality;
- Respect for international standards of behavior;
- Respect for human rights;
- Accountability.

PARACEL will create mechanisms to identify the material issues for its different stakeholders, i.e., those issues that have a direct or indirect impact on an organization's ability to create, maintain, or distribute economic, environmental, and social value for itself and its stakeholders.

1.3 Documents of the Health, Safety, Environment and Social Management System

. Paracel has developed a set of health and safety, environmental, and social (HSES) management plans (ESMPs) for construction and operations phases of the Project,

encompassing both the mill and plantations' ESIAs (pulp mill, river port, transmission line, electrical substation and plantation areas). These are arranged in four pillars: i) **Social**; ii) **Indigenous Peoples**; iii) **Environmental**; and iv) **Health & Safety**. The ESMPs and their procedures or protocols, together with Paracel's institutional policies (e.g. Sustainability Policy) and codes form part of Paracel's Environmental and Social Management System (ESMS). The ESMS constituent elements also serve as a guide and reference to Paracel's suppliers and contractors, through four standard contractual appendices.

The ESMS and its constituent instruments (policies, codes, ESMPs, procedures, protocols, instructions, etc.) are more than formal requirements of the permitting process, they are living risk management tools and, as such, in permanent evolution. The degree of advance of each document is aligned to the stage of Project development.

2 PROJECT CHARACTERISTICS

The Project schedule presented for the construction / implementation and pre-operation phases of the pulp mill should initiate in 2021 and is expected to last until 2023, for a total of 28 months. Mill operation is estimated to initiate in 2023, with third party supply plantation eucalyptus. PARACEL started planting their owned plantations in 2020 and Paracel expects to start supplying wood to the mill from the PARACEL plantations in 2027.

The total investment foreseen for the implementation of the Project will be in the order of USD 2.2 billion.

It is estimated that the industry component will generate around 8,000 direct jobs at the peak of the construction phase, and 1,200 during operation phase. However, considering the whole project, the peak workforce estimated to be 11,000 (approximately 8,000 for the mill, 2,500 for forestry and 500 for logistics) at construction phase. In addition, the generation of indirect jobs is projected to be between 10,000 and 30,000, with the company potentially boosting the local and national economy. This would represent a significant worker influx considering that the total area of influence population is approximately 800,000. Therefore, as mitigation management measures, both a Workers' Accommodation Plan (to ensure the promotion of healthy, safe, and comfortable accommodations without negatively affecting the surrounding communities) and a Job Reduction Management Plan (to provide a set of actions to manage the dismissal process in a socially responsible manner and in accordance with international standards and best practices) will be developed, which are critical elements of Paracel's health, safety, environment and social management system (HSES-MS). Please refer to the following table for a detailed breakdown of Project Workforce.

Table 1 – Project Workforce

Phase	Feasibility	Construction / Implementation	Implementation and Pre-Operation	Operation - Learning Curve	Operation
Mill / Corporate	34	4,485	8,020	840	650
Ops Trainees 350-350	0	350	250	250	200
Paracel	33	135	170	100	60
Outsourced / Third Party	1	4,000	7,600	490	390
Logistics	2	305	545	255	170
Paracel	1	5	5	5	5
Outsourced / Third Party	1	300	540	250	165
Forestry (Plantation Area)	270	1,335	2,545	2,750	3,050
Paracel	15	35	45	50	50
Outsourced / Third Party	255	1,300	2,500	2,700	3,000
Total	**306**	**6,125**	**11,110**	**3,845**	**3,870**
Paracel	49	525	470	405	315
Outsourced / Third Party	257	5,600	10,640	3,440	3,555

The workers coming from outside the region will be duly accommodated in up to 6] (six) camps, , hotel chains and properties located in Concepción and Loreto districts. As of now, there are 3 workers camp that are fully permitted. These accommodations will have a total capacity of up to 7,280 workers.

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The accommodation will consist of an area delimited by fences, with a guard, surveillance, first aid system, rooms, bathrooms, cafeterias, leisure area, electricity, street distribution, drinking water supply by artesian wells, collection system, treatment (type of modular plant), and disposal of sanitary effluents and firefighting system.

The location of these accommodations is shown in the following figure.

Figure 4 – Accommodations location (CAMP 1, 3, 6, 7, 9 and 11)

Camps 1, 6, 7, 9 and 11 will have the following structure.

- Car and bus parking
- Guardhouse, Security office, entrance
- Lodge operator facility / Administrative office
- Medical center and First aid
- Restaurant and kitchen
- Social center / Recreation area
- Gymnastics equipment in open space
- Sports track
- Football field
- Utilities
  - Substation, electrical room, power generator
  - Garbage
  - Sewage treatment plant
  - Water treatment plant
  - Tower
  - Drinking water reservoir
  - Restaurant water reservoir
- Ecumenical room
- Lodges

Camp 3 will have a smaller structure, composed by a parking, administrative office, security office, lodge operator facility, social center, recreation area, utilities (garbage, electrical room, power generation and drinking fountain and hot water feed point), 7 lodges.

The following table presents camps capacity and building area.

Table 2 – Camps capacity and building area

Camp	Camp workers capacity	Building area (m²)
1	2.352	48.826
3	224	4.500
6	1.344	14.200
7	896	7.200
9	1.288	7.500
11	1.176	7.200

It should be noted that if it is necessary to drill wells for the accommodations outside the city, PARACEL will communicate beforehand MADES and the same precautions will be taken as for drilling the wells within the mill site. Nevertheless, it is not expected that there will be a conflicting use of the groundwater as the information collected shows that there is availability of the aquifer.

2.1 Location

The PARACEL pulp mill will be located in the municipality of Concepción, on the left bank of Paraguay River, about 15 km (in a straight line) from the city center.

The next figure shows the location of the mill.

2.2 Access

The permanent access to PARACEL pulp mill from Concepción will be through a 5 km main access road (red line in next figure) and a 5 km temporary road (green line), the latter to be used mainly during construction phase. The entrance to both accesses is achieved through the public road network (yellow lines), in a route of 18 and 22 km respectively from the center of the city of Concepción.

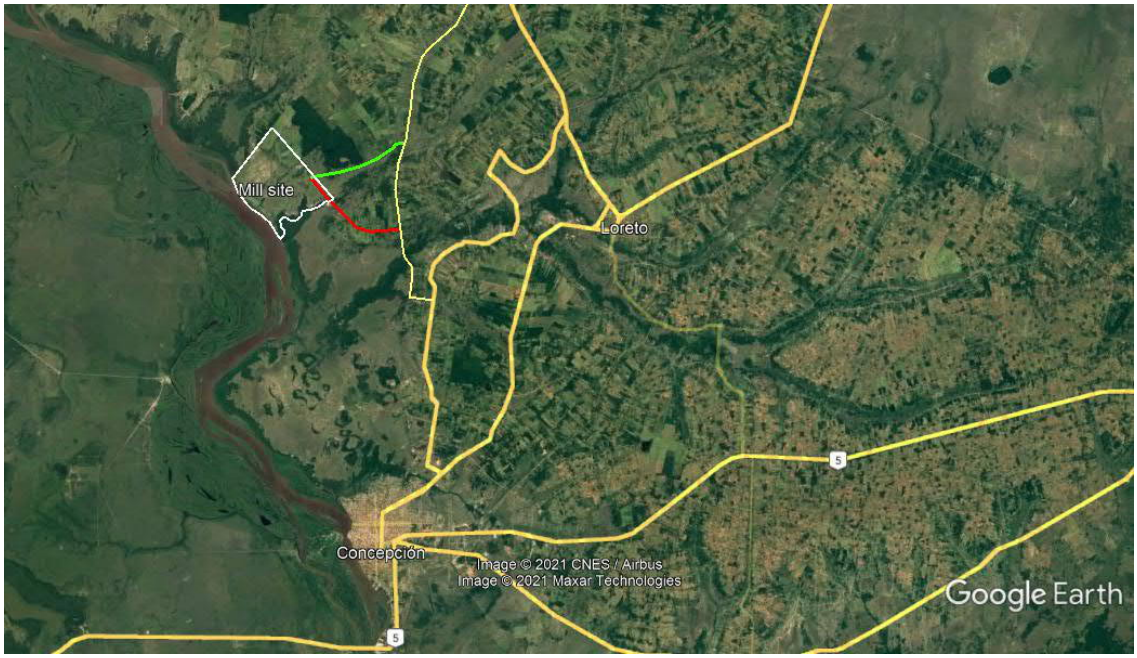


Figure 5 – Access to PARACEL pulp mill. Source: Google Earth, 2021.

2.3 Transmission Line

The Project consists of the construction, assembly and commissioning of the 220 kV Transmission Line, between the Concepción Substation and the Estancia Zapatero Cue Substation, presenting an approximate length of 33 km.

The transmission line will present the electrical characteristics according to the table as follows.

Table 3 – Electrical characteristics of Transmission Line

Description	Specification
Nominal tension	220 kV
Frequency	50 Hz
Quantity of circuits	1 (one) conductor per phase
Conductor	ACAR 950 MCM, AI 18 AI 19, one conductor per phase
Guard cable	C. G. OPGW, 24 fibers, single mode type, d_{max} = 14 mm
Insulator string	Polymeric rubber type insulators for both suspension chains and for anchoring, with ball-and-joint type coupling

The following figure present the TL route.

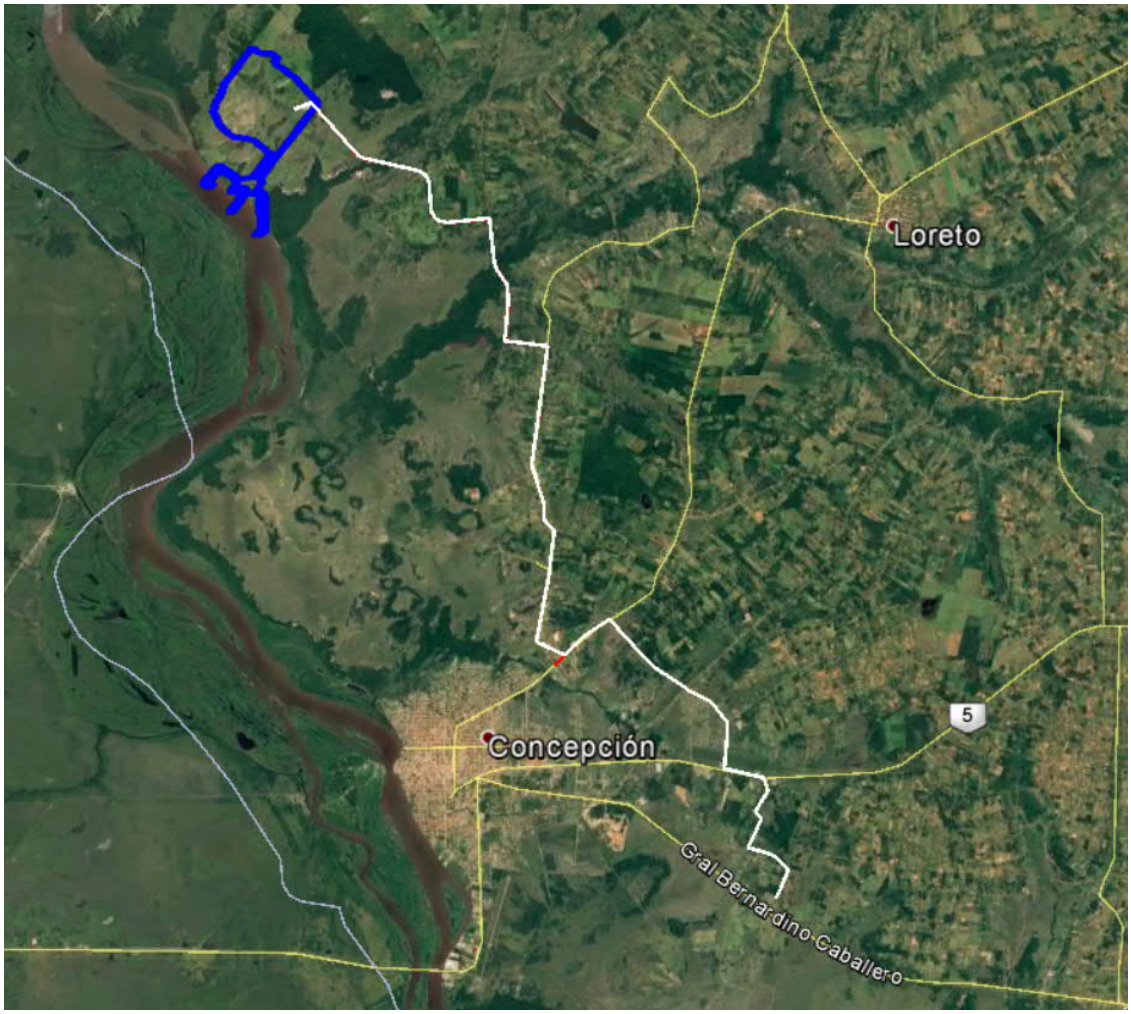


Figure 6 – Complete route (white), from Villa Real Electrical Substation to Paracel Electrical Substation

Right of Way (RoW)

The transmission line RoW, which was considered the direct influence area, will be 5 meters for the cable side and 1.5 meters for the other side, resulting in a lane of 6.5 meters, according to the figure bellow. This RoW is established by Paraguayan legislation.

It is important to highlight that there will not be any population or economic displacement due to the transmission line implementation, since it will follow the RoW of the existing roads and it will not cross any private property. The following figure shows the land use of the transmission line.

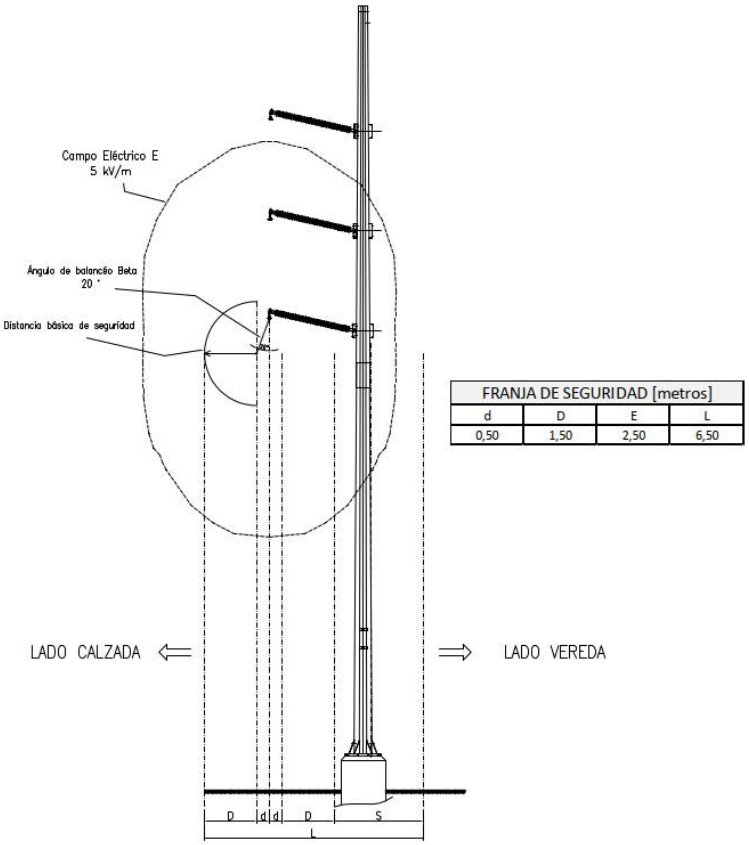


Figure 7 – Type of towers

2.4 Electrical Substation

The installed power in the substation will be 280 MVA (sum of the 2 transformers) within the pulp mill site. The plant operating in regime will generate a surplus of energy that will feed into the national grid but will demand energy from the grid during startups and stops.

Electrical characteristics:

- Transformers: 2 x 140/170 MVA
- Capacitor: 9 MVAr (estimated, since it depends on the study of harmonics)
- Others: 5x (52) 3500 A - 220 kV / 18x (89) 2000 A - 220 kV / 4x Current Transformer / 6x Potential
- Transformer / 3x 34.5 kV cubicle / 1x Auxiliary Transformer 45 kVA

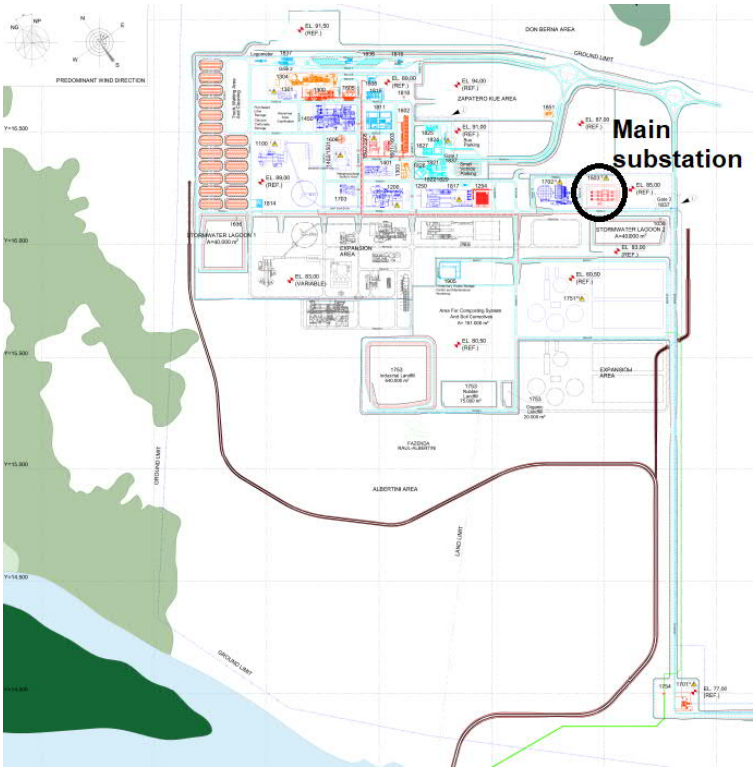


Figure 8 – Main substation location at pulp mill site

2.5 River port

The river port of the pulp mill will be a terminal-type construction on the left bank of the Paraguay River, built as an elevated platform on a structure composed of: an operating platform, an access bridge for vehicles and people, and a shed structure for the pulp transport area. All the structures will be made of reinforced concrete and the loading roof will be made of a metal structure.

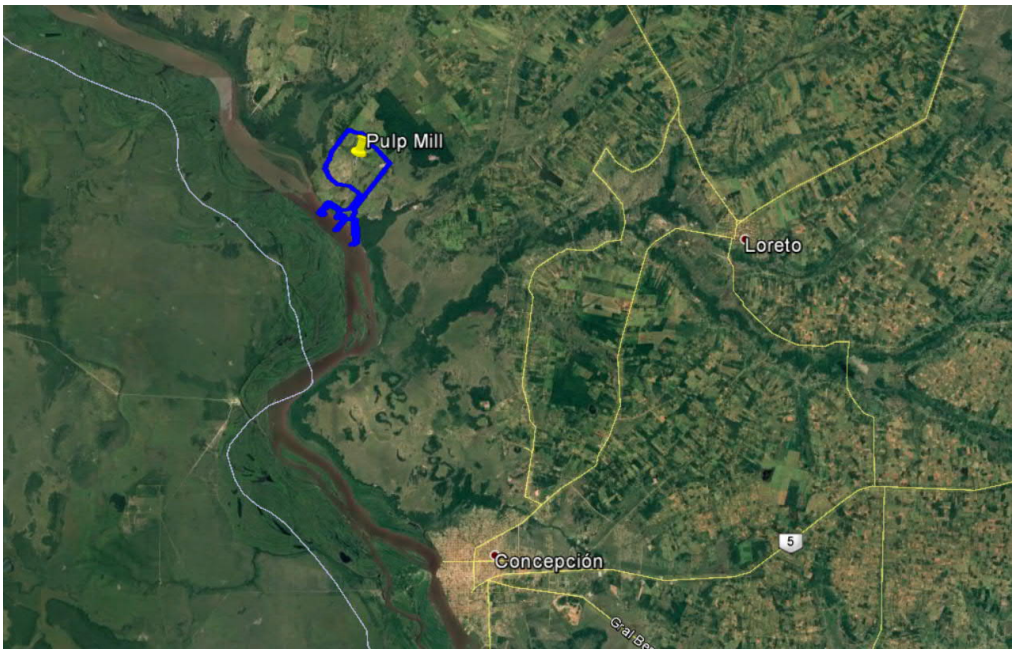


Figure 9 – Location of PARACEL pulp mill and the river port. Source: Google Earth, 2021.

The river port will move the following loads:

- Pulp transport by river barges at an average rate of 1,500,000 t/year;
- Reception of unbarked logs with volumes varying between 2 and 5 million underbarked m³/year (this range is due to the early supply for the mill till when the Paracel plantations begin to produce);
- Reception of inputs for the pulp mill (liquid or bulk, including fuel) up to 450,000 t/year.

The boats that will operate in the port will be the current models in circulation in the fluvial section of the Paraguay River with the format of convoys according to the official conditions of navigation. The typical pulp convoy will consist of 12 barges (3 x 4) with a unit capacity of up to 2,500 tons each.

The boats for wood and inputs will be suitable for each of the operations/products and will be regulated by the navigation conditions.

No dredging actions will be required for the approach channel, the evolution basin and the anchorage area of the vessels (barges and pusher craft). For platform or access bridge construction services, bottom forming services may occasionally be required at the site of underwater structures.

The selection of the positioning of the river port was defined according to the format of the pulp mill area and the morphological characteristics of the Paraguay river. The selected point is characterized by having natural draft conditions for boats (pulp barges) without the need for deepening actions or maintenance of dredging, and preserves the conditions of regular distance from the navigation channel, in accordance with the premises and institutional regulations.

The train anchorage areas are located upstream of the river port for empty trains awaiting cargo and downstream for loaded trains awaiting final train formation.

Facilities Description

The AWT (All Weather Terminal) will have an area of approximately 4,600 m² and will be completely developed in metallic structure, therefore, the covering, the closings and the beams will be metallic. The 56 t capacity crane support columns will be made of precast concrete.

These buildings will have a conventional concrete structure, structural masonry, precast slab and metal roof. The support building will house bathrooms, meeting rooms and control rooms with an area of 127 m². The pump room will have an area of approximately 44 m².

The design includes 12 (twelve) tie-down points, 2 (two) main protection points and 11 (eleven) protection points of the AWT roof columns.

It is planned to use metal jacketed perforated inclined piles filled with reinforced concrete and their respective blocks, which consist of a precast bark element for the second subsequent concreting step.

The barge dock will have a 133 m x 32 m wide reinforced concrete platform, with an area of 4,256 m². Its structure will be made of perforated metal-clad piles filled with reinforced concrete, beams and precast slabs in solidarity with the reinforced concrete in situ.

As well as the pier, the access bridge will be made up of a 340 m x 10 m wide reinforced concrete structure with an area of 3,400 m². Its structure will be made of perforated metal-clad piles filled with reinforced concrete, beams and precast slabs in solidarity with the reinforced concrete in situ.

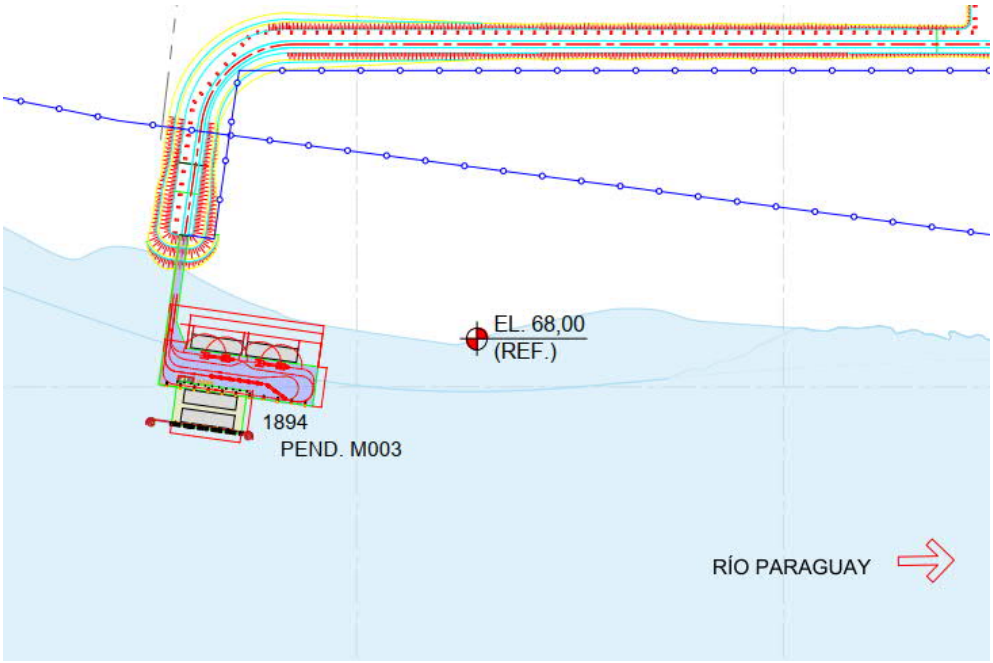


Figure 10 – River Port

2.6 Plantation Operations and Locations

PARACEL acquired an area of approximately 190,000 ha belonging to 21 former cattle ranching properties. Adherence to Paraguayan law for the preservation or restoration of forests and waterways, avoidance of soils unsuitable for planting and application of Paracel conservation strategy for establishing buffers, corridors will result in approximately 47% of the total Paracel property (c. 90,000 ha) being considered non-plantable and placed under conservation management. The remaining 53 % is potentially plantable, pending further detailed analysis of the presence of Natural Habitat patches (per IFC Performance Standard 6 definitions) within the less modified dry or seasonally inundated savanna Cerrado habitat types.

The PARACEL owned plantations are located at distances between 30 km and 150 km from the mill site.

The main purpose of these plantations is to provide wood to the pulp mill which is schedule to start operating in 2023.

The areas currently managed by PARACEL and that are covered by this study are divided in 21 properties and are located on the regions of Concepción and Amambay, as per following figure.

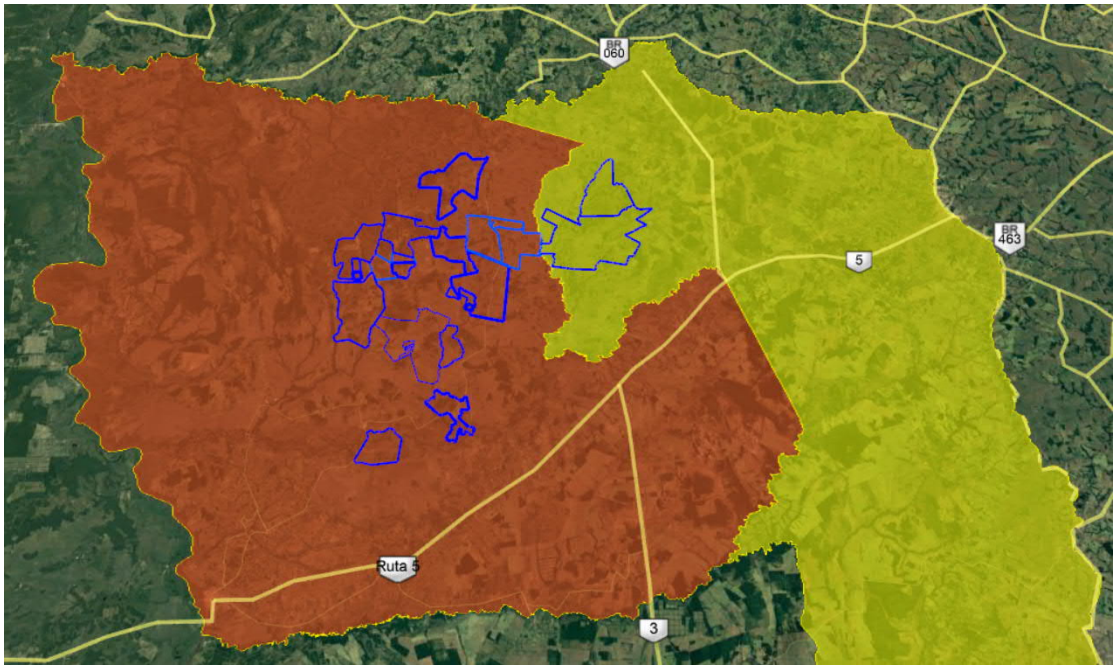


Figure 11 – Location of Forest Properties in Departments of Concepcion (orange) and Amambay (yellow)

The following Eucalyptus species will be prioritized by PARACEL for market purchase: *E. urograndis*, *E. grandis*, *E. dunnii*, and *E. saligna*. Other Eucalyptus species, such as *E. camaldulensis* and hybrids of *E. urophylla*, will be considered depending on the market availability.

For PARACEL's own plantations and third parties in Paraguay, hybrids of *E. urophylla* will be prioritized, especially *E. urograndis*.

As the area is a new frontier for Eucalyptus plantations, the selection of suitable species and genetic material will be based on a long-term project, based on the species and genetic material that better adapt to edaphoclimatic environment and meet the mill requirements in terms of pulpwood supply.

The use of Eucalyptus species is justified by their high productivity, which is expected to be around 30-40 m³/ha/year, according to data from similar regions in the state of Mato Grosso do Sul, Brazil. Eucalyptus plantations currently cover roughly 100 thousand hectares in Paraguay.

The plantation health monitoring includes all steps related to the monitoring and treatment of all factors that can affected the trees growth or result in mortality. This includes the following programs:

- Plantation establishment monitoring: check on the mortality of the seedlings after plantation;
- Weed monitoring: check on the presence and the damage caused by weeds to the forest plantations;
- Ant monitoring: check on the efficiency of ant control measures;
- Forest fires: check on the surface of forest areas affected by forest fires.

PARACEL has committed to implementing a Biodiversity Management Program and a Biodiversity Monitoring Program in the Forest Area, which include among other activities field surveys of the fauna and flora to evaluate the integrity and condition of the native forest remnants every 6 months. The first two biodiversity monitoring surveys were already performed.

Forest fires

Forest fires are characterized by the occurrence of uncontrolled fire. These are the most critical occurrences within the scope of forest protection, with environmental and social economic impacts.

The fire risks in the first year of planting tend to be low, as it is an area without large concentrations of vegetation and combustible material. The more mature the forest, the more significant the economic losses are, whether due to the forest itself, or the risks of imbalances in the supply plan of a market or an industry.

In order to avoid fire and its consequent losses, all actions must be mainly aimed at its prevention and control. However, corrective measures must be considered and be at full capacity if they have to be put into practice.

The occurrence of the fire depends on at least two factors: cause and condition. Preventive measures aim to eliminate or minimize at least one of these factors and can be listed at:

- Eliminate or reduce the combustible materials around the plantations, by keeping firebreaks free of combustible materials such as woody, in order to avoid the start and propagation of uncontrolled fires. The fire breaks must be more intensively managed the greater the potential risk of fire, that is, during the dry season and where there is a greater intensity of traffic of vehicles and machines. This practice is incorporated into forestry activities;
- Monitoring of local climatic conditions, which allows estimating the probability of fire occurrence. The variables to be monitored are: temperature, relative humidity, wind and lightning occurrence. These indexes guide the preventive mobilization of contingency resources;
- Communication and education of local communities and neighbors on the importance of avoiding using fire as a practice for cleaning vegetation, as well as develop, together with the communities, a communication system to alert the occurrence fire outbreaks.
- Develop of an efficient internal communication system, to guarantee the quick activation of the combat team in case of fire outbreaks.
- Construction of fire lookout towers, with the objective of increasing the effectiveness of monitoring fire outbreaks. The observation of changes in the landscape can be made by human observation or with the use of more advanced technologies, such as high-resolution cameras that automatically detect changes in the landscape, the presence of vehicles and other risk factors. The use of high-resolution cameras allows data to be communicated in real time to a control room that can immediately trigger firefighting brigades. In the case of human observation, binoculars and long-range visualization equipment help identifying fire outbreaks and risk factors, which are communicated via radio.

The implantation of a network of surveillance towers for the detection of forest fires preventing accidents, as well as emergency acts due to soil contamination, from leaks

of fuels, oils and pesticides is foreseen at the Occupational Health and Safety Manual – Forestry Component.

2.7 Brief pulp process description

Logs without bark will be sent to the debarking and chipping lines, which will cut the wood to chips. The chips produced by the chippers will be stored in a pile and then transported to the cooking area.

The chips have controlled dimensions, which allow the penetration of chemicals during cooking, which facilitates the softening of the wood and the fibers decomposition, separating it from the lignin, producing the so-called brown pulp.

Consequently, the pulp is previously bleached, through a physic and chemical process, using oxygen as the main reagent. The aim is to reduce the consumption of chemical reagents in the bleaching process and generate less organic load for the effluent.

Bleaching is a purification process that aims to remove much of the undissolved residual lignin. The aim is to obtain a high degree of bright. For this, more selective chemical reagents and softer working conditions are used.

The bleached pulp then goes to the drying and packaging section, where the formation of the leaf occurs, to ensure greater homogeneity and avoid machine breakage or irregularities in the product. The pressing process aims to eliminate water by mechanical action, consolidate the position of the fibers and provide greater resistance so that the pulp passes through the drying process. When drying, the water is removed by evaporation (applying heat to the pulp sheet). After leaving the dryer, the pulp sheets are cut, weighed and packed into 250 kg bulks. The bulks are stacked in two groups of four, forming a 2 tons load.

Chemical Recovery

The *kraft* pulp mill has a system that allows the recovery of the chemicals used to obtain the pulp.

Recovery begins with the evaporation of the black liquor, increasing the dry solids content from 15% to approximately 80%.

After evaporation, the liquor is sent to incineration in the recovery boiler. In the boiler, the organic matter present in the liquor will be incinerated, leaving a smelt, formed by the inorganic compounds that will be sent to causticizing. In the causticizing, the green liquor will be clarified and the white liquor will be obtained later.

2.8 Environmental Control System

In relation to environmental control systems, the best available technologies - BAT (Best Available Techniques), as well as the Environmental Management Practices - BPEM (Best Practices of Environmental Management) to reduce, control and monitor liquid effluents, emissions and the solid waste generated will be applied, meaning that PARACEL project will be in line with the IFC EHS Guidelines.

2.8.1 Pulp Mill

2.8.1.1 Liquid Effluents

The liquid effluents from the operation industrial will correspond to the activities of the pulp production process and its support activities. The effluents will be piped to the Effluent Treatment Plant (ETP), which will basically consist of: primary treatment with solid removal, secondary biological treatment of (activated sludge) for elimination of the organic load and tertiary treatment to remove phosphorus, color and COD, through a physicochemical process.

PARACEL will use the best available technologies (BAT), the state of art in processes, installations and operational practices for the treatment of effluents in pulp mills. The quality of the treated effluent will meet the national standards determined by Resolution # 222/2002 and the strictest regulatory standards internationally recognized.

Control of liquid effluents will also have a system for collecting and handle spills, where the discharges will be collected near the source as possible, and will be recycled directly to its own process stage.

The treated effluent will be discharged into the Paraguay river through a subaquatic emissary. The emissary was designed to discharge the treated effluents in a controlled and safe condition, by underwater discharge; in conditions that prevent the formation of foams and promote dispersion more efficient in the water body.

The value of effluent is 5,700 m³/h for the production of 1,500,000 t/year, which corresponds to a specific generation of 29.0 m³/t, however the pulp mill may reach a production of up to 1,800.000 t/year and in this scenario, generation will reach 6,000 m³/h, with that, the specific consumption will be lower, of 25.5 m³/t. Thus, there will be no significant increase in impact.

Table 4 – Expected emissions from treated effluents

Standards	Unit	Average value	Legal parameters Res. 222/02	BAT Reference Document IED 2010/75/EU (2015)	IFC EHS Guidelines (2007) *
Flow	m^3/h	5,700	-	-	-
	m^3/t	29.0	-	25 - 50	50
pH	-	6.0 to 8.0	5 - 9	-	6 - 9
Temperature	ºC	≤ 40	<40	-	-
BOD	mg/L	25	50	-	-
	kg/day	3,200	-	-	-
	kg/t	0.7	-	-	1.0
COD	mg/L	150	150	-	-
	kg/day	20,500	-	-	-
	kg/t	4.3	-	7 – 20	20

Standards	Unit	Average value	Legal parameters Res. 222/02	BAT Reference Document IED 2010/75/EU (2015)	IFC EHS Guidelines (2007) *
Suspended solids	mg/L	40	-	-	-
	kg/day	5,500	-	-	-
	kg/t	1.2	-	0.3 – 1.5	1.5
Color	mg/L	250	-	-	-
	kg/day	34,200	-	-	-
	kg/t	7.3	-	-	-
AOX	mg/L	3	-	-	-
	kg/day	400	-	-	-
	kg/t	0.08	-	0 – 0.2	0.25
N_{total}	mg/L	7	40	-	-
	kg/day	960	-	-	-
	kg/t	0.20	-	0.05 – 0.25	0.20
$N_{ammoniacal}$	mg/L	2	-	-	-
	kg/day	300	-	-	-
	kg/t	0.06	-	-	-
P_{total}	mg/L	1	4	-	-
	kg/day	150	-	-	-
	kg/t	0.03	-	0.01 – 0.03	0.03

*Effluent guidelines for pulp and paper facilities – bleached kraft pulp, integrated – Annex B, Table 1a

2.8.1.2 Emissions to the atmosphere

The main sources of air emissions from the pulp mill will be from the following equipment: Recovery Boiler, Lime Kilns and Biomass Boiler.

PARACEL will use the best available technology (BAT), the state of the art in processes, facilities and operating practices for the minimization and control of emissions pulp mills, such as: use of electrostatic precipitators of high efficiency, real-time monitoring systems and control system, to identification and rapid correction of operational disturbances. The quality of the emission will comply with national standards and the strictest regulatory standards internationally recognized.

Emissions will be discharged through individual and independent pipes to the emission into the atmosphere. These independent ducts will be wrapped in a single body of concrete, i.e. a chimney with a height of 140 m, suitable for the dispersion to the atmosphere.

The atmospheric emissions are compared to EU BAT Industrial Emissions Directive 2010/75/EU, 2015 for Recovery Boiler, Lime Kilns and Biomass Boiler. The emissions are also compared to IFC EHS Guidelines, 2010 for Recovery Boiler + Lime Kilns, which only establishes references to specific emissions (kg/t).

It is important to highlight that there are no limits of atmospheric emission in Paraguayan legislation.

Table 5 – Expected atmospheric emissions - Recovery boiler (flow and concentration values corrected to 8% O_2, dry basis)

Parameter	unit	Expected value	EU BAT 2010/75/EU (2015)
Flow rate	Nm^3/s	365	-
Temperature	^oC	140	-
Particulate Material	mg/Nm^3	22	9 – 22 [1]
	g/s	8.0	-
	kg/t	0.15	0.02 – 0.20
TRS (as H_2S)	mg/Nm^3	5	1 – 9 [2]
	g/s	1.8	-
	kg/t	0.03	-
SOx (as SO_2)	mg/Nm^3	45	9 – 43 [2]
	g/s	16.4	-
	kg/t	0.3	-
TRS + SOx (as S)	kg/t	0.18	0.03 – 0.13 [1]
NOx (as NO_2)	mg/Nm^3	175	104 - 173
	g/s	63.9	-
	kg/t	1.1	1.0 – 1.7
CO	mg/Nm^3	300	-
	g/s	109.5	-
	kg/t	2.0	-
Moisture	%	23.7	-
Velocity	m/s	20	-
Chimney height	m	140	-
Chimney diameter	m	5.64	-

[1] Annual average
[2] Daily average

Table 6 – Expected atmospheric emissions - Lime kilns (flow and concentration values corrected to 8% O_2, dry basis)

Parameter	Unit	Expected value		EU BAT 2010/75/EU (2015)
		Lime kiln 1	Lime kiln 2	
Flow rate	Nm^3/s	27	27	-
Temperature	^oC	300	300	-
Particulate Material	mg/Nm^3	22	22	9 – 22 [1]
	g/s	0.6	0.6	-
	kg/t	0.010	0.010	0.005 – 0.020
TRS (as H_2S)	mg/Nm^3	10	10	1 – 9 [2]
	g/s	0.3	0.3	-
	kg/t	0.005	0.005	-
SO_x (as SO_2)	mg/Nm^3	100	100	48 – 104 [3]
	g/s	2.7	2.7	-
	kg/t	0.05	0.05	-
TRS + SOx (as S)	kg/t	0.030	0.030	0.055 – 0.120 [1]
NOx (as NO_2)	mg/Nm^3	400	400	87 – 303 [3]
	g/s	10.8	10.8	-
	kg/t	0.20	0.20	0.10 – 0.35 [3]
CO	mg/Nm^3	150	150	-
	g/s	4.1	4.1	-
	kg/t	0.08	0.08	-
Moisture	%	23.0	23.0	-
Velocity	m/s	20	20	-
Chimney height	m	140	140	-
Chimney diameter	m	2.02	2.02	-

[1] Annual average

[2] Daily average

[3] Annual average. Considering methanol burning in the Lime Kilns

Table 7 – Expected air emissions - Biomass boiler (flow and concentration values corrected to 8% O_2, dry basis)

Parameter	Unit	Expected Value	EU BAT 2010/75/EU (2015)
Flow rate	Nm^3/s	38	-
Temperature	^oC	155	-

Particulate Material	mg/Nm³	50	1 – 260 [1]
	g/s	1.9	-
	kg/t	0.03	-
SO_x (as SO_2)	mg/Nm³	150	30 – 67 [1]
	g/s	5.7	-
	kg/t	0.1	-
NOx (as NO_2)	mg/Nm³	320	113 – 286 [1]
	g/s	12.2	-
	kg/t	0.22	-
CO	mg/Nm³	300	4 – 130 [1]
	g/s	11.4	-
	kg/t	0.21	-
Moisture	%	24.0	-
Velocity	m/s	20.0	-
Chimney height	m	140	-
Chimney diameter	m	1.90	-

[1] Daily average

Table 8 – Expected air emissions – Recovery Boiler + Lime Kilns – Comparison to IFC EHS Guidelines

Parameter	unit	Recovery Boiler	Lime kiln 1	Lime kiln 2	Recovery Boiler + Lime Kiln 1 + Lime Kiln 2	IFC EHS Guidelines (2010)
Particulate Material	kg/t	0.15	0.01	0.01	0.17	0.50
TRS (as S)	kg/t	0.03	0.01	0.01	0.04	0.20
SOx (as S)	kg/t	0.1	0.03	0.03	0.16	0.40
NOx (as NO_2)	kg/t	1.1	0.2	0.2	1.5	1.5
CO	kg/t	2.0	0.08	0.08	2.16	-

2.8.1.3 Solid Waste

The operation of the PARACEL pulp mill will generate solid waste classified as: industrial and non-industrial.

Industrial solid waste will come from the management areas of wood handling areas, causticizing, boilers and treatment plants of water and effluent. The non-industrial waste will be generated in the administrative activities and operational and support services such as offices, canteen and maintenance garages.

PARACEL will have its own final disposal site for industrial and non-industrial waste. The management of solid waste generated by PARACEL pulp mill will include best practices, in accordance with Law # 3,956/2009 and Decree # 7,391/2017 (Integral Management of Solid Waste in the Republic of Paraguay).

With respect to the treatment and final disposal of solid waste, PARACEL mill will have a composting system and production of soil acidity correctors, thus using the best technology available

2.8.1.4 Noise

The generation of noise during the operation of the project will be due to the activities of the industrial process.

PARACEL will employ noise treatment systems and protective measures for its employees and third parties in its facilities, which are based on legislation and technical standards, such as Law # 1,100/1997 on the prevention of noise pollution. In addition, PARACEL will have health and safety programs as a way to control and/or minimize the exposure of its employees and partners to industrial noise.

The monitored noise level will follow the Noise Level Guidelines according to IFC EHS Guidelines, below:

Table 1.7.1- Noise Level Guidelines[54]

Receptor	One Hour L_{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational[55]	55	45
Industrial; commercial	70	70

2.8.2 Forestry

2.8.2.1 Liquid Effluents

The generation of liquid effluent in the forestry areas will be due to sanitary sewage generation at worker camps.

The temporary workers camps will consist of a fenced area with a guard, surveillance, first aid system, bedrooms, bathrooms, cafeterias, leisure area, internal roads, electricity and drinking water supply, trash collection system, treatment (type of modular station), and disposal of sanitary effluents and firefighting system.

PARACEL's plantation-area worker accommodations for third party workers are expected to be temporary, modular structures that mobilize following Project work fronts. The design, construction, and maintenance of these worker accommodations would be responsibility of future plantation contractors, but PARACEL will supervise to assure the accommodations meet the Applicable Standards (including IFC/EBRD 2009). Other than, Paracel will be in line with IFC EHS Guidelines.

The triple washing of pesticide packages (as recommended) does not generate liquid effluent, because the washing water will be mixed together with the pesticides in the application tank provided with waterproof surface.

2.8.2.2 Inputs, Agrochemicals, Fertilizers and Pesticides

In compliance with the FSC policy on use of Highly Hazardous Pesticides - HHP (SC-POL-30-001 V3-0), PARACEL will exclude the use of all hazardous pesticides that contain or main contain active ingredients listed as prohibited by the FSC. Other than that, the forest component of the PARACEL project is in line with the IFC PS and the IFC EHS Guidelines for Perennial Crop Production.

The HHP listed by the FSC as highly restricted can be used when there's no viable alternative methods, evidenced by analysis of costs, risks and social and environmental impacts.

The HHP listed by the FSC as restricted can be used as an auxiliary method to non-chemical treatments, subject to exhaustive analysis of environmental and social risks for the active ingredient to be used.

At the operational level, at first, the highly hazardous pesticides are identified as prohibited, of highly restricted use or of restricted use, due to their hazardous level. When the integrated pest management identifies the necessity of using a chemical pesticide as the last resource, an evaluation of social and environmental risk must be carried out on different levels to identify the nature and level of risk, as well as to define mitigation measures and requirements for impact monitoring.

PARACEL's program on the use of agrochemicals establishes the criteria for the environmentally safe handling of pesticides and the residues generated by their application (empty containers and packaging), as well as the importance of monitoring the use of pesticides and its potential impact.

PARACEL will make efforts to investigate the products and control methods of weeds in order to diminish the use of HHP with a view to their complete eradication. Any HHP to be used will present legal registration with the competent authorities.

In alignment with FSC's pesticide program, PARACEL has the following short-term objectives:

- Promote the best practices in order to minimize risks to human health and the environment when using chemical pesticides;
- Reduce the volume and total number of pesticides in use;
- Eliminate the use of highly hazardous pesticides.

In the long term, PARACEL aims at complete eliminating the use of chemical pesticides.

This program applies to all PARACEL's operation areas, suppliers and contractors that provide services that can make use of pesticides inside PARACEL's management areas, aiming to protect the natural vegetation, the human health and the native species. PARACEL will monitor its own activity, as well as suppliers and contractors as per IFC PS01.

2.8.2.3 Emissions to the Atmosphere

Vehicle traffic can generate dust, related to traffic on unpaved roads, and can carry dust depending on the wind conditions in the region. An important point is that the new internal roads will be wetted during the execution of the works whenever possible and

gravel will be used whenever possible, making the passage of trucks, especially in the rainy season, safer and preventing dust spread.

In addition, trucks that transport all types of dusty material must have their cargo covered, preventing the release of particles and dust.

It should be noted that the area surrounding the company's areas is dominated by agricultural and livestock activities, not expecting to cause any impacts to communities due to dust generation. In case of existing people/communities present near those areas, dust control will be more rigorous, with more humidification on the access routes to the community, and more frequently.

2.8.2.4 Solid Waste

It should be noted that PARACEL's plantation areas worker accommodations for third party workers are expected to be temporary, modular structures that mobilize following Project work fronts. The design, construction, and maintenance of these worker accommodations would be responsibility of future plantation contractors, but PARACEL will supervise to assure the accommodations meet the applicable international Standards (including IFC PS).

Other than that on the farm areas and the workers camps there will not be equipment maintenance workshop. Those maintenance workshop will be located in a duly licensed area by third party which will be responsible for store, treat and dispose the solid waste in accordance with current legislation, and PARACEL will supervise those actions.

2.8.2.5 Hazardous Waste

PARACEL will follow the Forest *Stewardship Council (FSC)* chemical use policy, which certifies its forest plantations.

The agricultural inputs should be properly stored within a waterproof pavement in a duly licensed area that will be managed by a company specialized in this service.

With regard to empty packages, PARACEL has procedures for the management of pesticide package generated in the operational activities at the farms, in accordance with current standards and legislations. In general, these procedures consist of the triple washing the empty pesticide packages, where the technique is applicable. Then, the washed packages are sent to the empty packaging tank, where they are stored in a tank of empty packages of pesticides. Then, those empty washed packages will be delivered to an appropriate licensed final disposal.

2.8.2.6 Noise

On PARACEL's farms the generation of noise is due to the forest operation that consists of planting, maintenance and harvesting stages, in which machines, equipment and vehicles are used. The noise generated will follow the Noise Level Guidelines according to IFC EHS Guidelines.

Thus, it is expected that during those stages, the traffic of vehicles, such as machines, trucks and buses on the access roads will increase, as the work will require an amount of material, equipment and machinery.

One impact of the increased vehicle traffic on the roads relates to noise generation.

Regular maintenance of equipment and vehicles plays a key role in noise control and safety, as well as increasing the life span of machinery. The causes of increased noise emissions from machines in use are: wear and tear of gears, bearings, poor lubrication, imbalance of rotating elements, clogging of air pipes, unsharp cutting devices, clogged and damaged silencers, removal of the noise attenuation device, etc. (BISTAFA, 2011).

Therefore, PARACEL will require the maintenance of machinery engines, trucks and vehicles.

It is noteworthy that this impact is not significant within the farms, because the surroundings of the farm are basically composed of extensive areas of plantations of different crops or cattle raising. In addition, this impact is punctual and temporary, since the stages of planting, maintenance and harvesting occur with an interval of 6-7 years in the same place.

3 PROJECT JUSTIFICATION

Paracel's project is commitment to adhere to the applicable EHS Guidelines: Pulp and Paper Mills, Forest Harvesting, Perennial Crop Production, and to align with the IFC PSs and Equator Principles.

PARACEL pulp mill in Concepción will adopt *Kraft*[1] process for pulp production.

The *kraft* process is widely used to obtain bleached pulp all over the world. This technology is totally dominated not only by the pulp producing industries, but also by engineering, equipment and consulting companies. It also has additional advantages, such as the ability to obtain high standards of whiteness and fiber quality required by the global pulp market, along with the ability to be energy self-sufficient.

As far as the environmental issue is concerned, the *kraft* process of pulp production, compared to others, such as the sulphite process, has a great advantage, since it allows the recovery of the chemicals used in the cooking of wood, through evaporation and the burning of liquor. In addition, cooking in the recovery boiler reduces the organic load for the treatment of liquid effluent.

The bleaching process adopted was the Elemental Chlorine Free (ECF), which does not use elemental chlorine in its internal stages, a fact that significantly reduces the emission of organochlorine compounds into the effluent.

In addition, in accordance with the most advanced standards in industries of this type, high technology equipment has been incorporated into the manufacturing process, the aim of which is to optimize the production process and reduce emissions into the environment (liquid, atmospheric and solid emissions), such as:

- Adoption of dry eucalyptus bark separation, instead of wet as is currently done, to reduce the contaminating load of the liquid effluent from this operation;

[1] *Kraft* pulp: Pulp produced by sulphate process

- Adoption of a continuous digestor for cooking (instead of batch digesters), which reduces the generation of condensable gases, organic load in the effluent, and emission of sulfur into the atmosphere;
- Use of a closed circuit purification that mitigate the generation of pollutant liquid load;
- Installation of a delignification unit (first bleaching phase) which will consist of using oxygen to separate the lignin from the fiber, with the aim of substantially reducing the organic load and color generated in the effluent;
- Purification of the contaminated condensate through the installation of a gas/liquid separation column, recovering the condensate and thus reducing the contaminating load of the liquid effluent;
- Installation of waste recovery and control systems in the production process;
- System for collecting and burning concentrated and diluted non-condensable gases;
- Installation of equipment to control atmospheric emissions, such as electrostatic precipitators and scrubbers to eliminate or minimize emissions;
- Installation of a highly efficient liquid effluent treatment and control system, such as activated sludge;
- Installation of a system for treated effluent disposal in the Paraguay River through land and underwater emissaries equipped with bottom diffusers that will ensure adequate dispersion of the treated effluent at the point of discharge;
- Installation of a system for the treatment and final disposal of solid industrial waste through composting and the dumping of industrial waste;
- Generation of clean and renewable electrical energy available to the network.

In addition, PARACEL became heavily involved with the adoption of Best Available Techniques (BAT) in order to reduce, control and monitor air emissions, liquid effluents and solid waste generated.

The chosen site presents a series of environmental factors, which combined favors its choice in comparison with the others. The selected site has the following characteristics that justify its choice:

- Water availability in the region (Paraguay River) for water supply;
- It has good conditions of dispersion in terms of minimum flow for the disposal of treated effluent from a pulp mill;
- Conditions for atmospheric dispersion are favorable.

The justification for implementing the project is based on the premise that the current market for pulp and paper is expanding abroad. This can be seen through the projects to increase various industries in the productive sector, with the consequent expansion of their forestry bases, with South America standing out in recent years, with new pulp mills in Brazil, Uruguay and Chile.

Paraguay, like Brazil, has a competitive advantage for the cultivation of renewable and sustainable forests. As such, Paraguay can become a future supplier for the world market of short-fiber pulp, with factors such as climate and good forest productivity, resulting in a very competitive cost.

The implementation of the pulp mill will promote economic development and increase infrastructure in the region. Direct and indirect incomes and salaries will promote an increase in tax collection, which will allow the partnership of government and other agencies to increase investment in the development of social and economic programs. This process is called the multiplier effect and is based on economic theories.

The development of this project will benefit not only PARACEL, but also the region of the municipality of Concepción, the Department of Concepción and Paraguay.

4 BASELINE CONDITIONS

A physical, biotic and social environmental baseline was conducted for the project influence area.

The diagnosis of the physical environment allows us to observe the current states of climate and meteorology, air quality, noise, geology, geomorphology, pedology and hydrology (surface and underground water resources) of the areas of influence and thus obtain an adequate evaluation of the environmental impacts related to the implementation and operation of PARACEL project.

The diagnosis of the biotic environment provides the opportunity to observe the current state of flora and fauna (mammals, birds, herpetofauna, ichthyofauna and aquatic organisms) in the areas of influence of the region and thus obtain an adequate evaluation of the environmental impacts related to the construction and operation of the PARACEL project.

The main objective of the social studies carried out within the framework of the ESIA is to develop a social baseline of the project's area of influence that will make it possible to evaluate the impacts of the social environment and consequently develop mitigation measures and social management programs.

An important part of the social studies was devoted to surveying the population's perception of the area of influence in relation to its community and the project, as well as identifying key actors at the institutional and community level, and the communities living in the area closest to the plant.

This document was prepared on the basis of a report by a team of external specialists and corresponds to the results of the studies of the social component, developed within the framework of the Environmental and Social Impact Assessments (ESIAs) of the PARACEL project in the department of Concepción and Amambay, Paraguay.

4.1 Influence Area

The environmental diagnosis was carried out in the areas of influence of the Project.

For the physical environment, the Hydrographic Units (department), defined according to Resolution n. 376/2012, were considered as the reference base. In this way, the definition of the IIA has the CIH18-Rio Pilcomayo and CIH8-Aquidaban Units. These units cover part of the middle and lower Paraguay sub-basin. Another factor that justifies the definition of this IIA limit refers to the dispersion of the treated effluents in the Paraguay River, which is rapid and occurs very close to the point of release (between 0.37 and 0.42 m), this point being located upstream of the pulp mill water intake.

For the biotic environment, the Indirect Influence Area considered the ecoregions that the Department of Concepción intercepts and, in part, the Aquidabán and Pilcomayo

watersheds, namely Cerrado, Alto Paraná, Chaco Húmedo and Chaco Seco. The organization of information by ecoregions is within the available bibliography justified the choice of this criterion.

For the socio-economic environment, the Indirect Influence Area (IIA) includes the three northern departments of the country: Concepción, San Pedro and Amambay including the road and river access to Asunción, as well as 100km from the edges of the farms.

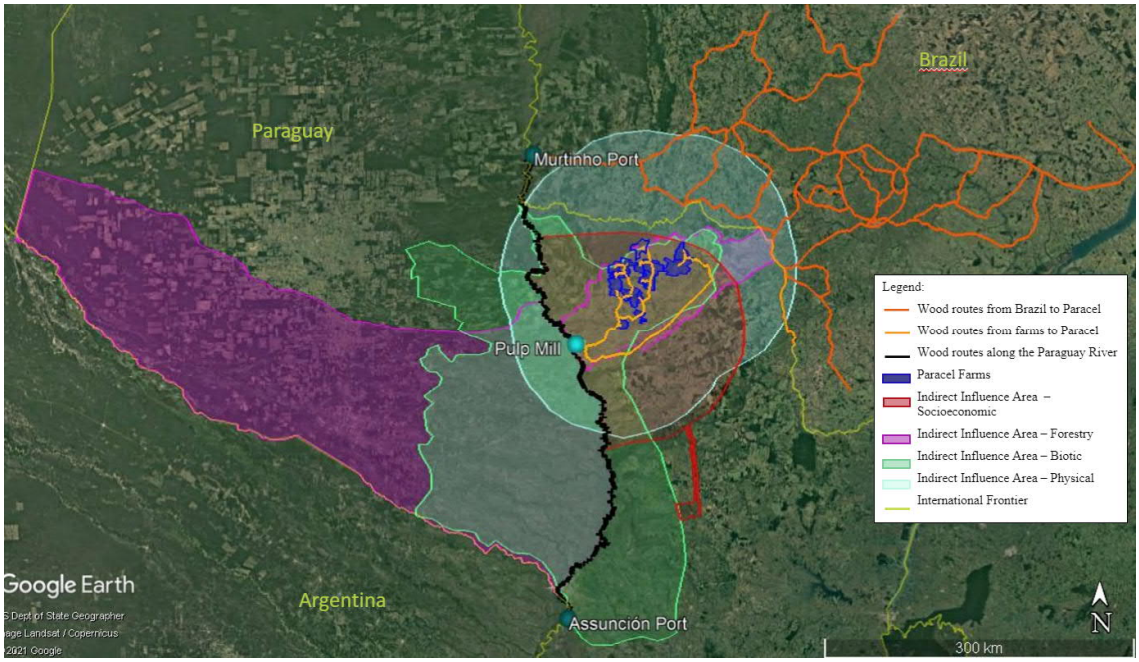


Figure 12 – Indirect Influence Area (IIA).

4.2 Physical Environment

The physical environment diagnosis allowed to be observed the current climate and meteorology state, the air quality, noise, geology, geomorphology, pedology, and hydrology (surface and underground water resources) of the studied area and thus, to be obtained an appropriate environmental impact assessment related to the implementation and operation of the enterprise.

Climate is tropical to subtropical with a dry and rainy season.

The landscape has average elevation of 130 m above sea level and its maximum height sporadically reaches 300 m and constitutes a flat plain, an alluvial formation of slight slope from the Andean; and has plateaus and valleys, which are flat to almost flat lands that receive the drainage water from the high places, which are the hills and mountains.

The soils are good for plantations.

For PARACEL project, the Area of Indirect Influence are the hydrographic units basins, Aquidaban and Pilcomayo River, which are tributaries of the Paraguay River, where the treated effluent will be discharged through an underwater emissary.

In order to evaluate the quality of Paraguay river before the operation of the PARACEL's project, considered as a background and reference for impact studies and

future monitoring, three campaigns were carried out to collect and analyze surface water during the dry and rainy seasons.

The results showed that most of the parameters analyzed are within the conditions required for class 2 surface water bodies, according to the law in force (Resolution # 222/02).

It should be noted that the Paraguay River has good homogeneity, very good quality conditions and excellent resources for its use in industrial purposes.

Other than that, PARACEL provided the coordinates of the 20 monitoring points for the surface waters within the plantation areas prepared by TECNOAMBIENTAL (2021); 18 points are existing watercourses located in the so-called “Farm Zone” of the project´s and 2 points are on the River Paraguay.

Based on the Terms of Reference defined by the company PARACEL SA, laboratories certified by the ONA (National Accreditation Body) carried out the analytical determinations. The analysis and evaluation of the results are done by the following normative:

- Resolution SEAM Nº 222/02 "BY WHICH THE WATER QUALITY STANDARD OF THE NATIONAL TERRITORY IS ESTABLISHED".
- Law 1614/200 - General Law on the Regulatory and Tariffing Framework for the Drinking Water and Sanitary Sewerage Service - ANNEX I.
- NP 24 001 80. Drinking Water: General Requirements

Which are in line with IFC EHS Guidelines.

4.3 Biotic Environment

4.3.1 Flora

The studied area is mainly located in the Cerrado ecoregion, which is located as the Highest Regional Priority Level for conservation, based on an analytical system for assessing the conservation status of ecoregions (Dinerstein et al. 1995). In Paraguay, the Cerrado occupies comparatively small mosaic-shaped discontinuous areas on gently wavy topography with sandy soils that can usually be seen among plants. It should be noted that, depending on the authors and the context, the Cerrado can be classified as an ecoregion, an ecosystem, a biome or a formation.

In the studied area converge the Cerrado with the adjoining ecoregions of the Humid Chaco and Atlantic Forest of Alto Paraná, which promotes a high and characteristic transitional biodiversity of the main taxonomic groups, focus of the study: plants, fish, amphibians and reptiles, birds and mammals, product of the interaction of ecoregions and their convergence.

Paraguay currently has 6 Ramsar sites or Wetlands of International Importance covering 785,970 hectares and the designation of Asunción Bay is expected to cover 2,585 hectares (WCPIC, 2014).

It should be highlighted that no Ramsar sites or Wetlands of International Importance are located in the influence area of the project.

One of the greatest pressures on ecosystems is related to the reduction of natural environments due to deforestation. The areas of influence of the PARACEL pulp mill

are highly anthropized and with low connectivity between the remaining vegetation, intensive use for livestock is another major pressure factor on these environments. Regarding vegetation cover, it is partly affected by anthropogenic occupations and economic activities already consolidated in the region.

A biodiversity baseline field study was conducted for the industrial pulp mill in 2019 to 2020 and the forestry plantations from 2020 to 2021. Additionally, the biodiversity baseline for the forestry plantations was assessed through eDNA metabarcoding of water samples collected in April 2021.

Eight plant communities were identified in both ESIAs, three of which correspond to forest types (Degraded Tall Forest, Riparian Forest, *Cerradón*) and five to savannas , (*Campo Cerrado*, Dirty Fields (*Campo Sucio*), High Savanna, Floodable Savanna and Flooded Savanna), each with varying degrees of species richness. These eight plant communities correspond to habitat types which exist in a variable mosaic throughout the landscape according to bio-physical characteristics such as soil type, slope and wetness.

The **Degraded Tall Forest (BA)** is characterized by presenting an average height of 12 m (which can reach up to 18 m) with three strata; the middle and lower strata being the ones with the highest density and diversity of species. In this formation the understory is not very dense, with few epiphytes and lianas. The natural regeneration of some tree species was noted. The 'degraded' classification refers to the selective harvesting of its most valuable timber species and the invasion of exotics in the clearings. The soil is sandy in texture, red in color and covered by a thick layer of leaf litter.]

The **Riparian Forests (BR)** follow water courses, and are generally contiguous with floodable savannas. They are characterized by having an average height of up to 14 m (which can reach up to 18 m) with three strata, the lowest being the one that presents highest density and diversity of species. It is important to highlight the presence of tree species belonging to the *Cerradón*. In this formation, the understory is sparse, with few epiphytes and lianas; however, the natural regeneration of tree species is visible. There is evidence of selective harvesting of its most valuable species as well as the presence of cattle. The soil is sandy, and covered by abundant leaf litter.

The ***Cerradón*** **(CD)** is a plant formation characterized as an open semi-deciduous forest, presenting a height of up to 16 m, with three strata, the middle and lower strata being those with the highest density and diversity of species. Most of the tree species are typical of the formation and can also appear in more open formations such as the *Cerrado*. Most of the species are adapted to periodic burning, by presenting thick, corky and cracked bark. The understory is very open, with few epiphytes and lianas. Not much can be observed in the way of natural regeneration of tree species. The soil is sandy, shallow, covered by abundant leaf litter, and with rocky outcrops appearing in certain sectors.

The ***Campo Cerrado*** **(CC)** is a type of savanna formation, characterized by the dominance of sub-shrub species, with highly developed underground structures. Herbaceous species are present in proportionally lesser quantity and represented, among others, by numerous species of grasses forming large patches. Evidence of periodic burning was noted. The soil is sandy, the topography is undulating and in certain sectors with rocky outcrops.

The **Dirty Field** or ***Campo Sucio*** **(CS)** is a phytophysionomy of the *Cerrado*, which also presents a predominance of sub-shrub species forming extensive patches of several individuals, with characteristic species of the formation and some typically ruderal. It

occupies the higher parts of the terrain, with undulating topography, sandy soils, and with little leaf litter.

The **High Savanna (SA)** formation occupies the highest parts of the terrain, which are contiguous with forest formations. They present a mainly herbaceous cover with predominance of grasses, mainly *Elionurus muticus* (*Espartillo*) and *Aristida* sp., as well as other herbaceous species and some trees either as isolated individuals or in small groups or patches. They are prone to extensive grazing and periodic burning. The presence of large patches was also recorded, mainly of *Syagrus campylospatha* (*Jata'i mi*). The soil is sandy.

The **Floodable Savanna (SI)** formation occupies the lowest parts of the terrain and borders with the forest formations. They present a mainly herbaceous cover with a predominance of grasses forming large patches, as well as other herbaceous aquatic and palustrine plants, and some trees either as isolated individuals or in groups forming small patches. In certain sectors, the presence of large patches, mainly of *Syagrus campylospatha* (*Jata'imi*), were also recorded. At other sites, the presence of isolated individuals of *Copernicia alba* (*Karanda'y*) and *Acrocomia aculeata* (*Mbokaja*) was observed, as well as *Machaerium hirtum* at an arboreal level. Within certain sectors of the localities surveyed, the presence of bodies of water was observed, presumably formed some time ago by the damming of small water courses, and that have since been colonized by aquatic and/or palustrine plant species, either freefloating or bottom-rooted, depending on the depth of the water. Based on the verification of certain evidence, this formation is prone to extensive grazing as well as periodic flooding and burning.

The **Flooded Savannah (SIn)** formation is characterized by the dominance of few species, including Cyperaceae and Fabaceae, mainly *Aeschynomene* aff. *americana* growing in isolation. This savanna has permanent water and an organic substrate. Other registered species are: *Eleocharis* spp .; *Utricularia* spp., *Hibiscus sororius*, *Ludwigia nervosa*, *Nymphoides indica*, *Pontederia* aff. *Subovata.*

The floristic diversity of all the identified plant formations was determined based on direct observations, collections and processing (in the field and in the office) of more than 3,500 specimens of vascular plants (both fertile and sterile).

The flora richeness of the studied área is represented by 667 species; 346 genera and 95 families. The 667 species represent the 10.3 % of the total number of plants estimated for Paraguay (6,500; Mereles 2007). Based on Mereles (2007) estimates for vascular plants, in this study the 6.4% of them have been recorded. Of the 95 Families recorded, 28 of them present a greater diversity.

4.3.1.1 Land cover and land use

Mill site

The figure below shows a land cover map created through digitizing the satellite image of the mill site property, a former estancia, identifying modified and natural existing areas. These area total approximately 1,206 ha. About 83% of the area is highly disturbed (cattle pasture) and 16% is natural forest and 1% is watercourse.

Figure 13 – Land cover at Mill site.

The implementation of the pulp mill will require the conversion of approximately 3.99 ha of remaining vegetation of the Semideciduous Forest and 0.31 ha of remaining vegetation of the Savannah at riparian area for the implantation of the water intake system, the terrestrial emissary of treated effluents and the river port. The DAA has about 150 ha, and only to 2,7% of the existing native forest will be converted. Paracel has committed to compensate the suppression by increasing the native area in relation to the current situation, specially enlarging the riparian areas resulting in a net increase in natural forest habitat area. The implementation of the project will result in a native forest coverage in 30% of the mill site, compared to the 12% that it currently occupies. This compensation measure thus determines an increase in the native area of approximately 150% in relation to the current situation. A pending residual biodiversity impact assessment will estimate this outcome in a habitat-hectares currency.

Moreover, the regenerated 30% will reinstate the riparian forest connectivity, now highly fragmented, and also connect the native areas of the neighboring properties to the NW and SE acting as a biological corridor, now non-existent.

Transmission Line

The figure below shows the image of the transmission line (TL) easement lane, identifying existing land cover. These area total approximately 23,1 ha. About 84,3% of the area is modified and 15,3% is natural forest and 0,4% is watercourse.

Most of the TL extension will be built on the right of way of existing roads and the towers will be located in anthropized areas, so that no forest will be converted.

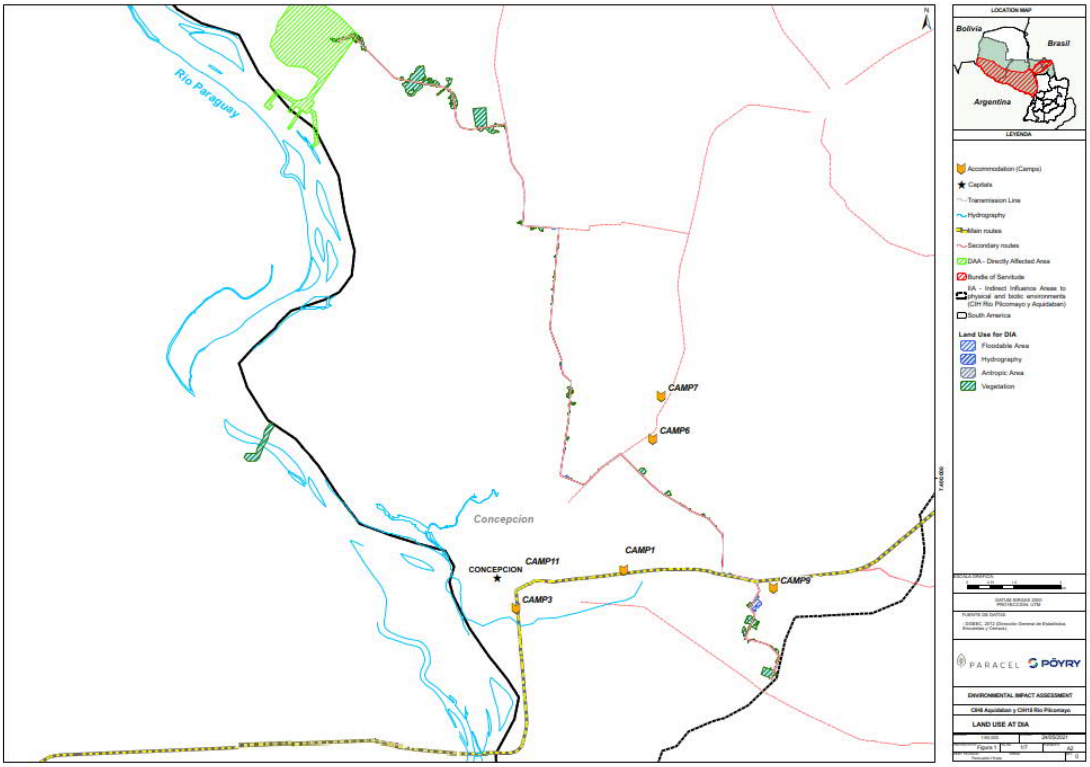


Figure 14 – Land cover at Transmission line easement lane

* Note: this figure was broken up into multiple figures to zoom in Biotic section of ESIA pulp mill.

Land cover in Transmission Line DIA is divided in 3 classes type: native forest, Floodable/Waterland area, Grassland/Pasture/Roads area. The percentage of vegetation cover in DIA is presented at the table and figure below:

Table 9 – Land cover in TL DIA

Class ID	Class type	Area (ha)	Percentage	Area (ha)	Percentage
1	Native forest	3,53	15.3%	3,63	15.7%
2	Floodable/ Wetland	0,10	0.40%		
3	Grassland/Pasture/Roads	19,47	84.3%	19,47	84.3%
Total		**23,10**	**100%**	**23,10**	

<u>Forestry DIA</u>

The land cover in Forestry DIA is divided in 5 classes type: native forest, riverside forest, Savanna/Floodable/Cerrado area, Grassland/Pasture/Agriculture area and Forest plantations. The percentage of each land cover class in the DIA is presented at the table and spatially represented in the figure below:

Table 10 – Vegetation cover in Forestry DIA

Class ID	Class type	Area (ha)	Percentage	Area (ha)	Percentage
1	Native forest	52697.11	28.5%	144,487.26	78.14%
2	Riverside forest	8642.29	4.67%		
3	Savanna/Floodable Savanna	83147.86	44.97%		
4	African Grass/Cattle Pasture/Agriculture	31324.74	26.94%	40,429.79	21.86%
5	Forest plantations	9105.05	4.92%		
	TOTAL	**184,917.05**	**100%**	**184,917.05**	

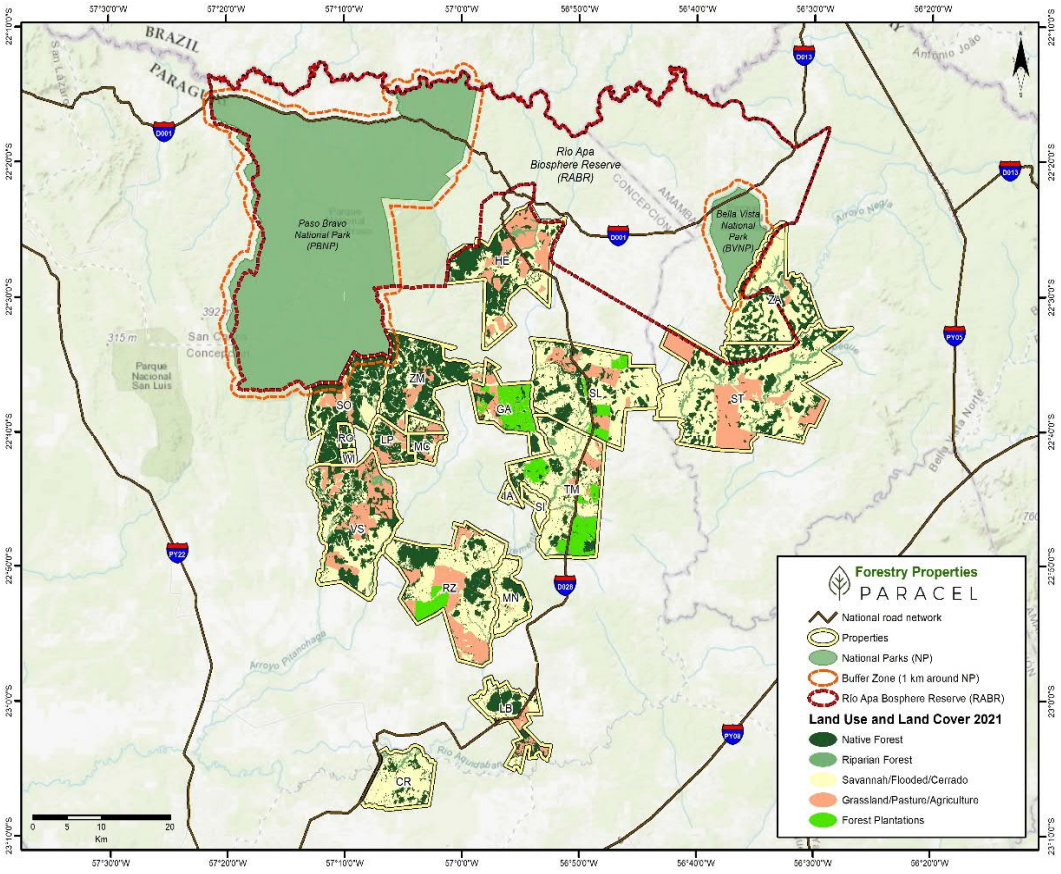


Figure 15 – Defined Land Use and Land Cover by Paracel

The Project area is a mosaic landscape consisting of land cover and use including savannah degraded by grazing, farming and other anthropological uses and possibly areas of undisturbed savannah. Modified land cover types include pasture implanted with African grasses, manmade (areas, structure, and pavement not including roads), cleared areas, agriculture, agroforestry plantations, and roads. Cerrado habitat types are varied and include wet grasslands, as well as “clean” and “dirty” savannah, referring to the amount of woody stem vegetation. Both savannah types are represented by

undisturbed and degraded forms; the extent of degradation varies within the vegetation type. Forest/Wetland land-cover consists of subhumid forests, riparian gallery forests, forest islands (which includes “Cerradon” open dry forests), and seasonal and herbaceous wetlands. According to PS 6, Modified Habitats are those that “contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area’s primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands”. Baseline data indicates large areas on non-forest land cover within the Paracel properties that would qualify as Modified Habitat; there is also substantial area of Natural Habitat patches where the extent of human disturbance has not been sufficient to remove the dominance of native species. Natural Habitats are defined as “areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area’s primary ecological functions and species composition.”

In order to mitigate impacts from the forest plantation, Paracel defined criteria for establishing conservation vs planted areas, as showed at the table and figure below:

Table 11 – Paracel criteria for establishing conservation vs planted areas

Forest Management	Criteria
1km PNBV	Buffer area with 1 kilometer around the National Parks adjacent to the properties, where Paracel will not voluntarily make changes in the current use of the land, as a protection measure in the zone that continues to the protected area.
1km PNPB	
Biological Corridor	Area where Eucalyptus plantations will not be carried out. They do not correspond to areas of environmental liabilities, but will be conserved in its natural state or in confinement as a natural corridor area between the forest masses.
Non-plantable area	Area that includes areas of native forest, protective forests of water courses, or soils not suitable for planting (rocky, low flood zones, etc.)
Recomposition/Confinement	Areas of liability that must be restored (confined or recomposed) both by: 1) Zero Deforestation Law 6676/20 (a satellite image from 2005 was used); 2) Forest Law 422/73 (a satellite image from 1986 was used) and; 3) Law 4241/10 of Protective Forests of Water Channels (a buffer of 100 m was used on both sides of the water channels visualized in the current satellite image and the database of the National cartography of the National Institute of Statistics of the year 2012) .
Potentially plantable area	Area available for Eucalyptus plantations without restrictions in Paraguayan environmental legislation. With the clarification that these are "potential" areas where prior soil analysis and on-site verification of habitat condition (degree of modification) must be carried out to accurately determine their aptitude for planting.

RBRA - Río Apa Biosphere Reserve	In the areas where the RBRA buffer zone overlaps with Paracel's properties, resolution 200/2001 was taken into account in its Art. 31 regarding Biosphere Reserves. Art. 31 set the following guidelines for areas with the Biosphere Reserve management category: a) The property (s) on which the area is based may be public or private property, as well as those in the municipal public or private domain. b) Production must be carried out through environmentally compatible systems, promoting sustainable production; c) Possess at least 50% of the surface with minimal anthropic alterations, or in natural conditions. d) Carrying out activities aimed at maintaining Environmental Services; e) Carrying out activities aimed at the restoration of ecosystems; Y f) The administration of the area will be exercised by the Enforcement Authority. RBRA stakeholders will be consulted to create an appropriate management plan to guide land use in the buffer zone.

As part of the elaboration of the Plantation Development Management Plan, Natural and Modified Habitats within the 'potentially plantable' non-forest area referred to in Table 10 will be more precisely defined and mapped. A Critical Habitat Assessment will determine the level of threat and vulnerability the biodiversity features present are under to make a definitive evaluation of local Critical Habitat status. The Mitigation Hierarchy will be applied (with the most connected and highest condition non-forest areas avoided) and a residual biodiversity impact assessment will quantify any compensatory requirements for the Project to achieve a No Net Loss (or Net Gain where Critical Habitat is confirmed) status for significant biodiversity lost as a result of plantation conversion. Early analyses indicate sufficient opportunity to implement management actions in the Protected and Key Biodiversity Areas present to the north and west of the Paracel property parcels such that a No Net Loss or Net Gain position could also involve implementing avoided loss offset mechanisms.

4.3.2 Fauna

The diagnosis of the fauna provided the opportunity to observe the current state of the mammals, birds, herpetofauna, ichthyofauna and aquatic organisms in the areas of influence of the region and thus obtain an adequate evaluation of the environmental impacts related to the construction and operation of PARACEL's project. Other than that, results from eDNA approaches have provided valuable insights to the study of ancient environments and proven useful for monitoring contemporary biodiversity in terrestrial and aquatic ecosystems in large areas. It was considered 115 samples taken across 14 plantations PARACEL forest lands.

4.3.2.1 Mammalian survey

A total of 7 (seven) threatened species were recorded in both ESIAs, as defined by national and global IUCN criteria, the table below summarize them:

	Mammals

Scientific Name	Common name	CR / EN national list (Res. 632/2017)	IUCN
Sylvilagus brasiliensis (Linnaeus, 1758)	Tapeti	-	EN
Cabassous chacoensis (Wetzel, 1980)	Chacoan naked-tailed armadillo	EN	NT
Leopardus tigrinus (Schreber, 1775)	Oncilla	EN	VU
Panthera onca	Jaguar	CR	NT
Myymecophaga tridactyla	Giant Anteater	VU	VU
Tapirus terrestris	South American Tapir	VU	VU
Tayassu peccari	White-lipped peccary	VU	VU

* Category of "Near Threatened" (NT), "Endangered" (EN), "Vulnerable" (VU)

4.3.2.2 Ornithological survey

A total of six bird species were recorded that fall under categories of threat according to the Global IUCN Red List (NT, LC and VU), and under categories of threat at a national level (Threatened and Endangered) (MADES Resolution No. 254/19, Rojas et al. 2020, IUCN 2021).

	Birdlife		
Scientific Name	**Common Name**	**CR / EN national list (Res. 254/2019)**	**IUCN**
Pyrrhura devillei (Massena & Souancé, 1854)	Blaze-winged parakeet	EN	NT
Alipiopsitta xanthops	Yellow-faced parrot	EN	NT
Ara chloropterus	Red and green macaw	EN	LC
Ara ararauna	Blue and yellow macaw	EN	LC
Anodorhynchus hyacinthinus	Hyacinth macaw	EN	VU
Crax fasciolata	Bare-faced curassow	VU	VU

* Category of "Near Threatened" (NT), "Endangered" (EN), "Vulnerable" (VU), “Least Concern” (LC)

4.3.2.3 Herpethological survey

In terms of conservation status, only *Rhinella scitula* and *Dendropsophus elianae* are included under some degree of threat, either at international (IUCN) or national levels. *Rhinella scitula* is a small terrestrial toad (34 -51 mm) endemic to the Cerrado; in Paraguay it is found exclusively within the Departments of Amambay, Concepción and San Pedro (Brusquetti et al. 2006, Smith et al. 2012, Sugai et al. 2014). *Dendropsophus elianae* (20 - 26 mm) is an endemic climbing frog of the *Cerrado* (Napoli & Caramaschi, 2000); it has few records in the country which all come from within the Departments of Amambay and Concepción. Its restricted distribution and few records rank it as EN (endangered) at a national level (Motte et al. 2019). *Chelonoidis carbonaria* is a large land turtle, with a widespread but fragmented distribution in South America, whose southern portion covers most of the Pantanal biomes, the northern portion of the Chaco and southern portion of the *Cerrado*, threatened at a national level.

	Reptiles/ amphibians		
Scientific Name	**Common Name**	**CR / EN national list (Res. 433/2019 206/2020)**	**red-listed CR / EN of IUCN**
Dendropsophus elianeae (Napoli & Caramaschi, 2000)	-	EN	LC
Chelonoidis carbonaria	Red-footed tortoise	EN	

* Category of "Endangered" (EN), “Least Concern” (LC)

4.3.2.4 Ichthyological survey

The 64 species of ichthyofauna recorded represent 21% of the Paraguayan ichthyofauna, according to the checklist of Koerber, Vera & Reis (2017).

With regard to threatened species, *Potamorrhaphis eigenmanni* is categorized as VU (Vulnerable) according to MADES Resolution 1563/09.

4.3.2.5 Aquatic organisms

The characterization of aquatic biota (phytoplankton and benthic invertebrates) in the Area of Indirect Influence - IIA of the PARACEL pulp mill was based on secondary data from the specialized literature, focusing on academic studies and publications provided by government agencies.

The mill's IIA is located in the Paraguay River basin, whose drainage area includes transboundary re-gions, receiving input from several tributaries, including the Verde

River on the right bank, Aguaray Guazu, Manduvirá, Aquidabán and Ypané on the left bank. Among them, Aquidaban and Ypané are the main tributaries of the IIA.

The Direct Influence Area (DIA) is located in the department of Concepción, covering the Paraguay River, about 10 km upstream from the urban center of Concepción. The directly affected area (DAA) of the project includes the proposed pulp mill on the left bank of the Paraguay River.

The assessment of aquatic biota (phytoplankton and benthic invertebrates), within the framework of the DIA and DAA of PARACEL pulp mill, was carried out on the basis of two sampling campaigns, conducted during the rainy season, the first on October 17, 2019, in the spring, and the second on March 5, 2020, in the summer.

The collection and analysis of aquatic biota was carried out by Econsult Environmental Studies. This laboratory is accredited according to ABNT NBR ISO/IEC 17025, by the General Accreditation Coordination - Cgcre of the National Institute of Metrology, Standardization and Industrial Quality - INMETRO, of Brazil.

Endangered benthic species

It should be noted that the benthic invertebrates of the Paraguay River recorded in October/2019 and March/2020 are common organisms, with a wide continental distribution, and are not included in the international list of threatened species (IUCN, 2020). According to the Action Plan for the Conservation of Biodiversity in Paraguay (SEAM, 2016), there is no list of threatened aquatic invertebrate species in Paraguay.

Indicator species

This study did not record insects of the orders Ephemeroptera, Plecoptera or Tricoptera, commonly used in monitoring programs as indicator organisms of good water quality due to their restricted environmental requirements. In general, the taxon sampled in these two campaigns are considered to have a wide range of tolerance to variations in their natural habitats and to loss of water quality.

In summary, in general, the benthic community found is in accordance with that already recorded by other authors in studies conducted in the region, with high frequency and abundance of the family Chironomidae and the Oligochaeta rings. The hydrodynamic regime and flood seem to be the main structuring factors of the community's environment, although there is not yet a complete hydrological cycle to confirm these behaviors.

4.3.2.6 Environmental DNA (eDNA) Analysis

Environmental DNA (eDNA) – defined as: genetic material obtained directly from environmental samples (soil, sediment, water, etc.) without any obvious signs of biological source material – is an efficient, non-invasive and easy-to-standardize sampling approach. Coupled with sensitive, cost-efficient and ever-advancing DNA sequencing technology, it may be an appropriate candidate for the challenge of biodiversity monitoring.

Results from eDNA approaches have provided valuable insights to the study of ancient environments and proven useful for monitoring contemporary biodiversity in terrestrial and aquatic ecosystems in large areas.

The baseline study included 115 samples in PARACEL forest lands. The following picture presents the monitoring points.

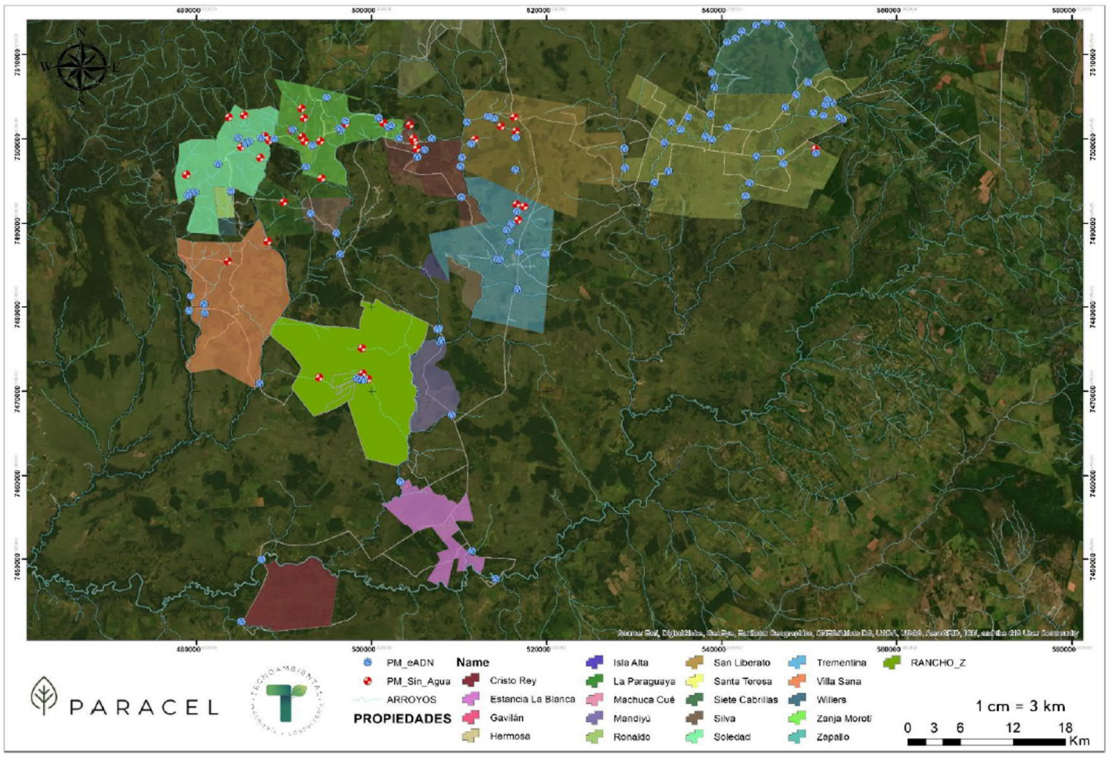


Figure 16 – Monitoring Points

NatureMetrics (2021)[2] has presented the result of the analysis of 115 samples collected. These sampled showed evidence for 357 taxa with an average taxonomic richness of 39.9 (4 to 90) with the most abundant sequence for *Pimelodella* sp., and the most commonly detected species being *Hoplias* sp.

A total of 357 taxa were detected. 39.5% (141 taxa) were at least 99% similar to species in the global reference databases, and species names are suggested for these taxa. The remaining taxa were identified to the lowest possible taxonomic level: 40% to genus (143 taxa), 9.8% to family (35 taxa), and the remainder to order (38 taxa). The taxa belong to 5 classes, 38 orders, 90 families, and 188 genera. The taxon count per class was: 195 fish, 30 amphibians, 78 birds, 50 mammals, and 4 reptiles. Note that taxa are approximately equivalent to species but some over-and under-estimation of diversity in some lineages is possible.

Species of note included eight species of conservation concern according to the IUCN Red List: turquoise-fronted Amazon (NT, *Amazona aestiva*), greater rhea (NT, *Rhea americana*), Neotropical otter (NT, *Lontra longicaudis*), Chacoan naked-tailed armadillo (NT, *Cabassous chacoensis*), black-and-gold howler monkey (NT, *Alouatta caraya*), White-lipped peccary (VU, *Tayassu pecari*), South American tapir (VU, *Tapirus terrestris*), and Giant anteater (VU, *Myrmecophaga tridactyla*). These were generally limited to a small number of samples, except the Neotropical otter, South American tapir, and Giant anteater, which were found in 11, 10, and 8 of 14 Properties

[2] NatureMetrics. 2021. Vertebrate Metabarcoding Results. Paracel S.A., 12 pp.

respectively. The number of threatened species detections per sample varied from 0 (51 samples) to 5 (1 sample).

Discussion

Overall, the diversity recorded in this study exceeds the expectations in terms of creating a biodiversity baseline for both flora and fauna carried out over the 29.5 of effective field workdays both in flora and fauna monitoring. These monitoring days resulted in an investment of 4.21 days per sampling area for both seasons. The baseline evidence illustrates the rich biodiversity of the study area.

A total of 700 plant species, belonging to 97 botanical families were recorded: 22 pteridophytes, 139 monocots, 539 dicots. The study made it possible to survey and classify the plant formations of one of the most threatened and less known ecoregions at a country level, despite its importance at a regional and global level. The current knowledge of its biodiversity is based mainly on floristic studies dating back more than 100 years. The most recent studies were carried out within the last three decades, and were mainly based on the application of the Rapid Ecological Assessment methodology (The Nature Conservancy) in preparation for the Technical Justifications and draft Management Plans for Protected Areas. There are also a few floristic studies of specific taxa that have been carried out by local and foreign specialists.

The study area was found with moderate to high anthropic disturbance; nevertheless, the first campaign of a rapid seasonal survey (rainy season) of the fauna and flora was carried out, fulfilling the objective of providing the first records for the resulting baseline and for future evaluation. The 700 species of plants and 438 species of vertebrates recorded (besides the 40 species of fungi and other species of invertebrates) reflect the great potential of this site for conserving elements of the *Cerrado*, as well as other ecoregions that converge in this area, such as the Atlantic Forest and the Lower Chaco (Humid Chaco). Out of flora and fauna taxa, the diversity of fungi and invertebrates is still far from being known.

4.3.3 Critical and Natural Habitat

The project is likely to be in Critical Habitat and extensive areas of good quality Natural Habitat have been identified. The Critical Habitat concept as defined by International Finance Corporation (IFC) Performance Standard 6 (PS6) represents areas of highest biodiversity value, identified based on five criteria to identify habitats of significant importance to (1) IUCN listed threatened species (EN, CR), (2) endemic and restricted range species, (3) congregatory and migratory species, (4) threatened or unique ecosystems, and (5) areas associated with key evolutionary processes.. Natural Habitat represents areas where natural processes and native species communities dominate, in many cases despite lower levels of human disturbance.

A Critical Habitat screening against the five IFC criteria was carried out at the landscape scale, to evaluate the likely presence of Critical Habitat for each species with regular occurrence in the project's area of influence, or ecosystem, covered by Criteria 1-4'. The Area of Analysis (AoA) considers large-scale ecological patterns acting in and around the area of influence, ensuring all potential risks are taken into consideration and putting the importance of the area of influence for biodiversity conservation into context. The Aquidabán Ecoregion of Paraguay chosen as the AoA. The Paracel

properties extend across approximately half of this ecoregion in both the north-south and east-west axes, and their total area sums to approximately 10% of its coverage.

Biodiversity features screened against the Critical Habitat criteria and thresholds using global data-bases and expert opinion were species confirmed to be present by the plantation baseline (either by observation or eDNA) complemented by a search of the Integrated Biodiversity Assessment Tool (IBAT) records for the area.: The screening assessed more than 70 species and one ecosystem resulting in one of three classes being assigned – qualifying, potentially qualifying or not qualifying. Most were found to be non qualifying, none definitely qualified and six potentially qualified.

Of the six features potentially qualifying the Area of Analysis as Critical Habitat, five species were concluded to be possibilities and the Cerrado ecosystem represented by the ecoregion itself was considered likely. There is currently no completed IUCN Red List of Ecosystems assessment for Paraguay so the criteria were applied to the extent possible with available data. The 'likely' class descriptor was applied on the basis of the rate of historic habitat conversion across the ecosystem extent being estimated to exceed the qualification for the 'endangered' category.

A full Critical Habitat Assessment is planned post-ESIA to make a definitive assessment of the Critical Habitat criteria. For the ecosystem, further investigation and expert consultation is required to verify current understanding of ecosystem classifications and mapped extent in Paraguay and to examine the land-use change data available in more detail to assess temporal and spatial patterns. For the species considered to potentially qualify, expert consultation and possibly supplementary baseline are required to confirm presence, distribution and abundance. Further investigation of the nationally listed species is required to establish if IUCN regional listing guidelines were followed and if there are any significant and isolated populations.

Feature type	Scientific name	English name	IUCN status	Confirmed by the baseline	Presence in AoA	CH screening result
Bird	*Amazona vinacea*	Vinaceous-breasted Amazon	EN	No	Potential	**Possible**
	Buteogallus coronatus	Crowned solitary eagle	EN	No	Confirmed	**Possible**
	Sporophila palustris	Marsh seedeater	EN	No	Potential	**Possible**
Reptile	*Phalotris nigrilatus*	-	EN	No	Potential	**Possible**

Amphibian	*Rhinella scitula*	Cope´s toad	DD	Yes (*Genus*)	Potential	**Possible**
Ecosystem	Aquidabán ecoregion	Cerrado	Not assessed	Yes	Boundries define the AoA	**Likely**

None of the potentially qualifying species are migratory or congregatory and there are no Ramsar sites within the Project or proximal areas.

The confirmed presence of Natural Habitat means the Project should pay special attention to the management and measurement of biodiversity impacts so that an overall No Net Loss (versus the no-project scenario) can be demonstrated. Given the likely Critical Habitat status of the local Cerrado ecosystem, Natural Habitat patches are likely also to represent Critical Habitat. If further analysis confirms the Critical Habitat then an additional level of scrutiny will be applied to biodiversity mitigation planning, implementation, and assurance with the goal of demonstrating a Net Gain (versus the no-project scenario) for Critical Habitat-qualifying features. If any species are confirmed as qualifying features for Critical Habitat and measurable adverse impacts are predicted then mitigation planning will ensure a Net Gain for these features with specific actions planned if habitat protection alone is not an adequate strategy.

Practically, a Net Gain goal implies an overall increase in the extent/condition in the habitats of concern within the AoA can be demonstrated by the Project such that an expert third party would have a high degree of confidence in the improved status compared to the forecast situation without the Project interventions.

4.3.3.1 Discussion

The set-aside, restoration and offsets strategy Paracel is following, versus the no project scenario of continued agricultural intensification in the wider landscape and illegal activities in the Protected Areas, has the potential to contribute positively to the recovery and protection of a significant area of central Latin America's biodiverse but threatened *Cerrado* biome – a tropical savannah and dry forest ecoregion that exists primarily in Brazil but extends into Paraguay and Bolivia. Arguably the Aquidabán Ecoregion of the project, which itself is also threatened, is an especially important part of the biome due to it being transitional with the neighboring Humid Chaco biome and Alto Paraná expression of the Atlantic Forest biome. According to WWF around half the native savannah and forest of the Cerrado has been converted to agriculture since the late 1950s. Unsustainable agricultural activities, particularly soy production and cattle ranching, as well as burning of vegetation for charcoal, continue to pose a major threat to the Cerrado's biodiversity. On average, up to a million hectares is cleared each year. This is the equivalent of converting an area the size of New York City every month. Just eight per cent of the Cerrado is officially protected – less than 3% under strict protection - and landowners are required to conserve just 20 % of their land, a rule that unfortunately has not been enforced in many regions.

Paracel is developing an integrated land use development management plan for the large plantation area that commits to maintaining all forested areas (so no existing natural forest areas will be affected by the Project's plantations), restoration of natural forest

areas degraded by logging, protection of all riparian corridors and wetlands, and incorporating ecological corridors to connect forest areas with riparian corridors for wildlife transit. In addition, the project will establish 1 km wide buffers where properties are adjacent to the NationalParks Paso Bravo and Bella Vista and the overlap portions of the three plantations with the Cerrado del Rio Apa Biosphere Reserve buffer zone will have a differentiated plantation plan that will result in a minimum of 50% conserved area within the overlaps. The buffers, riparian corridors, and ecological corridors will contain a mosaic of the different Cerrado habitats, and management plans will be implemented to control invasive African grasses that were introduced during cattle ranching and avoid degradation of the conserved areas. Overall, Paracel expects to dedicate over 90,000 hectares, or up to 47% of its total land holdings exclusively to conservation. Furthermore, Paracel is exploring REDD+ and other mechanisms to assure the set aside or biodiversity offset areas would be preserved in perpetuity.

Given the conservation importance of the Aquidabán ecoregion within which the properties lie and the representation of some good condition areas of the four main types of Cerrado habitats therein (*Cerradón*, *Campo Cerrado*, dirty grassland (*"Campo Sucio"*) and High Savanna, as well as high and riparian forests, floodable and flooded savanna, it is recommended to:

Maintain high forests and riparian forests. These forests hold rich biodiversity, the highest in the region, and they allow connectivity with the units of conservation of the area and offer environmental services, among them water capture and filtration for its sustainability in terms of water quantity and quality.

Facilitate the biologic interconnection of these high forests and riparian forests with the four Cerrado habitats. Select those areas of these natural habitats in their best conservation status (in preference 10% of the total land of the property) with the best connectivity, to allow provision of ecosystem services. Most of these areas have been affected and are areas of potential plantations. Wetlands in these types of habitats could serve as representative samples and would not affect the potential area of plantation.

Implement a biodiversity offset designed to achieve No Net Loss or Net Gain outcomes for habitats and species of interest through connecting the natural habitats maintained within the Paracel properties to a better managed Protected Area complex to create a larger and more resilient representative block of the Cerrado ecosystem.

Monitor the Cerrado biodiversity. Given the Cerrado fragmentation and the changes in the environmental and climatic dynamics, the Cerrado is subject to different processes, among them towards a savannization (a process of the change of the landscape from its original feature – forests or grasslands- to a savanna-like type); therefore, it is important to monitor annually the biodiversity using indicator and flagship species, which should be reported in the baseline of biodiversity. This monitoring should also evaluate the scope of the connectivity and its effectiveness. It is also suggested to prepare biodiversity conservation plans and that these not only be based on the maintenance of the genetic diversity but also the populational and ecosystemic, given the environmental heterogeneity in its character of ecotonal and transitional.

4.3.4 Ecosystem Services

Ecosystem Services are the benefits that people, including businesses, derive from ecosystems (IFC Performance Standard 6). There are four types of ecosystem services (IFC, 2012): (i) provisioning services, which are the products that people obtain from

ecosystems; (ii) regulation services, which are the benefits that people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the non-material benefits that people obtain from ecosystems, and (iv) support services.

For this study, provisioning, culture and regulation are considered for Type I Ecosystem Services (i.e., those benefitting potentially affected communities). The baseline data collected to date indicates that for some communities continued access to the supply of some ecosystem services is important. An Ecosystem Services Review (ESR, as per PS 6 definition) is planned to establish the level of dependency affected communities have on Priority Ecosystem Services and to evaluate the effect on their well-being that any potential adverse Project impact on such Services may have. The ESR will also evaluate Project operational dependency on any Type II Ecosystem Services (e.g., water supply).

4.3.4.1 Provisioning Services

A major ecosystem service for local and indigenous communities is the utilization of water to obtain food, and use wells, lakes and springs.

It is common in the DIA to practice fishing, both for sale and for self-consumption (for example, the towns of Paso Barreto, Paso Mbutu, Islería). In Direct Influence Area (DIA), from the 64 sampled fish species, ten species are used as subsistence fishing, while nine are used in commercial fishing and 23 are used for ornamental purposes, according to the following table.

Table 12 – Usage of recorded species in different fishing practices.

N	Scientific names	Subsistence	Commercial	Ornamental
1	*Acestrorhynchus pantaneiro*	X	X	
2	*Serrasalmus marginatus*	X	X	
3	*Paradon nasus*			X
4	*Megaleporinus obtusidens*	X	X	
5	*Steindachnerina brevipinna*			X
6	*Potamorhina squamoralevis*	X		
7	*Hoplias misionera*	X	X	
8	*Pyrrhulina australis*			
9	*Triportheus pantanensis*			X
10	*Charax leticiae*			
11	*Astyanax lacustris*			X
12	*Astyanax lineatus*			X
13	*Psellogrammus kennedyi*			
14	*Hemigrammus ulreyi*			X
15	*Bryconamericus exodon*			X
16	*Moenkhausia dichroura*			X
17	*Moenkhausia bonita*			X
18	*Moenkhausia sanctaefilomenae*			X
19	*Odontostilbe pequira*			X
20	*Gymnocorymbus ternetzi*			X
21	*Poptella paraguayensis*			
22	*Tetragonopterus argenteus*			
23	*Hyphessobrycon eques*			X
24	*Aphyocharax anisitsi*			X
25	*Aphyocharax rathbuni*			X
26	*Characidium* sp.			
27	*Characidium* sp.1			
28	*Characidium* sp.2			

N	Scientific names	Subsistence	Commercial	Ornamental
29	*Trachelyopterus galeatus*			
30	*Pterodoras granulosus*			
31	*Platydoras armatulus*			
32	*Pimelodella* sp.	X	X	
33	*Pimelodella* sp.1	X	X	
34	*Rhamdia* sp.	X		
35	*Rhamdia quelen*	X		
36	*Amaralia oviraptor*			X
37	*Corydoras aurofrenatus*			
38	*Corydoras aeneus*			X
39	*Corydoras hastatus*			X
40	*Ancistrus pirareta*			X
41	*Rineloricaria aurata*			
42	*Otocinclus* sp.			X
43	*Eigenmannia trilineata*			
44	*Brachyhypopomus gauderio*			
45	*Gymnotus pantanal*		X	
46	*Potamorrhaphis eigenmanni*			
47	*Bujurquina vittata*			X
48	*Cichlasoma dimerus*			X
49	*Crenicichla lepidota*			
50	*Gymnogeophagus balzanii*			X
51	*Pseudopimelodus* sp.	X		
52	*Crenicichla mandelburgeri*			
53	*Gymnorhamphichthys britskii*			
54	*Rineloricaria lanceolata*			
55	*Loricaria sp.*			
56	*Hypostomus sp.*			
57	*Pimelodella gracilis*		X	
58	*Microglanis carlae*			
59	*Pimelodus maculatus*		X	
60	*Serrapinnus sp.*			
61	*Curimatopsis sp*			
62	*Bryconops melanurus*			
63	*Otothyropsis sp.*			
64	*Paravandellia oxyptera*			

According to the Fundación Natán report, hunting and fishing activities are one of the main sources of food for some indigenous families. The 12% of the country's indigenous communities declare that they practice these activities. It is recognized that since the pre-colonial period, the indigenous people of the region lived in egalitarian societies and did not produce surpluses, the forest provided them with everything they needed for their subsistence. They traveled large areas to collect, hunt and fish, in addition to meeting their needs for clothing and tools. Hence the importance of these activities for people of indigenous communities.

In relation to hunting and fishing, the knowledge and practice of these activities are directly related to food. The communities hunt only edible animals and in the amount that is indispensable for feeding the community and family, avoiding indiscriminate hunting and respecting the fauna's breeding season. The main animals available for hunting within the IIA are armadillo, pig, fish, deer, coati, lizard, bird, turtle, anteater, monkey, capybara, and rhea.

Seven mammal species of hunting interest can be included in this category. *D. novemcinctus*, the nine-banded armadillo, is considered, together with the limpet, the tastiest and most appreciated wild animal meat by hunters (Sigrist, 2012). Similarly, *Dasyprocta sp.* (Agouti)*; Hydrochoerus Hydrochaeris* (Capybara) *and M. gouazoubira* (Brown-brocket deer), are usually hunted for sport or as a source of food.

Cerdocyon. thous (Crab-eating fox)*; Leopardus pardalis* (Ocelot) and *L. tigrinus* (Oncilla) are under hunting pressure to obtain and market their skins.

In addition, the existing drinking water supply systems are supplied by groundwater, and, as for the communities that still do not have access to drinking water systems, the majority are supplied from deep wells, springs, cutwaters, rivers and streams.

Wetlands perform extremely important functions such as: water reserve and purification, flood buffering, carbon sinks, sediment, organic matter and nutrient storage and/or export sites. In addition, they play a critical role in the life cycle of numerous species of fauna and flora and support trophic chains of adjacent ecosystems (WCPI, 2014). The Project area contains extensive areas of both floodable savannah grasslands and wetlands; Paracel has a commitment to avoid impacting wetland habitats.

Regarding vegetation cover, the area is partly affected by anthropogenic occupations and economic activities already consolidated in the region. The forests are important because they provide ecosystem services also for the whole community in the influence area, providing them with timber (used for house construction), fauna (for subsistence hunting), flora (for food and traditional medicine), and harvested foods such as honey and fruit. The activities of gathering wild fruits are carried out by the indigenous families of the communities to provide themselves with food sources at different times of the year to complement their diet. In the country, 88.6% of indigenous communities declare that they practice gathering food from the forest, field or other places. The main sources of collection in the area are wild honey, coconut, guavira, yvaviju, pakuri and beans. IP related matters are addressed in section 4.4.6.

4.3.4.2 Cultural Services

During field surveys, in perception studies, many people have expressed the use of water resources for recreation/recreation (bathing, beach, fishing), highlighting the Aquidabán river.

Livelihoods are the capabilities, assets (which include both material and social resources) and activities necessary to earn a living (Ashley & Carney, 1999). In indigenous peoples there is usually a vision of interaction and coexistence with forests, biodiversity and ecosystem services. In this sense, the productive activities of subsistence of the communities cannot be separated from the conservation of the forests, since their protection is interdependent on the well-being of the communities.

The manufacture of handicrafts is a cultural and economic activity for many communities. In the country, 75.2% of indigenous communities declare that they dedicate themselves to this activity, with a greater participation of women, which represent 68.2% of indigenous artisans. Although the manufacture of handicrafts is considered as underdeveloped compared to the activities of agriculture, livestock, gathering, hunting and fishing in the area, it is an activity of interest to artisans that not only provides them with income, but is also a source of leisure that contributes to their overall well-being. The raw materials that are usually used for the manufacture of

indigenous crafts in the departments of Concepción, San Pedro and Amambay are karaguata, takuara, seeds, wool, guembepi, karanday, feathers and soft woods.

Most of the population alternates agriculture and livestock with the production of handicrafts; These populations have always lived in conditions of extreme poverty with little support from the government and from organizations that channel their productive work towards the achievement of their needs and interests. Many of the artisan trades and their products have disappeared and consumption has drastically decreased as a result of the processes of migration and rural depopulation.

Traditional medicine activities are a constitutive element of the identity of indigenous communities, as it is linked, on the one hand, to the relation between health and disease and, on the other hand, to their worldview and magical, religious and empirical knowledge. For the practice of traditional medicine, indigenous people collect medicinal plants from their environment, known as pohã ñana, and perform prayers, songs and dances. In most cases tobacco is used as a primary plant for healing rituals carried out by spiritual leaders.

4.3.4.3 Regulating Services

For the care of the environment, the project will be governed by national regulations (water and effluent quality standards, zero deforestation, among others). With the highest international standards, which require permanent monitoring of environmental impacts, and the public dissemination of the results.

4.3.5 Legally Protected and Internationally Recognized Areas

Legally Protected Areas are clearly defined areas proposed by the Paraguayan Government for any category of protection for the conservation of nature, ecosystem services or cultural values. Internationally Recognized Areas refer to those areas identified as priorities for conservation that may not benefit from legal protection, including UNESCO Natural World Heritage Sites, UNESCO Man and the Biosphere Reserves, Key Biodiversity Areas and Ramsar wetlands.

IFC Performance Standard 6 places special requirements on Projects located in or near such areas: that any development within such an area be legally permitted and act consistently with and government recognized management plans (gaining approval from the management authority), that stakeholders are consulted, and that if impacts are likely additional programs are put in place to enhance the effective management of the area.

Figure 17 shows that at the northwest and northeast of PARACEL properties there are three Protected Areas – two IUCN Category II National Parks and one Biosphere Reserve. Figure 18 shows three Key Biodiversity Areas in the vicinity of the Project, one of which partially overlaps with Paso Bravo National Park..

Paso Bravo National Park borders two Paracel properties: Soledad and Zanja Moroti, and Bella Vista National Park borders the Zapallo property. The Paraguayan Law 352/94 indicating Protected Area buffer zones is ambiguous. It refers to a region adjacent to the entire perimeter of each Protected Area and leaves specific distances to be determined by the management plan. The buffer zones of the two National Parks bordering Paracel Properties need to be confirmed; the Project has committed to establishing a 1 km buffer of habitat protection where their Properties border.

The Cerrado del Río Apa Biosphere Reserve was established in 2001 by Executive Decree No. 14,431. The core areas of this reserve border two (Soledad and Zanja Moroti) plantations and the buffer area overlaps with three (Zapallo, Hermosa and Santa Teresa) Paracel properties. The core areas of the reserve constitute the Paso Bravo and the Serrania San Luis National Parks; therefore the Paraguayan National System of Protected Natural Areas (SINASIP) considers the core areas as officially Protected Areas; however the buffer zone (comprising an area of 174,224 ha that links the two-core zone National Parks) is not officially part of SINASIP and currently has no formal protection.]

Two KBAs, Important Bird Areas (IBA's) occur near Paracel plantations:

- Arroyo Tagatiya IBA, which sits greater than 15 km west of the Soledad plantation and has some protection from two private protected areas; and
- Cerrados de Concepción IBA, which overlaps with both the UNESCO Biosphere Reserve and the PNs Paso Bravo & Serrania San Luis, and, which borders three Paracel owned plantations: Soledad, Zanja Moroti, and Hermosa.

The IBA designation process involves an analysis of threats to the persistence of the biodiversity features present and notes the ongoing threats from deforestation, hunting, grazing, uncontrolled fires and the establishment of invasive African grass (particularly *Hyparrhenia rufa*).

There are no Ramsar sites within the Project nor surrounding areas. The closest Ramsar Site is the National Park Estero Milagro, 60 km downstream of the Project and south of the city of Concepción (Figure 17) which provides excellent habitat for wildlife and is one of the most important aquatic environments in Paraguay, important for several endangered species, migratory birds and five threatened plant species. There are no World Heritage Sites nor Alliance for Zero Extinction sites near the Project

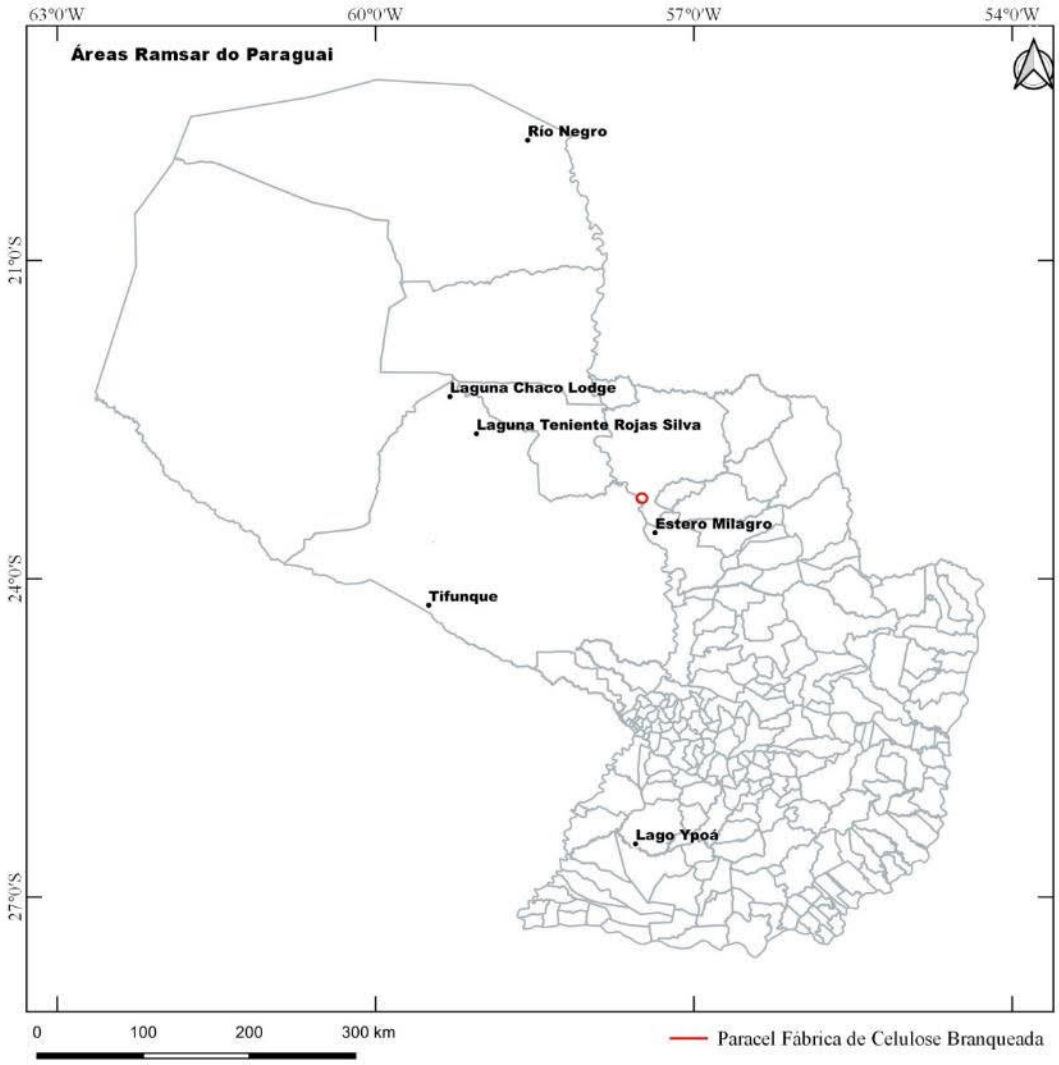


Figure 17 – Map of Ramsar areas in Paraguay. Source: Ramsar Sites Information Service (Available at: https://rsis.ramsar.org/).

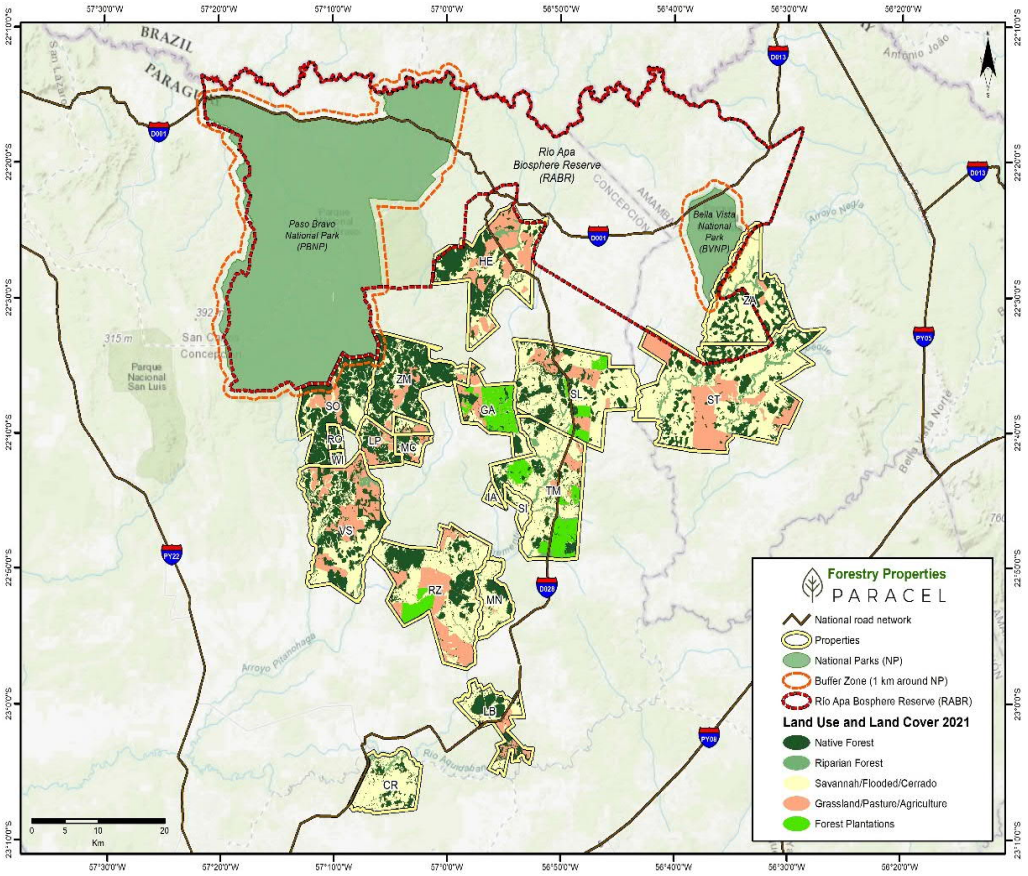


Figure 18 – Map showing Protected Areas (two National Parks and one Biosphere Reserve) in relation to PARACEL properties.

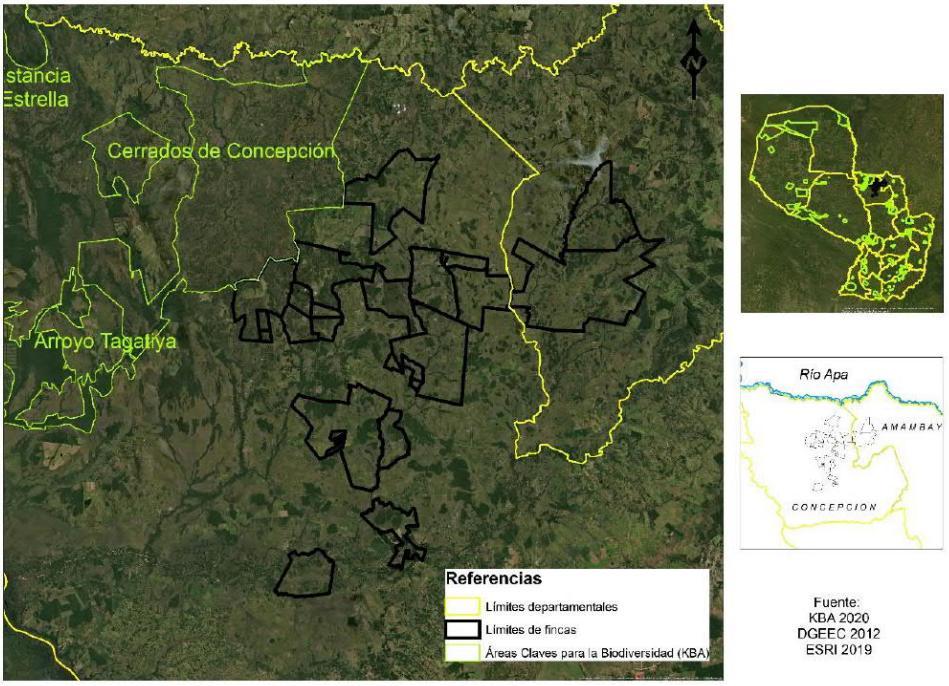


Figure 19 – Map of key areas for biodiversity conservation in relation to PARACEL properties. Produced with data from KBA (2020), DGEEC (2012) Produced by S. Ríos y L. Rejalaga

The Project currently proposes to keep the Soledad and Zanja Moroti properties that border Paso Bravo National Park totally free of plantations and is considering doing the same for the contiguous Ronaldo plantation. All these properties have extensive habitats of high conservation value. The Project has also committed to establish 1 km buffers along the entire borders of the three properties adjacent to the National Parks.

The Biodiversity offset strategy for the Project will focus on considering actions to increase the management effectiveness of the Protected and Internationally Recognized Areas nearest the Paracel properties, including the core and buffer areas of the Biosphere Reserve.

A Biodiversity offset feasibility study will evaluate whether and how it is feasible to implement management actions to reduce the ongoing and future threats to the biodiversity features within the Protected and Internationally Recognized Areas, i.e., to effect an 'avoided loss' offset mechanism versus the no-project scenario. This evaluation of threats will involve an analysis of rates and drivers of land-use change and habitat degradation in the region, and should also take into consideration potential indirect impacts from the Project's improvement of road access.

Paracel is (as of September 2021) negotiating an agreement with SENAD (the Paraguayan anti-drug agency) to establish a joint Paracel-SENAD work program to help prevent the cultivation of drugs and to reduce deforestation from illicit crops.

4.4 Socio-economic Diagnosis

The socioeconomic diagnosis of the anthropic environment aims to describe the characteristics of all aspects associated with economic and socio-environmental issues in the Project's area of influence.

For the socioeconomic diagnosis, it was established that the IIA would include the three northern departments of the country: Concepción, San Pedro and Amambay; which were taken into account since they could represent, given their proximity, areas of possible migratory flows, especially in the context of the construction stage, as well as the plantation areas location.

The Project (including the pulp mill, river port, transmission line and most forestry areas) will be located in the department of Concepción and some forest plantation areas will be at Amambay department (Santa Teresa and Zapallo farms). From the approximately 190,000 ha plantation farms, only 44,000 ha area will be located in Amambay Department (23%).

The department of Concepción is located in the north of the Eastern Region of Paraguay. To the north, bordering Brazil, to the south with department of San Pedro, to the west with the Paraguay river and to the east with the department of Amambay. Numerous rivers and streams run through it; and the main waterway is the Paraguay River.

The department of Concepción has a surface of 18,051 km^2 and occupies the second place in the region in terms of area. According to data from 2017, the current population amounts to 244,071 inhabitants. The department of San Pedro borders on Concepción to the south and has an area of 20,002 km^2. Its population reaches 419,629 inhabitants (data projection 2017) and has a population density of 21 inhabitants/km^2.

The department of Amambay borders to the west with Concepción. It has an area of 12,933 km^2, its population is 164,462 inhabitants (2017 data) and the population density is 12.7 inhabitants/km^2.

4.4.1 Population

The total population of the three IIA departments totals 828,162 inhabitants, which is estimated to represent 11.91% of the country's population, and of which 400,989 are women (48.41%).

With respect to the population that lives in rural and urban areas, figure bellow presents estimates made for each department[3].

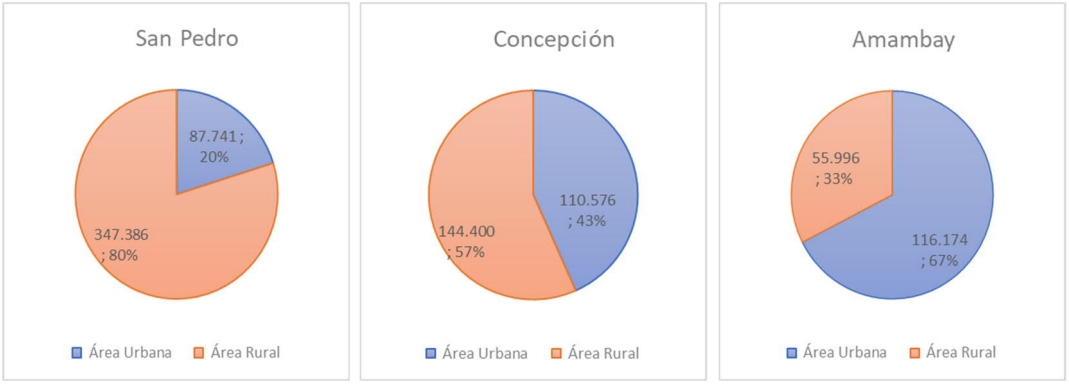


Figure 20 – Rural urban population projected according to each department year 2020, considering 2012 projections

SOURCE: OWN ELABORATION ABOUT DATA BASE PROVIDED BY STP/DGEEC. FEBRUARY 2020

52% of the country's indigenous population lives in the Eastern Region, where the three departments of the IIA are located. In the department of Concepción, 91.3% (103,396), which means that the majority lives in rural areas and 8.7% (9,858) lives in urban areas.

In the IIA, the population is eminently young: in Concepción 72% of the total population is under 35 years old, while in San Pedro and Amambay, the data is 70% and 68% respectively.

4.4.2 Poverty, Income Distribution and Unmet Basic Needs (NBI)

- According to data from the Permanent Household Survey, 43.97% of the population of Concepción is in a situation of poverty, around 107,097 people have a per capita income lower than the cost of a basic consumption basket (LPT). Of these people, 15,911 (6.53%) have a per capita monthly income lower than a minimum food consumption basket. This percentage is similar in San Pedro; being higher in the case of people living in extreme poverty. Amambay is the department with the lowest poverty rates in the IIA.
- According to available data, in 2017, the average per capita income in Concepción reached approximately Gs. 896,02617. The average income in this

3 For the estimates, according to the methodology indicated by the DGEEC, the data from a report specifically prepared by said institution were used; for each department, the projected population for the year 2020 was used and the proportions were applied according to observations from the 2012 National Census.

department is almost 40% lower than in Amambay and 7.45% higher than in the department of San Pedro.

- Regarding NBI, as mentioned in the report on the industrial component, in the three departments the highest percentage of these occurs in relation to access to health infrastructure. It is also indicated that both the departments and the districts are in worse conditions than the national average.

4.4.3 Employment

- In 2017, the open unemployment rate in Concepción was 6.66% and that of Amambay was 5.48%. In other words, some 7,247 people from Concepción and another 4,490 from Amambay were unemployed18. The country's unemployment rate was 5.20%, a figure lower than any of those mentioned.
- In the three departments, the highest proportion of the people who work do so in SMES/Establishments with 1 to 5 employees (Concepción: 70.54%; San Pedro: 81.34%; Amambay: 45.14%). On the other hand, analyzing the data provided by occupation category, it is possible to conclude that, both in Concepción and San Pedro, the population works mainly independently (Concepción: 57.02%; San Pedro: 72.46%) while that in Amambay most of the population works as employees of private companies (43.93%) compared to 39.12% of independent workers.

4.4.4 Economy

Primary Sector

Regarding the primary sector, in the three departments, 68,047 farms are registered with a total area of 4,575,7254 hectares dedicated to the sector. The area dedicated to livestock reaches 2,935,287 hectares (65.2% of the total), while that used for agriculture is 527,512 hectares (11.5%), and the area with cultivated natural and forested forests is 734,741 hectares (16.1%).

Secondary and Tertiary Sector

According to the 2011 Economic Census, in Concepción, there are 5,242 economic units that occupy 13,682 people (44.55% are women) and generate income of Gs. 1,444,284,575,000. San Pedro presents data of high similarity with Concepción, while there is less coincidence with Amambay, where all the registered data are of greater magnitude; for example, income that reaches Gs. 5,112,545,870,000. This is due to the exposure situation of the Amambay department to Brazil, where trade with the neighboring country is one of the highest in the country after Alto Paraná.

4.4.5 Stakeholder engagement

PARACEL is committed to actively engage with the communities and other interested parties in the Project’s area of influence to actively maintain and strengthen relationships with stakeholders.

4 DGEEC. Agricultural Census.

PARACEL's Stakeholder Engagement activities are responsibility of the Social Sustainability and Communications (SS&C) Team. That team is presently composed by 6 members. Paracel has an SEP. SEP goals are to ensure fruitful and mutually beneficial relationships with key local interest groups and establish and maintain a harmonious co-involvement that forms the basis of the Project's social license to operate. In doing so, the plan mandates disclosure of relevant information to the public during all project stages, including compliance with sustainability commitments, in a timely, transparent, free, culturally appropriate, and accessible manner. The information is oriented appropriately to reach various interest and vulnerable groups, which are mapped on a regular basis to understand stakeholder dynamics. One of these vulnerable groups is indigenous peoples (IP). Specific engagement efforts have been made with IP, which are briefly described in the next section.

PARACEL is opening a Community Relations Office in Conception. The office is located at Mcal. José Félix Estigarribia st., between Pedro Juan Caballero st. and Iturbe st., in Concepción downtown. Concepción was selected as the location for the office for several reasons, including that Concepción is the closest city to the mill site, and also the most populated and capital of the department. The office will be open to the public 5 days a week from 8:00 am to 5:00 pm.

Stakeholder engagement activities carried out by Paracel's SS&C Team are weaved into the different management plans and community programs, such as the *Environmental Education Program, the Workforce Environmental Education Program, the Local Procurement Plan, the Fisher's Management and Support Plan, and the Management Plan of People Affected by Land Acquisition.* In order to get the environmental license, PARACEL conducted a Public Hearing on December 10th 2020, over 180 people attended the meeting (in both face-to-face and online participation), that lasted 3 hours.

PARACEL interacts with stakeholders on a permanent basis. Most part of SEP activities comprise face-to-face interactions or gathering people from communities, including community visits to, community rounds, community assemblies and community meetings. Since early July 2019, Paracel has maintained a close dialogue with stakeholders, mainly through various interactions in Asunción and many localities in the department of Concepción. Most of these activities comprised face-to-face interactions or small group gatherings. To date more than 200 meetings have taken place with stakeholders where the following subjects have been discussed: Project description, environmental and social impacts, management and monitoring plans and programs, community concerns, opportunities, integration of the follow-up committee, grievance mechanisms, as well as specific questions and requests.

PARACEL's table of stakeholder engagement is in PL/SS/ASO Plan For Relations with the Community and other Social Actors, within the HSES-MS documents book.

4.4.6 Indigenous People

There are 10 indigenous communities near PARACEL's project areas, as it can be seen in the figure below.

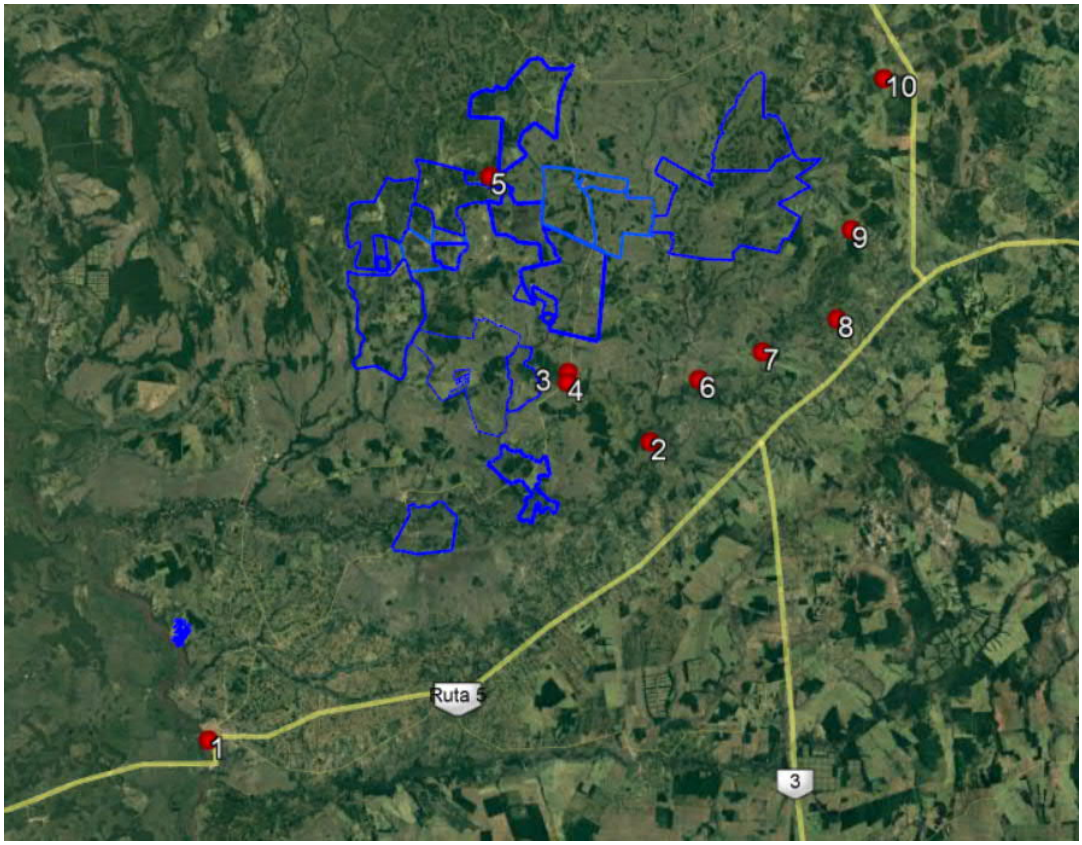


Figure 21 – Map of indigenous communities near PARACEL's project areas.

These are: *Redención Jeguahaty, Vy'a Renda, Takuarendyju, Takuarita, Sati – Pai renda Chirupoty, Guyra Ñeengatu Amba, Mberyvo Jaguarymi, Yvyty Rovi* and *Apyka Jegua*. Redención is the only IP community that is settled in an urban environment and closer to the Mill Pulp Site. All the others are in the plantation areas. Approximately 1,570 people inhabit these communities.

The Indigenous Peoples Plan (PPI) is linked to PARACEL's Social Management Plan and Environmental Management Plan; this plan is designed for the 10 indigenous communities and its objectives are:

- Ensure full respect for the rights of indigenous peoples and carry out activities established by current legislation and international regulations.
- Establish a participatory, healthy and predictable relationship framework with indigenous communities.
- Strengthen support for indigenous communities with the project.
- Promote local and community development.
- Influence PARACEL's stakeholders for the improvement of the relationship practices with indigenous communities.
- Generate a successful experience of social management with indigenous communities in the country in order to inspire future work related to local and foreign investment projects of similar characteristics.

Prior Consultation and Consent of Indigenous Communities

The study "Indigenous Consent and Identification of the Self-Determination Model of Indigenous Communities in the Direct Influence Area (DIA) of the Cellulose Plant Project" was prepared by the Natán Foundation Technical Team, which began in October 2020. It complements the Social Studies carried out by PARACEL, both for the industrial component and the forest component. It also details the FPIC process followed through more than 50 meetings with the IP communities in the Direct Area of Influence (DIA) to get their consent. This study describes technical and regulatory aspects that have been taken into account in designing, planning and implementing the consultation and dialogue process with the indigenous communities, within the framework of respect for human rights and the rights of indigenous peoples and communities.

The study includes:

a) Document research

List of indigenous communities whose current territory is in the area of direct and indirect influence and the likely impact of the forestry and industrial project. This list includes the peoples to which these communities belong, their population, their leadership system and their land tenure situation.

b) Observation and on-site study of the area

The location of the land was taken as the starting point, to get in touch with the members of the community, through a respectful dialogue, in order to obtain the first perceptions and their concerns both regarding the installation of the project, and other interests of the community. This activity involved field trips for field studies.

The criteria for identifiying the indigenous communities potentially affected by the Project has started from the approach of selecting those that are settled at a distance of up to 20 km from the physical limits of the Project. The Mbya Guaraní and Pai Tavyterá communities near the Paraguay and Ypané Rivers, both of which belong to the Guaraní language family, are Guaraní speakers.

Also included is the Community of Redención, which is located within the city of Concepción and has a multiethnic composition, such as Enxet, Qom, Guaná, Sanapaná, Angaité and Pai Tavyterá.

c) Consultation Agreement and Project Consent

As said, specific engagement efforts have been made with indigenous peoples, since the relationship with their communities is regulated by national legislation.

Before being consulted, indigenous communities must approve in writing that they agree to begin a relationship process and that they agree to be consulted about the Project. According to Decree 1039/2018, IP have the free right to accept or reject any conversation process with people who are foreign to their community. The study includes a copy of these agreements signed with each of the 10 communities, all of them dated between November 12th 2020 and December 14th 2020.

As a result of the PIC process, each of the 10 communities signed the consent of the Project in the presence of the INDI, in accordance with the law. The study also includes

a copy of these consent signed with each of the 10 communities, dated from December 15th to 18th, 2020.

4.4.7 Direct and indirect jobs

The Project will comply with the principles of IFC Performance Standard 2, clearly defining the employment relationships, depending on whether the employees are direct workers, contract workers, or supply chain workers, depending on the case. The labor required for the project will preferably be recruited in the region of Concepción through the Program for Development and Linkage with the Local Workforce.

According to the socio-economic data, people in the department of Concepción will be able to cover the demand for unskilled employment, as there is a wide availability of people who could be suitable. In the department of Concepción, a large part of the population is young, 72 per cent of whom are under 35 years of age, with an average of 7.61 years of education.

The department of Concepción could also provide a certain amount of qualified labor, as the Social Baseline showed that different types of technical courses are offered in the department with a rapid return to work, especially in the urban areas of the department, and that there are several public and private training centers.

The departments of Amambay and San Pedro, considered within the Project's IIA, will also be able to provide labor for the Project. In both departments, most of the population is young, under 35 years of age (68% Amambay, 70% San Pedro), with averages of 8.48 and 7.21 years of study. Women make up approximately half of the population of the two departments.

The generation of jobs at the local level will contribute to the reduction of unemployment, which is 6.66% (about 7,247 people) in the department of Concepción, higher than the national average rate, and of income poverty and structural poverty, which in the department of Concepción are high, over 40% in terms of income poverty and over 50% in terms of at least one (1) Unsatisfied Basic Need (UBN), above the national average. In addition, the creation of a source of employment, albeit temporary, could help reduce the levels of migration observed in the department of Concepción, which would be motivated by work, study and, more recently, lack of security.

5 IMPACT IDENTIFICATION AND ANALYSIS

The methods and criteria used to the evaluation consists of the analysis of the impacts resulting from the actions of the company in each environmental component (physical, biotic and socioeconomic), which are detailed in accordance with the minimum content defined in Article 3 of Law # 294/1993, comprising a qualitative and a quantitative evaluation.

The tables below presents all the impacts identified in the Impact assessment from Forestry and Industrial ESIAs, their corresponding mitigation measures and plan/programs.

Table 13 – Impacts – Forestry Component

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Planning	Impact to Land Acquisition and Displacement (physical and economic)	– Establish criteria for buying and leasing lands in the company's strategic planning for wood supply, avoiding the isolation of properties; – Agree to not occupy lands with population settlements or land that would require the physical or economic displacement of any person, family, group or community; – Prioritize developing eucalyptus plantations on territory that has already been largely anthropized with cattle farming and its production, and that does not occupy natural or protected areas, biosphere reserves, Ramsar areas, fragile ecosystems or any other area that is sensitive from a biotic point of view.	– Forest Master Plan – Environmental Management Plan – Biodiversity Management Program in the Forest Area – Sustainability Policy – Ecosystem Services Management Plan
Planning	Impact to Climate Change Long Term Risk Assessment	– Carry out periodic monitoring of GHG emissions and capture in forest plantations, once established, using allometric equations for this specific case. Since the site index varies depending on different factors (such as the type and quality of soil, meteorological parameters, genetic material used, diseases and others), the aforementioned would be justified, if a more exact value is intended; – Establish criteria for buying and leasing lands in the company strategic planning for long term wood supply, avoiding the eastern portion of the Santa Teresa and the southern portion of the Zapallo areas, because the plantations are located in a potential landslide hazard zone with a medium potential risk of rainfall triggered landslides several times a year (4 days on average) by the 2030s.	– Environmental Management Plan – Forest Master Plan – Sustainability Policy
Planning	Impact to Climate Change Short Term Risk Assessment	– Adopt firefighting procedures (observation towers, firebreaks, etc.) and constant training of brigade staff for these procedures; – Build firebreak capable of protecting and giving access to the planting areas due to the most common fire outbreaks.	– Emergency Preparedness and Response Plan – Corporate Security Management Manual – Occupational Health and Safety Manual – Forestry Component – Health, Safety, Environmental and Social Management Handbook

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Air	– Perform maintenance on the engines of machines, trucks and vehicles used by the company; – Humidify the internal circulation routes and use gravel on roads in order to make a safer access and preventing dust spread, whenever necessary; – Cover the trucks transporting earth, rocks and all powdery material with tarpaulins.	– Environmental Management Plan – Road Safety Program
Implantation/ Operation	Impact to Water	– Direct the expansion areas to the regions with highest rainfall index in the region – Adapt the management plantation to the crop rotation period; – Adopt forest management with water-saving strategies; – Plan plantations in the Aquidaban and Apa River basins, and their sub-basins (Arroyo Pytanohaga, Arroyo Trementina, Arroyo Negla, Arroyo Paso Bravo) with economically viable mosaics; – Develop a water availability-demand study in the sub-basins aiming to define and propose measures to reduce conflicts between water uses and users; – Develop micro basins monitoring, involving ecosystems formed by planted and native forests; – Consolidate the monitoring of surface water, water use in its farms and surroundings, especially with regard to water quality; – Study the best spacing of the eucalyptus plantation in certain areas with greater water and soil restriction and the increase of native vegetation areas; – Equate the best proportion between eucalyptus plantation areas and areas with native vegetation; – Protect riparian areas in properties especially upstream of water intake for human demand; – Develop a water availability-demand study to estimate water usage before and after planting of Eucalyptus on grassland, and potential impacts to water supply on surrounding wetlands; – Perform Biodiversity Management Program, water management program, surface and ground water quality monitoring program and biodiversity monitoring program – forestry.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Program – Water Management Program – Surface and Underground Water Quality Monitoring Program – Biodiversity Monitoring Program in the Forest Area – Soil Management Program – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact from Effluents	– Take measures to certify that the company hired to collect the sanitary sewage from the workers camps is properly regulated, and that the wastewater is disposed of in an environmentally sound manner; – Perform the maintenance of vehicles, machines and equipment in properly authorized locations; – The agricultural inputs must meet the specifications of use; – Implement containment lagoons with waterproof surface in the case of storage tanks.	– Environmental Management Plan – Forest Master Plan – Sustainability Policy
Implantation/ Operation	Impact from Runoff	– Remove plant cover from soil only in places where forest planting is strictly necessary; – Protect water bodies with dams, to avoid hauling land; – Rationalization of access opening, soil restoration, implementation of the drainage system and restoration of plant cover; – Perform slope protection and stabilization, with drainage channels and vegetation planting; – Perform erosion control at soil monitoring program; – Reduce soil preparation and planting in curves levels, avoiding surface runoff of rainwater; – Maintain plant cover between plantation lines; – Keep debarked materials in the forests, to cover the farm soil with organic matter.	– Environmental Management Plan – Forest Master Plan – Water Management Program – Surface and Underground Water Quality Monitoring Program – Soil Management Program – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Streams and Morphology	– Adopt methods to restore coastal forests in watercourses and springs; – Properly store, treat and dispose of solid waste in accordance with current legislation; – Perform qualitative-quantitative monitoring program for water resources; – Training and qualification of workers regarding conservation of preserved areas; – Recovery of riverside areas without vegetation; – Recovery of currently degraded areas; – Preserve less degraded areas of Cerrado savannah from eucalyptus plantation, considered critical habitat; – Perform the Biodiversity Management Program and the Biodiversity Monitoring Program.	– Environmental Management Plan – Comprehensive Waste Management Program – Dissemination and Communication Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Biodiversity Management Program in the Forest Area – Water Management Program – Surface and Underground Water Quality Monitoring Program – Biodiversity Action Plan – Biodiversity Monitoring & Evaluation Program – Soil Management Program – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Soil	– Supervise the collection, packaging, storage and transport of solid waste in accordance with current legislation from worker accommodations areas; – Perform the maintenance of vehicles, machines and equipment in duly authorized locations; – Promote the training of staff involved in forestry activities, especially those involved with pesticides uses; – Use the agricultural inputs according to the specifications of use; – Perform triple washing of empty packages, before their duly licensed destination; – Forward empty packets to the receiving center of the region duly licensed; – Empty packages of plant protection products must be collected and delivered to their return point; – Perform waste management plan against soil contamination by solid waste; – Perform agrochemicals management program and hazardous materials management program, in order to prevent risks to the environment.	– Environmental Management Plan – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Comprehensive Waste Management Program – Agrochemical Management Program – Hazardous Materials Management Program
Implantation/ Operation	Impact to Noise	– Carry out maintenance on machine, truck and vehicle engines; – Carry out activities in the area predominantly in the work daytime period.	– Environmental Management Plan – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Terrestrial and Aquatic Flora	– Conduct road open planning to avoid roads or services in areas of natural drainage and forest formation; – Delimitate firewall to ensure permanent preservation areas; – Remove the tree/shrub cover from the ground only where strictly necessary; – Carry out planting territorial planning, marking the Riparian Zones in order to favor organized spatial occupation and cause minimal impacts; – Implement a native forest recomposition project, covering permanent preservation areas and priority areas, defined for the formation of ecological corridors; – Recovery of riverside areas and springs without vegetation or with erosion / sedimentation by planting endemic species in the region; – Eliminate/cut the regeneration specimens spread in permanent preservation areas, preventing the formation of eucalyptus forests outside plantation areas; – Perform Biodiversity Management Program.	– Environmental Management Plan – Forest Master Plan – Corporate Security Management Manual – Occupational Health and Safety Manual – Forestry Component – Health, Safety, Environmental and Social Management Handbook – Invasive Exotic Species Control Program – Biodiversity Management Program in the Forest Area – Biodiversity Monitoring Program in the Forest Area – Sustainability Policy
Implantation/ Operation	Impact to Fauna	– Perform wildlife monitoring/research and rescue program; – Install signs on the main access routes to the planted areas through the wildlife safety and alert program; – Intensify surveillance activities in partnership with local authorities and neighbors to avoid animals hunt; – Consider the mosaics and characteristics of native habitats in the operational planning; – Proceed planting by mosaics blocks, so that the land is prepared in places strictly necessary for the implementation of forest plantation; – Perform the restoration of forests in ravine and rivers in areas at direct influence areas; – Recover currently degraded areas; – Perform Biodiversity Management Program.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring & Evaluation Program – Soil Management Program – Sustainability Policy
Implantation/ Operation	Use of Ecosystem Services	– Maintain high forests and riparian forests. – Maintain representative samples interconnected with the other types of cerrado; – Monitor the Cerrado biodiversity; – Planning of plantations.	– Environmental Management Plan – Forest Master Plan – Biodiversity Management Program in the Forest Area – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impacts to Critical Habitat	– Commit to a Net Gain goal for any measurable adverse impacts on Critical Habitat areas and implement biodiversity offsets where feasible and necessary.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Program
Implantation/ Operation	Impacts to Modified, Natural Vegetation	– Commit to a No Net Loss goal and follow the criteria for establishing an appropriate mix of conservation vs planted areas plus biodiversity offsets where feasible and necessary; – Perform the Biodiversity Management Program and the Biodiversity Monitoring Program.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Program – Sustainability Policy
Implantation/ Operation	Impacts to Protected and Internationally Recognized Areas	– Commit to protect all areas of native forest within the owned plantation lands, as well as to reforest and/or restore riparian gallery forest with native species within a 100 m buffer along rivers and smaller tributaries; – Commit to establish buffers along the border with the National Park adjacent to two plantations (Soledad and Zanja Moroti) and to manage the Biosphere Reserve buffer area, which overlaps portions of three plantations (Zapallo, Santa Teresa, and Hermosa), in accordance with the biosphere reserve's management plan (to be created) and a proper Land Use Plan.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Plan – Sustainability Policy – Biosphere Reserve Management Plan
Implantation/ Operation	Fragmentation of the natural landscape	– Remove the tree/shrub cover from the ground only where strictly necessary; – Carry out planting territorial planning, marking the Riparian Zones in order to favor organized spatial occupation and cause minimal impacts; – Recovery of riverside areas and springs without vegetation or with erosion / sedimentation by planting endemic species in the region; – Conduct road open planning to avoid roads or services in areas of natural drainage and forest formation; – Plan plantation to improve connectivity.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Plan – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Dust generation and suppression of local vegetation	– Manage the cutting period and its spatial extension, in order to avoid or minimize the loss of populations occurrence such as arthropods and other animals with limited mobility; – Plan a management through Forest Mosaic, in order to favor the displacement of fauna species.	– Environmental Management Plan – Forest Master Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Plan – Sustainability Policy
Implantation/ Operation	Noise related disturbance on fauna	– Manage the cutting period and its spatial extension, and give preference to low noise emission machines, in order to avoid or minimize the disturbance in local fauna; – Avoid removal of vegetation and specially during nesting and breeding season of birds and fauna.	– Environmental Management Plan – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Plan – Sustainability Policy
Implantation/ Operation	Eutrophication of rivers due to improper fertilization	– Perform agrochemicals management program, in order to prevent risks to the environment; – Exclude the use of all hazardous pesticides that contain or may contain active ingredients listed as prohibited by the FSC.	– Environmental Management Plan – Agrochemical Management Program – Hazardous Materials Management Program – Sustainability Policy
Implantation/ Operation	Indirect impacts of pesticide use (fipronil) on community bee keeping	– Perform agrochemicals management program, in order to prevent risks to the environment and protect the health of all employees; – Exclude the use of all hazardous pesticides that contain or may contain active ingredients listed as prohibited by the FSC; – Interview periodically the local bee keepers and compare their local bee colonies and monitor data in regard to the use of pesticides (fipronil).	– Environmental Management Plan – Agrochemical Management Program – Hazardous Materials Management Program – Community Relationship and Social Investment Program – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Harassment of workers to wild fauna and flora	– Perform wildlife monitoring/research and rescue program; – Install signs on the main access routes to the planted areas through the wildlife safety and alert program; – Intensify surveillance activities in partnership with local authorities and neighbors to avoid animals hunt; – Prohibit hunting by workers and install signs prohibiting hunting.	– Environmental Management Plan – Forest Master Plan – Biodiversity Management Program in the Forest Area – Biodiversity Monitoring Program in the Forest Area – Sustainability Policy
Implantation/ Operation	Spread of invasive species along new roads and fire breaks	– Monitor continuously the invasive species along new roads and fire breaks; – Plant native grasses within fire breaks.	– Environmental Management Plan – Forest Master Plan – Invasive Exotic Species Control Program – Corporate Security Management Manual – Occupational Health and Safety Manual – Forestry Component – Health, Safety, Environmental and Social Management Handbook – Biodiversity Action Plan – Biodiversity Monitoring and Evaluation Plan – – Invasive Species Management Plan – Sustainability Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Risk of fire	– Perform preventive measures aiming to eliminate or minimize cause and condition of fire; – Implantation of a network of surveillance towers for the detection of forest fires requires studies of the topographic characteristics of the region, calculation of the visual range of the operators / cameras of the towers and analysis of maps of fire risk based on previous occurrence records; – In the event of a fire, the main measures to be taken are: • Speed and effectiveness of the initial combat to the fire outbreak to prevent this outbreak from spreading and taking on large proportions. In order for the action time to be as short as possible, an efficient system for monitoring, detecting, communicating and mobilizing firefighting resources is necessary; • Access conditions, this means that road and bridge conditions must not prevent combat resources from reaching the desired location quickly; • Fire brigades, which consist of a water truck structure and pickup trucks with combat kits. It is recommended to have a structure of 1 (one) water truck and 1 (one) fire brigade for each 20 thousand hectares of forest plantation, for greater agility and effectiveness in combat; • Annual training of the firefighting team, reviewing all combat concepts and techniques, such as the use of retardants, fire-fighting techniques, cleaning and opening fire breaks, safety during combat, the essential equipment for the activity and how to handle them, etc. When properly trained and well positioned, the combat team becomes able to quickly locate the outbreaks and effectively implement the communication and control measures, thus reducing the risk of fire propagation; • Effective communication systems, as they guarantee the quick activation of the entire combat team and almost immediate action.	– Environmental Management Plan – Forest Master Plan – Corporate Security Management Manual – Occupational Health and Safety Manual – Forestry Component – Health, Safety, Environmental and Social Management Handbook – Emergency Preparedness and Response Plan

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Employment	– Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program; – Work with professional education organizations and institutions for the professional training of the local population through the Program for the Development and Linking of Local Labor.	– Communication Plan – Employee Influx Management Plan – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Human Talent Policy – Recruitment and Selection Policy
Implantation/ Operation	Impact to Indigenous Communities and Livelihoods	– Implement FPIC; – Ecosystem Services Review – Promote indigenous labor inclusion in PARACEL and in its suppliers, considering the cultures of origin of indigenous workers; – Monitor the adaptation of indigenous people hired to work on plantations by contractors, who must reside in temporary accommodation; – Promote respect for the rights of indigenous peoples and prevent discrimination against hired indigenous people and those residing in temporary accommodation; – Implement a Women's Empowerment Program and a Health and Safety Program; – Strengthen road safety on the roads that are shared by the project and the indigenous communities; – Perform the mitigation measures stated in the Relationship Program with Indigenous Communities.	– Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Road Safety Program – Equal Opportunities and Non-Discrimination Program – Women's Empowerment Program – Relationship Program with Indigenous Communities – Human Talent Policy – Recruitment and Selection Policy – Equal Opportunity and Non-Discrimination Policy – Ecosystem Services Management Plan – Policy of Linkage with Indigenous Peoples

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Community health and safety through vector borne and communicable diseases	– Support health campaigns in the DIA communities; – Carry out specific studies to systematize information from the Family Health Units (USF); and then deliver them to the Ministry of Public Health and Social Welfare (MSPyBS), performing a disease baseline study; – Monitor the health data of the community.	– Community Health and Safety Program – Communication Plan – Relationship Plan with the Community and other Social Actors
Implantation/ Operation	Increase Community Health, Safety and Security services availability (positive impact)	– Adopt the best environmental practices regarding water, effluent, solid wastes and noise controls, not to cause disturbance according with the Community Health and Safety Program; – Address issues such as community health, hygiene and safety through the Relationship Plan with the Community and other Social Actors; – Request public agencies to supervise safety, to inhibit illegal acts.	– Environmental Management Plan – Community Health and Safety Program – Communication Plan – Relationship Plan with the Community and other Social Actors
Implantation/ Operation	Worker Influx Increase	– Maintain the commitment to prioritize the hiring of local labor; – Prioritize the acquisition of services and goods for the company, preferably in Concepción and the region through the Promotion and Development of Local Suppliers Program; – Work with professional education organizations and institutions for the professional training of the local population through the Program for the Development and Linking of Local Labor; – Ensure decent and appropriate Labor and Working Conditions for employees, especially in terms of health plan and transportation.	– Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Workers Accommodation Plan – Human Talent Policy – Recruitment and Selection Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Labor and Working Conditions	– Promote a dissemination campaign to hire workers through the Dissemination and Communication Program, offering good work conditions; – Prioritize the acquisition of services and goods for the company, preferably in Concepción and the region through the Promotion and Development of Local Suppliers Program, offering third parties good work conditions. – Perform Program for Development and Linkage with the Local Workforce	– Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Human Talent Policy – Recruitment and Selection Policy – Equal Opportunity and Non-Discrimination Policy – Program for Development and Linkage with the Local Workforce
Implantation/ Operation	Impact to Human Rights	– Respect internationally recognized human rights; – Adopt adequate measures for the prevention, mitigation and, where appropriate, remediation of adverse impacts on human rights; – Monitor the health and safety of its workers, equal opportunities and the promotion of non-discrimination by gender, religion, ethnicity, race, sexual orientation, social status or any other factor, within the framework of full respect for human rights. – Follow the Equal Opportunity and Non-Discrimination Policy.	– Communication Plan – Dissemination and Communication Program – Community Health and Safety Program – Human Talent Policy – Recruitment and Selection Policy – Equal Opportunity and Non-Discrimination Policy – Labor Health and Safety Policy – Equal Opportunity and Non-Discrimination Policy

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Landscape and visual	– Establish measures, such as Forest Mosaics, in order to have a natural variability throughout the landscape; – Ensure planting of eucalyptus in plots with different planting ages, interspersed with ecological corridors and territorial planning of the allocation of legal reserve; – Plan the land in order to allocate the Areas of Legal Reserve to increase and enhance the benefits of Forest Mosaics and Ecological Corridors.	– Environmental Management Plan – Forest Master Plan – Biodiversity Management Program in the Forest Area – Biodiversity Monitoring Program in the Forest Area – Sustainability Policy
Implantation/ Operation	Impact to Cultural Heritage	– Take actions to ensure that the company's activities do not affect or destroy any cultural property considered as protected heritage throughimplementing the program for the protection and valorization of cultural heritage and the chance finds procedure. .	– Program for The Protection and Valorization of Cultural Heritage. – Fortuite Find Procedure

Phase	Impact	Mitigation or enhancement measures	Plans / Programs / Policies / Guidelines
Implantation/ Operation	Impact to Community Uses and Dependencies on Ecosystem Services	– Ecosystem Services Review – Prioritize the acquisition of services and goods for the company, preferably in Concepción and the region through the Promotion and Development of Local Suppliers Program; – Control application of chemical products at soils and plantations, especially during eventual aerial spraying, with effects that could accumulate and/or last in the medium and long term, and manage solid waste and effluents, especially those with chemical content or that have been in contact with these products; – Consult people who work in some of the farms where the forest plantations are located; – Perform strict measures of good practices in the field and of appropriate design, in the case of roads and drains; – Monitor water quality; – Carry out permanent monitoring of perception in the communities indicated in the Social Management Program. – Perform biodiversity monitoring program	– Ecosystem Services Management Plan – Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Agrochemical Management Program – Hazardous Materials Management Program – Comprehensive Waste Management Program – Water Management Program – Surface and Underground Water Quality Monitoring Program – Social Monitoring Program – Social Contingency Prevention and Management Program – Human Talent Policy – Recruitment and Selection Policy – Biodiversity Monitoring Program

Table 14 – Impacts – Industry Component

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Design	Generation of expectations in the population	– Disseminate project information, including details of jobs that will be generated, as well as the strategy to prioritize the local workforce, in addition to the capacity data, the technology to be used, the environmental control systems, the information on the negative and positive impacts of the company, among others, through meetings with the community and also through other means, in the Dissemination and Communication Program.	– Communication Plan – Relationship Plan with the Community and other Social Actors – Dissemination and Communication Program – Local Supplier Development and Promotion Program
Design	Generation of direct and indirect temporary jobs	– Disseminate project information, including data such as: the company's impacts, future monitoring programs, and possible employment opportunities, through the Dissemination and Communication Program.	– Communication Plan – Relationship Plan with the Community and other Social Actors – Dissemination and Communication Program – Local Supplier Development and Promotion Program
Design	Hypothesis of non-realization of the project	– To implement the pulp mill in a sustainable manner, reinforcing the company's commitment to the preservation of natural resources and the reduction of environmental impacts through the Environmental Management Plan.	– Environmental Management Plan – Communication Plan – Relationship Plan with the Community and other Social Actors – Dissemination and Communication Program

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Generation of erosion processes and river sedimentation	– Implement the Erosive Process Control and Monitoring, which aims to: • Plan the implementation of earth-moving and land-preparation works preferably outside the rainy season, in order to reduce the possibility of erosion phenomena due to the susceptibility of the land; • Minimize the exposure time of uncovered areas in the construction phase; • Store the top organic layer of the soil in a suitable place, for later reuse in a landscaping project, in gardening within the pulp mill; • Build temporary drains and sedimentation boxes around the embankment service works, to retain the solids, avoiding sedimentation in the water body.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Erosive Process Control and Monitoring Program – Sustainability Policy
Construction	Water use conflict	– Send to MADES a diagram of the place where the well is to be drilled, in which possible points of interference will be presented, such as: other wells installed, existence of springs, water courses, possible sources of contamination, etc., all within a radius of 500 m from the point of interest, as well as their relative distances to the future well; – Carry out a hydrogeological study before the installation of the wells; – Carry out Groundwater Quality Monitoring; – Coat the well with pipes to prevent the entry of unwanted water and not allow the collapse of the soil layers; – Properly close the wells to avoid any contamination of the aquifer, at the end of the works; – If it is necessary to drill wells for housing, PARACEL will inform the MADES beforehand and take the same care to avoid any contamination of the aquifer, from drilling to closing the wells.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Surface and Ground Water Quality Monitoring Program – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Change in Surface Water Quality	– Certify that the company hired to collect the wastewater from the chemical baths is properly regulated, and that the wastewater is disposed of in an environmentally sound manner; – Implement and operate a sanitary wastewater treatment plant to treat the wastewater generated during the construction phase after the chemical baths have been deactivated; – Follow the guidelines of the Water and Effluent Management Program, which aims: • Control sanitary sewage during the construction phase; • Perform audits and inspections of the sanitary wastewater treatment system during the construction phase; • Comply with the sanitary sewage emission standards of the parameters established by Resolution 222/02.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Water and Effluent Management Program – Sustainability Policy
Construction	Change in air quality	– Follow the guidelines of the Vehicular Emissions and Dust Control Program, to minimize the generation of dust, such as: • Humidify the internal circulation routes and the work yard during the execution of services, when necessary; • Cover the trucks transporting earth, rocks and all powdery material with tarpaulins.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Vehicular Emissions and Dust Control Program
Construction	Disturbances related to noise	– Follow the guidelines of the Noise Monitoring Program~~,~~ such as: • Carry out maintenance on machine, truck and vehicle engines; • Carry out activities in the area predominantly in the daytime period; • Carry out noise monitoring during the construction phase.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Vehicular Emissions and Dust Control Program – Noise Monitoring Program

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Changes in Soil and/or Surface Water and Groundwater Quality	– Follow the guidelines of the Waste Management and Monitoring Program, among which: • Manage the solid waste generated in the construction of the PARACEL pulp mill with the best practices, in accordance with Law # 3,956/2009 and Decree # 7,391/2017 (Integral Management of Solid Waste in the Republic of Paraguay), among which are: • Minimize waste generation through the 3R principle (Reduce, Reuse, Recycle); • Segregation of solid waste according to color standard; • Collection, packaging, storage and transport of solid waste in accordance with current legislation; • Environmentally appropriate final destination (reuse, recycling, composting, energy use, etc.) and/or environmentally appropriate final disposal of solid waste generated in the company; • Arrange the materials (excavation soil), if necessary, in duly authorized external areas; • Implement a Temporary Solid Waste Storage Center that will be managed by a company specialized in this service; • Implement a Debris Landfill and a Sanitary Landfill (organic).	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Waste Management and Monitoring Program – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Impacts generated by the construction of the river port	– Implement the Erosive Process Control and Monitoring Program, which aims to: • Plan the implementation of earthworks and land preparation works preferably outside the rainy season, in order to reduce the possibility of erosion phenomena due to the susceptibility of the land; • Minimize exposure time for areas without plant cover in the construction phase; • Store the top organic layer of the soil in a suitable place, for later reuse in a landscaping project, in gardens within the mill; • Build temporary drains and sedimentation boxes around the earthworks to retain solids, preventing sedimentation in the water body. – Follow the guidelines of the Noise Monitoring Program of the mill site construction regarding noise generation, such as: • Carry out maintenance on machine, truck and vehicle engines; • Perform activities in the area predominantly in the daytime period; • Perform noise monitoring during the construction phase. – Implement of the quay in the river port with the least number of pillars possible; – Supervise the environmental performance of the works during the project period; – Monitor the quality of surface water in the construction phase. – Follow the guidelines of the Vegetation Suppression Program on Industrial Site, which are: • Conduct picketing to mark the area to be removed; • Use a team experienced in this suppression activity; • Properly dispose of organic waste and vegetation from the suppression activity; • Store the organic layer on top of the soil in an appropriate place for later reuse in the landscape design of the industrial area; • Promote, as a compensation, the replanting with native species of areas within the property today impacted by livestock activity, in an area equal or greater than that occupied by the vegetation to be suppressed • Implement the Biodiversity Monitoring Program on the Industrial Site; • Carry out the supervision and environmental control of the suppression; • Prohibit the use of fire for vegetation suppression. – Mark the area of implementation of the port on the Paraguay River to avoid accidents with boats; – Inform local fishermen about the period and care during the works of the port through the Dissemination and Communication Program; – Signal the port implementation area on the Paraguay River to avoid boat accidents.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Erosive Process Control and Monitoring Program – Vehicular Emissions and Dust Control Program – Noise Monitoring Program – Vegetation Suppression Program on Industrial Site – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Communication Policy – Human Talent Policy – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Vegetation and land habitat loss	– Follow the guidelines of the Environmental Management Program for Construction, regarding the criteria and operational controls that will be carried out in the suppression of vegetation, which are: • Pick to mark the area to be removed; • Use a team experienced in this suppression activity; • Properly dispose of organic waste and vegetation from the abatement activity; • Store the top organic layer of the soil in an appropriate place for later reuse in the landscape design of the industrial area; • Promote, as compensation, the replanting with native species of areas within the property today impacted by livestock activity, in an area equal to or greater than that occupied by the vegetation to be suppressed; • Implement the Biodiversity Monitoring Program on the Industrial Site; • Carry out the supervision and environmental control of the suppression; • Prohibit the use of fire for vegetation suppression.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Vegetation Suppression Program on Industrial Site – Restoration, Compensation and Management Program of Biodiversity in the Industrial Site – Sustainability Policy
Construction	Dust generation due suppression of local vegetation	– Humidify the internal circulation routes and the work yard during the execution of services, when necessary; – Cover the trucks transporting earth, rocks and all powdery material with tarpaulins; – Perform small animals rescue, before suppression, in order to avoid or minimize the loss of populations occurrence such as arthropods and other animals with limited mobility; and – Regenerate degraded areas and implement corridors in order to favor the displacement of fauna species.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Vehicular Emissions and Dust Control Program – Sustainability Policy
Construction	Change in aquatic ecosystems	– Plan the execution of earthmoving works and land preparation preferably outside of the rainy periods; – Build a temporary structure for the containment of sediments; – Supervise the works during the project period; – Monitor the quality of surface water during the construction phase.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Erosive Process Control and Monitoring Program – Water and Effluent Management Program

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Higher risk of running over animals	– Inform and make drivers aware of defensive driving, traffic legislation and local legislation through the Road Safety Program, in order to minimize the risk of accidents, including those involving wildlife.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Road Safety Program
Construction	Risk of harassment to flora and fauna by workers	– Intensify surveillance activities in partnership with local authorities and neighbors to avoid animals hunt; – Perform environmental education program to give conscious to fauna and flora preservation.	– Communication Plan – Dissemination and Communication Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations
Construction	Impact to Natural and modified habitat	– Implementation of the Restoration, Compensation and Management Program of Biodiversity in the Industrial Site, including revegetation, reforestation and restoration of natural habitat; integrate with residual biodiversity assessment for whole project and biodiversity offset strategy as appropriate	– Environmental Management Plan – Restoration, Compensation and Management Program of Biodiversity in the Industrial Site – Whole project Biodiversity Action Plan
Construction	Generation of direct and indirect temporary jobs	– Promote an information dissemination campaign for the hiring workforce for the construction phase through the Dissemination and Communication Program, giving priority to the hiring of local people through the Local Labor Development and Linkage Program.	– Communication Plan – Employee Influence Management Plan – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Human Talent Policy – Recruitment and Selection Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Interference on infrastructure	– Disseminate the existing options of educational institutions in the municipality to workers who decide to migrate with their families, as well as to support, if possible, the competent educational bodies in the technical training of the population; – Provide an outpatient and inpatient structure for own and external employees; – Promote a zero accident practice that minimizes dependence on the region's health infrastructure; – Implement and operate on the construction site the basic sanitation system composed of: water supply service, wastewater collection and treatment, and solid waste collection and treatment service; – Accommodate workers coming from outside the region in accommodation, hotel network and rental housing already existing in the region with basic sanitation; – Provide for improvements in the public service system, together with the responsible public agencies, to meet the additional demand of the population of the region through the Community Relationship and Social Investment Program; – Implement the mechanisms for transporting workers between the municipalities involved and the construction site; – Identify the effects generated by the definition of the design of the construction site and accesses, seeking to minimize the effects on the DAA population, with emphasis on vulnerable groups through the Social Management Program for DAA communities; – Carry out a dissemination work with the subcontracted companies to orient the workers on: child prostitution, drugs, sexually transmitted diseases, etc., in the Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations with own employees and third parties; – Address issues such as health, hygiene and safety in the Community Health and Safety Program; – Request public agencies to supervise safety, to inhibit illegal acts; – Implement a program for Social Monitoring.	– Communication Plan – Dissemination and Communication Program – Workers Accommodation Plan – Community Relationship and Social Investment Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Social Management Program Community Health and Safety Program – Human Talent Policy – Recruitment and Selection Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Higher risk of accidents	– Install signage plates on the main internal access roads to the pulp mill's implementation area; – Perform maintenance on the engines of machines, trucks and vehicles used by the company; – Informing and raising awareness among vehicle drivers about defensive driving through the Road Safety Program. – Install signage plates on the transmission line path	– Communication Plan – Dissemination and Communication Program – Road Safety Program
Construction	Impact on morphology	– Implement the landscape project that favors the integration of the plant with the environment, reducing the effect of the contrast of the buildings and structures with the natural landscape, such as the implementation of tree curtains and the reuse of the land in gardens within the plant in accordance with the Landscape Restoration Program.	– Environmental Management Plan – Communication Plan – Landscape Recompositing Program
Construction	Interference with cultural heritage	– Take actions to ensure that the construction activities of the pulp mill do not affect or destroy the cultural property considered as protected heritage through the Program for The Protection and Valorization of Cultural Heritage.	– Environmental Management Plan – Communication Plan – Program for The Protection and Valorization of Cultural Heritage
Construction	Increasing tax collection and Boosting the local economy	– Prioritize the acquisition of services and goods in the construction phase, preferably in Concepción and the region through the Promotion and Development of Local Suppliers Program. – Give preference to companies, service providers and trade in the region through the Promotion and Development of Local Suppliers Program.	– Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Human Talent Policy – Recruitment and Selection Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Worker influx increase	– Give priority to hire local people through the Local Labor Development and Linkage Program; – Accommodate workers coming from outside the region in accommodation, hotel network and rental housing already existing in the region with basic sanitation, the provide camps for the workers; – Carry out a dissemination work with the subcontracted companies to orient the workers on: child prostitution, drugs, sexually transmitted diseases, etc., in the Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations with own employees and third parties; – Carry out the social perception monitoring through the Social Monitoring Program in order to identify in time inconveniences in the fulfillment of the objectives established, and to allow taking corrective actions in a timely manner; – Carry out the demobilization in accordance with the legal procedures of the contracting regime through the Contractor and Worker Awareness and Monitoring Program on compliance with regulations; – Provide in the contract with service providers, a commitment that all hired employees will be encouraged and supported to return to their places of origin, once the contracted work is completed; in addition, monitor demobilizations of hotels, rental properties and lodging; – Promote the training and qualification of people in the region for the pulp production, equipment maintenance, mechanical, electrical and instrumentation sectors, encouraging the possibility of contracting for the mill's operational phase, through the Local Labor Development and Partnership Program, signing partnerships with associations and educational institutions.	– Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Social Management Program – Job Reduction Management Plan – Human Talent Policy – Recruitment and Selection Policy
Construction	Impacts to community health and safety	– Implement Relationship Plan with the Community and other Social Actors Plan; – Implement Community Health and Safety Program.	– Communication Plan – Dissemination and Communication Program – Relationship Plan with the Community and other Social Actors Plan; – Community Health and Safety Program

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Construction	Impacts to vulnerable groups (including gender issues and impacts on supply chain workers -e.g. forced and child labor-)	– Carry out a dissemination work with the workers and subcontracted companies to orient the workers on: child prostitution, drugs, sexually transmitted diseases, etc., with own employees and third parties – Implement Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Support to the strengthening of community identity – Implement Equal Opportunities and Non-Discrimination Program – Implement Women's Empowerment Program	– Communication Plan – Dissemination and Communication Program – Relationship Plan with the Community and other Social Actors Plan – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Equal Opportunities and Non-Discrimination Program – Women's Empowerment Program – Human Talent Policy – Recruitment and Selection Policy
Deactivation	Reduction in the number of jobs	– Carry out the demobilization in accordance with the legal procedures of the contracting regime through the Contractor and Worker Awareness and Monitoring Program on compliance with regulations; – Provide in the contract with service providers, a commitment that all hired employees will be encouraged and supported to return to their places of origin, once the contracted work is completed; in addition, monitor demobilizations of hotels, rental properties and lodging; – Maintain the commitment to prioritize the hiring of local labor for the operational phase of the mill; – Promote the training and qualification of people in the region for the pulp production, equipment maintenance, mechanical, electrical and instrumentation sectors, encouraging the possibility of contracting for the mill's operational phase, through the Local Labor Development and Partnership Program, signing partnerships with associations and educational institutions	– Communication Plan – Dissemination and Communication Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Job Reduction Management Plan – Human Talent Policy – Recruitment and Selection Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Noise related disturbances	– Use machines and equipment with low noise level; – Wherever possible, soundproof the equipment by aiming for a low noise level; – Implement the Noise Monitoring Program.	– Environmental Management Plan – Noise Monitoring Program – Sustainability Policy
Operation	Change in soil and/or surface water and groundwater quality	– Apply best practices in solid waste management, in accordance with applicable laws and regulations; – Implement the Solid Waste Management Program; – Train operators for the correct disposal of the waste generated; – Implementing a system to protect soil and groundwater contamination (waterproofing) in all areas where industrial solid waste is handled, processed, treated, and disposed of; – Implement and properly operate a sanitary (organic) landfill and an industrial landfill, as well as the composting system and the production process for correcting soil acidity; – Implement the Groundwater Quality Monitoring Program.	– Environmental Management Plan – Integral Management of Industrial Waste Program – Surface and Ground Water Quality Monitoring Program – Sustainability Policy
Operation	Change in air, soil and/or surface water and groundwater quality	– Implement containment and waterproofing systems in the areas surrounding the chemical tanks, in addition to implementing maintenance plans and inspections; – Train operators involved in the handling, storage and transport of chemical products; – Implement and operate the system for collecting and handling spills and leaks.	– Environmental Management Plan – Industrial Hazardous Materials Management Program – Sustainability Policy
Operation	Conflicting water usage	– Monitor the Water Treatment Plant (WTP) to ensure the availability of water in accordance with the standards of potability for human consumption and for use in mill operations; – Follow the best water management practices, seeking continuous improvement of processes with the aim of minimizing water consumption.	– Environmental Management Plan – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Change in river quality	– Use the Best Available Techniques (BAT) in the production process to minimize the generation of liquid effluents (flow and organic load); – Implement an effluent treatment plant based on the best available practical technology (modern and safe), the activated sludge system and tertiary treatment; – Properly operate the effluent treatment plant so that the discharge of treated liquid effluents complies with current legislation; – Carry out a periodic inspection of the emissary system and its diffusers; – Carry out the Effluent Treatment Plant (ETP) Monitoring Program; – Carry out the Surface Water Quality Monitoring Program.	– Environmental Management Plan – Effluents Monitoring Program – Surface and Ground Water Quality Monitoring Program – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Change in air quality	– Follow best practices for air emissions management, as listed below: • Use of low odor recovery boiler; • High dry solids content (minimum 80%) in the black liquor burned in the recovery boiler, which minimizes SOx emissions • Use of high efficiency electrostatic precipitators for the recovery boiler, biomass boiler and lime kilns; • Collection of concentrated non-condensable gases from the digester and evaporation, and their incineration in the recovery boiler or biomass boiler (protected flame incineration); • Extensive collection of diluted non-condensable gases from the digester, brown pulp line, evaporation, with treatment in the recovery boiler; • Treatment of gases from the solution tank in the recovery boiler itself; • Efficient cleaning of bleach plant relief gases; and • Real-time gas monitoring systems and control system, rapid identification and correction of operational disturbances. – To adopt a cleaner energy matrix in its production process, based on the use of renewable fuels, producing pulp with minimum carbon emissions; – Implementing highly efficient emission control equipment, such as electrostatic precipitators; – Install chimney with defined height in the atmospheric dispersion model; – Implement an Atmospheric Emissions Monitoring Program; – Monitor the sources of atmospheric emissions through on-line measurements; – Implement an Air Quality Monitoring Program; – Implementing the Complaints, Grievances and Concerns Management Program.	– Environmental Management Plan – Atmospheric Emissions Monitoring Program – Air Quality Monitoring Program – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Fugitive emissions increase	– Follow best practices for air emissions management, as listed below: • Burning of concentrated black liquor (> 80% dry solids); • Maintenance of higher temperatures and high content of dry solids in black liquor; • Control of the adequate rate of sulfur/sodium (S/Na) in the liquor; • Control of excess air, temperature and combustion air distribution; • Maintenance the load in the furnace at optimum operating levels; • Use of fuel oil with low sulfur content, whenever possible; • Optimized combustion; • SOx emissions will be minimal because eucalyptus wood has low sulfur content; • Implement the Complaints, Grievances and Concerns Management Program.	– Environmental Management Plan – Atmospheric Emissions Monitoring Program – Air Quality Monitoring Program – Sustainability Policy
Operation	Higher risk of running over animals	– Install signage plates on the main access routes to the plant area; – Inform and raise awareness among vehicle drivers about defensive driving through the Road Safety Program.	– Environmental Management Plan – Communication Plan – Road Safety Program
Operation	Injury or death to fauna and flora due to improper waste disposal, including spills	– Apply best practices in solid waste management, in accordance with applicable laws and regulations; – Implement the Solid Waste Management Program; – Train operators for the correct disposal of the waste generated; – Implement a system to protect soil and groundwater contamination (waterproofing) in all areas where industrial solid waste is handled, processed, treated, and disposed of; – Implement and properly operate a sanitary (organic) landfill and an industrial landfill, as well as the composting system and the production process for correcting soil acidity; – Implement the Groundwater Quality Monitoring Program.	– Environmental Management Plan – Integral Management of Industrial Waste Program – Surface and Ground Water Quality Monitoring Program – Sustainability Policy

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Change in aquatic ecosystems	– Use the Best Available Techniques (BAT) in the production process to minimize the generation of liquid effluents (flow and organic load); – Adequately operate the effluent treatment plant so that the discharge of treated liquid effluents is in accordance with current legislation; – Implement the Program for Monitoring Aquatic Communities on the Paraguay River.	– Environmental Management Plan – Effluents Monitoring Program – Surface and Ground Water Quality Monitoring Program – Biodiversity Monitoring and Evaluation Program – Biodiversity Action Plan
Operation	Noise related disturbance on fauna	– Acquire machines and equipment with low noise levels; – Acoustic enclosure for equipment with a high sound pressure level; – Install silencers, attenuators, sound energy absorbers, if necessary; – Perform a health and safety programs as a way to control and/or minimize the exposure of its employees and partners to industrial noise.	– Environmental Management Plan – Noise Monitoring Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Labor Health and Safety Policy
Operation	Generation of direct and indirect jobs	– Promote a dissemination campaign to hire labor for the operation phase of the pulp mill through the Dissemination and Communication Program; – Work with professional education organizations and institutions for the professional training of the local population through the Program for the Development and Linking of Local Labor.	– Communication Plan – Employee Influence Management Plan – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Human Talent Policy – Recruitment and Selection Policy – Labor Health and Safety Policy – Supplier Code of Conduct

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Higher risk of accidents	– Follow the guidelines of the Risk Analysis Study, including: • Implement containment and waterproofing systems in the areas surrounding the chemical tanks, in addition to implementing maintenance and monitoring plans; • Provide training to operators involved in the handling, storage and transportation of hazardous products; • Install firefighting and control systems • In the event of an operational emergency, implement the Emergency Action Plan; • Use the appropriate Personal Protective Equipment on the pulp mill facilities; • Implement the Program for Prevention and Management of Social, Environmental and Labor Contingencies.	– Environmental Management Plan – Emergency Preparedness and Response Plan – Industrial Hazardous Materials Management Program – Internal Management Program for Land Affection and Risks by External Agents – Social Contingency Prevention and Management Program – Corporate Security Management Manual – HSE Guidelines - Industrial Site – Health, Safety, Environmental and Social Management Handbook
Operation	Increasing tax collection and Boosting the Economy	– Give preference to companies, service providers and trade in the region through the Promotion and Development of Local Suppliers Program. – Encourage the purchase of services and products preferably in Concepción and the region through the Promotion and Development of Local Suppliers Program.	– Communication Plan – Dissemination and Communication Program – Local Supplier Development and Promotion Program – Program for Development and Linkage with the Local Workforce – Human Talent Policy – Recruitment and Selection Policy – Supplier Code of Conduct
Operation	Road transportation increase	– Consider river transportation for wood to prevent accidents and traffic on roads; – Install signage plates on the main access routes to the plant area; – Inform and raise awareness among vehicle drivers about defensive driving through the Road Safety Program.	– Environmental Management Plan – Communication Plan – Dissemination and Communication Program – Road Safety Program

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Impacts from the Transmission line and substation	– Follow the guidelines of the programs of the mill site regarding noise, dust and erosion generation besides water resources sedimentation, impacts on fauna and flora due to transmission line and substation construction; – Minimize impacts on land use and landscape by tracing the transmission lines on the path of existing roads; – Improve economy by hiring local people for the construction; – Perform workers training to prevent accidents, through Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations; – Minimize the impact of the electric and magnetic fields to be generated during the operation of the line, due to the release of the bondage strip of the line and implementation of the safety and service zone; – Envisage flight diverters that will help migratory birds to have a visual image of vivid colors to avoid colliding with high voltage lines; – Use safety systems and standards in the design of electrical installations to ensure reasonable protection against accident risks that endanger the health of workers and third parties.	– Environmental Management Plan – Water and Effluent Management Program – Waste Management and Monitoring Program – Vehicular Emissions and Dust Control Program – Noise Monitoring Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Corporate Security Management Manual – Health, Safety, Environmental and Social Management Handbook – Labor Health and Safety Policy
Operation	Port operation	– Perform good maneuver, loading and unloading procedure to prevent accidents due to river transportation; – Require the best practices from the services providers; – Perform an Emergency Manual in the Port.	– Environmental Management Plan – River Transport Management Program – Emergency Preparedness and Response Plan – Corporate Security Management Manual – Health, Safety, Environmental and Social Management Handbook – Labor Health and Safety Policy
Operation	River transportation increase	– Prioritizeor balance wood from river transportation instead of road transportation.	– Environmental Management Plan – River Transport Management

Phase	Impact	Mitigation measures or enhancement	Plans / Programs / Policies / Guidelines
Operation	Visual impact	– Implement the landscape project that favors the integration of the mill with the environment, reducing the effect of the contrast of the buildings and structures with the natural landscape, such as the implementation of tree curtains and reuse of the soil from earthworks in gardens within the industrial area in accordance with the Landscape Recomposition Program besides revegetation of riparian forests.	– Environmental Management Plan – Communication Plan – Landscape Recompositing Program
Operation	Increase communication with local Stakeholders	– Perform Community Relationship and Social Investment Program; – Disseminate the project, informing the positive impacts that will be generated to the stakeholders through meetings and other means, in the Dissemination and Communication Program; – Carry out a conscious dissemination with direct and subcontractor workers to orient they about: child and indigenous prostitution, drugs, sexually transmitted diseases, etc., in the Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations, Supplier Code of Conduct.	– Community Relationship and Social Investment Program – Communication Plan – Dissemination and Communication Program – Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations – Stakeholder Engagement Policy – Supplier Code of Conduct

6 CUMULATIVE IMPACT ASSESSMENT

The Cumulative Impact Assessment (CIA) was performed in accordance with Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets – Good Practice Handbook, published by IFC, which recognizes that because of the increasing significance of system wide risk factors such as climate change, water availability, decline of species biodiversity, degradation of ecosystem services, and modification of socioeconomic and population dynamics, among others, cumulative impact assessment and management is an essential framework for risk management.

The CIA for the Project has been conducted following the six-step process specified by the IFC's Good Practice Handbook.. The figure bellow illustrates the Rapid Cumulative Impact Assessment (RCIA) logical framework which is suggested to be conducted by the IFC.

Steps of the RCIA process is as follows:

- Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries: Determine spatial and temporal boundaries and identify VECs;
- Step 2: Scoping Phase II – Other Activities and Environmental Drivers: Identify all developments and external natural and social stressors affecting the VECs;
- Step 3: Establish Information on Baseline Status of VECs: Determine present conditions of VECs;
- Step 4: Assess Cumulative Impacts on VECs;
- Step 5: Assess Significance of Predicted Cumulative Impacts;
- Step 6: Management of Cumulative Impacts

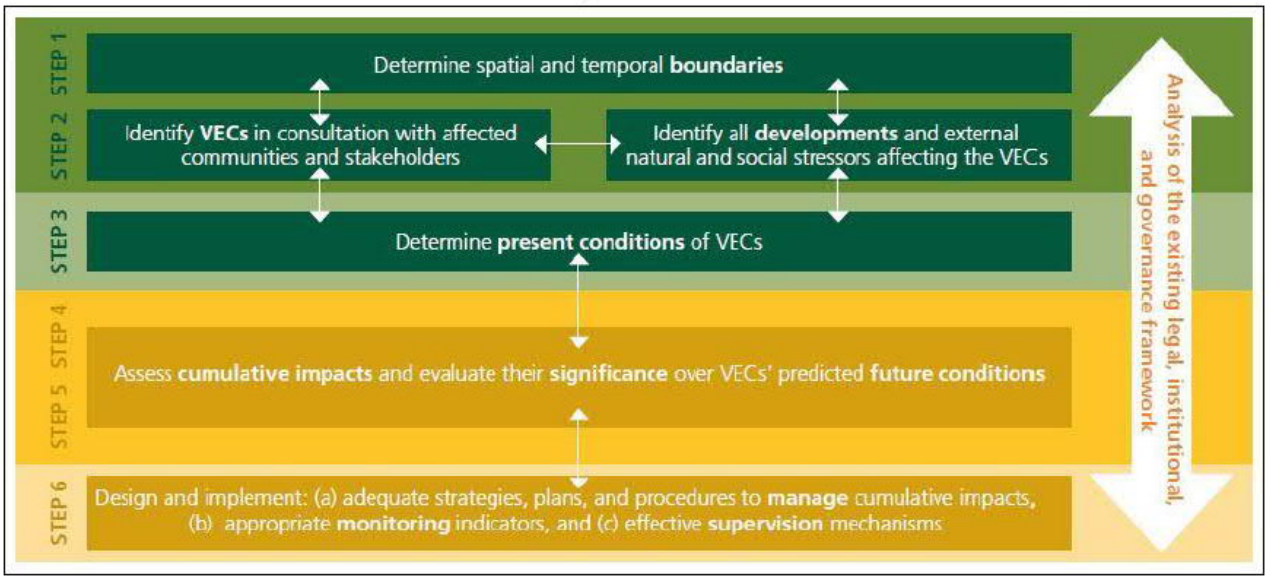
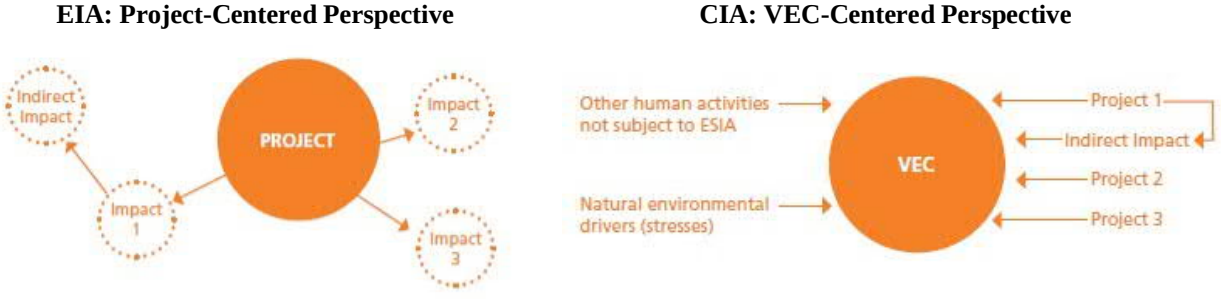


Figure 22 – RCIA Logical Framework

Unlike an EIA, which focuses on a project as a generator of impacts on various environmental and social receptors, a CIA focuses on VECs as the receptors of impacts from different projects and activities (see Figure below). In a CIA, the overall resulting condition of the VEC and its related viability are assessed.



Source: IFC 2013
CIA = cumulative impact assessment; EIA = Environmental and Social Impact Assessment; VEC = valued environmental and social component

Figure 23 – Comparing EIA and CIA

6.1 Spatial Boundary

For the delimitation of the spatial boundary, within the framework of physical, biotic and social researches, where the VECs are, as well as taken into account for the studies of the industrial component (including river port, transmission line and substation, besides the camps and road access) and the forestry component, the following criteria were considered:

- IFC Performance Standard No. 1, on the delimitation of the project's area of influence,
- The phases of the project (design, construction and operation) and its components (industrial and forestry), possible impacts and,
- The social and cultural aspects studied.

The influence area includes the departments of Concepción, San Pedro and Amambay. As mentioned above, for both, the industrial component of the project; as well as for the forest component, corresponds to these three departments in indirect influence area of the project, thus integrating both components, where the water basin, ecosystem services, infrastructure, health and safety and jobs will be affected by the whole project.

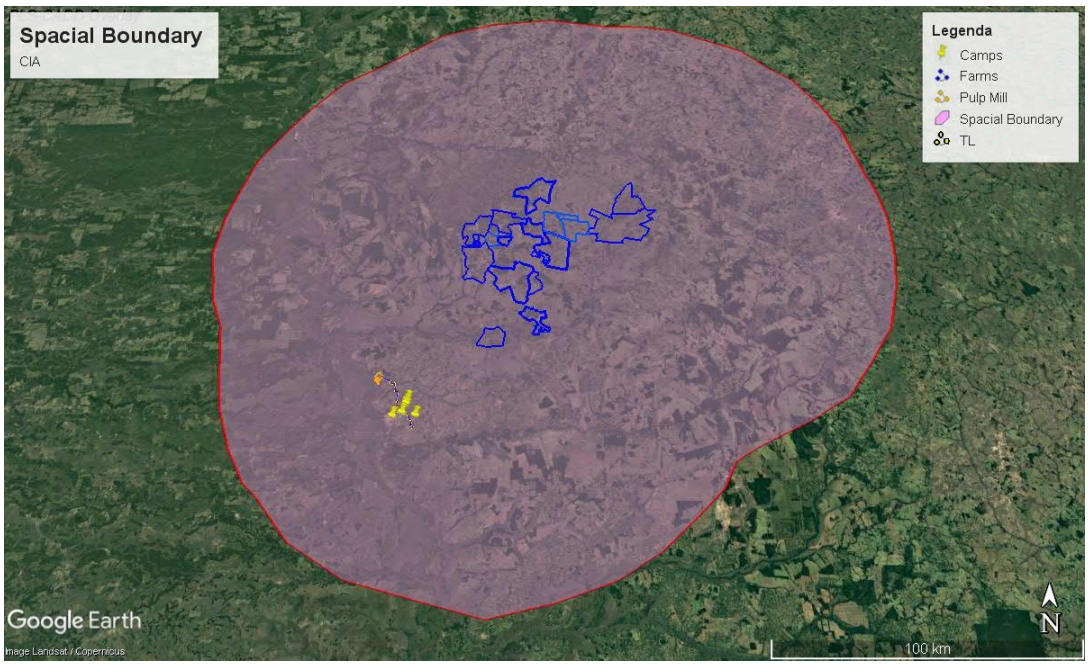


Figure 24 – Paracel project cumulative impact spatial boundary

6.2 Temporal Boundary

Regarding the temporal boundary of the study it was considered the entire period of project (in its different phases of planning, installation and operation). Although all phases will have cumulative impacts by year 6 (six), due to the fact that the forestry component will be able to be analyzed only after the mill, river port, transmission line

and substation will be already operating because the forestry activity has different schedule, as showed in the figure below:

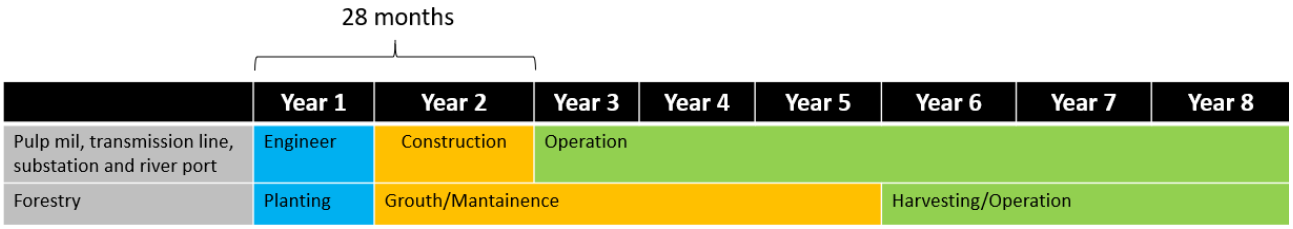


Figure 25 – Temporal Boundary for CIA

6.3 Potential Valued Environmental and Social Components (VECs)

To be included in a CIA, a VEC must first be confirmed to be valued by some identifiable stakeholder group and/or the scientific community. With this objective, it was performed the survey of the social perception through interviews within the CIA influence area, which included the following stakeholders groups: local authorities such government of the department, municipalities, regional offices of ministries and national secretariats, universities, associations, social and religious organizations, educational institutions, small businesses, tourism and recreation enterprises, sanitation boards, neighborhood commissions, public and private sector companies, and community members from the Project Area of Influence. The interviews took place between January and March 2020 for the Mill ESIA, and from July to September 2020 for the Forestry ESIA. The purpose of the interview was to find out what were the valued environmental components.

6.4 Other projects

Planned and ongoing initiatives have been identified in the project's influence area. These were also complemented with other projects known through official institutions of the National Government such as the MIC (Ministry of Industry and Commerce), MADES (Ministry of Environment and Sustainable Development), MOPC (Ministry of Public Works and Communications), MAG (Ministry of Agriculture and Cattle raising), the DNCP (National Directorate of Public Procurement) or the Municipality, and their websites, besides Latin America Bank of Development and other undertakings mentioned by the communities in the framework of the interviews carried out.

Other undertakings were mentioned by the communities in the framework of the interviews carried out. As follows:

PLANNED PROJECTS

- Project "Sanitary sewerage system and wastewater treatment plant for the city of Horqueta;
- Project "Environmental adaptation of the sanitary sewage system of Concepción - ESSAP S.A.";
- Project "Improvement of local roads in Concepción";

- Project "Improvement of the physical connectivity of the department of San Pedro - Punta Riel - Belén section";
- Project "Habilitation and maintenance of the Pozo Colorado - Concepción section";
- Improvement of the electrical system of Concepción (Section SE Horqueta - SE Concepción);
- Improvement of the dredging of the Paraguay - Paraná Waterway.

PROJECTS IN OPERATION

- Projects "Drinking Water System and Complementary Activities of ESSAP in the City of Concepción" and "Improvement of the Potable Water System for Regional Development in the Republic of Paraguay - ESSAP S.A Ciudad de Concepción";Project "Frigorífico Concepción";
- Project "JBS - Belén".

6.5 External drivers

Regionally present external drivers and stressors were identified through both ESIA-generated information and publicly available information. The evaluated External Drivers were climate change and livestock farming.

6.6 Selection of VECs

All potentially eligible VECs were analyzed against the following criteria: (1) confirmed to be valued by an identifiable stakeholder group; (2) reasonably expected to be impacted by the Project (i.e., at least one potential impact significance rating of Minor or Above); and (3) reasonably expected to be potentially impacted by some combination of other projects and external drivers. To be included in the CIA, the VEC had to meet all three criteria. The VECs selected in the CIA were:

- Soil contamination (erosion and waste collection and treatment system)
- Surface water resources (watershed conservation, drainage and sanitation)
- Infrastructure and road safety
- Jobs
- Local Development

6.7 Assessment of Cumulative Impacts on VECs

The CIA assessed the future conditions of the VECs, considering the impacts from the Project, other projects, and external drivers. The potential impacts to VECs were established from the results of the two Project ESIAs and other available information. If the potential impact significance on a VEC was rated as minor or higher for at least one potential impact associated with the Project (Industrial and/or Forestry) in the Project ESIAs, the VEC was identified as potentially eligible for the CIA. If no impact information was available (e.g., for other projects), it was assumed common sector-based impacts.

Based on the publicly available information and the findings of the stakeholder interviews, cumulative impacts were categorized by priority using the following definitions:

- **High Priority**: The VEC is expected to be adversely impacted by other projects and/or external drivers and the future addition of the Project could incrementally contribute to the adverse impact. Actions should be implemented in the short term to mitigate potential adverse cumulative impacts on the VEC.
- **Medium Priority:** The VEC could potentially be impacted by other projects and/or external drivers, and the Project could potentially contribute to the adverse impact. Actions should be implemented in the medium term to mitigate potential adverse cumulative impacts on the VEC.
- **Low Priority:** The VEC could potentially be impacted by other projects and/or external drivers, but the Project would not be expected to contribute to the adverse impact or its contribution is expected to be negligible. No actions are required to mitigate potential adverse cumulative impacts on the VEC, due to all mitigation measures presented at both ESIAs are adequate to mitigate any potential adverse cumulative impacts on the VEC.

The only VEC considered with Medium Priority was Surface water resources (watershed conservation, drainage and sanitation), all the other were considered with Low Priority.

6.8 Management of Cumulative Impacts

The management measures needed to prevent cumulative impacts in medium priority will depend on both the context in which the development impacts occur (i.e. the impacts from other projects and natural drivers affect the VECs) and the characteristics of the development's impacts. Since cumulative impacts typically result from the actions of multiple stakeholders, the responsibility for their management is collective, requiring individual actions to eliminate or minimize individual development's contributions. It should be noted that there is limited information on other developments at the time of conducting this CIA.

Besides controls and management measures included in both ESIAs (Industrial and Forestry) provided a means to mitigate the specific contributions of the Project to effects on VECs, the CIA provided recommendations in the context of the Project to manage potential cumulative impacts on the VEC. These recommendations are:

- Take measures to certify that the company hired to collect the wastewater from the chemical baths is properly regulated, and that the wastewater is disposed of in an environmentally sound manner.
- Adapt the management plantation to the crop rotation period.
- Adopt forest management with water-saving strategies.
- Plan plantations in the Aquidaban and Apa River basins, and their sub-basins (Arroyo Pytanohaga, Arroyo Trementina, Arroyo Negla, Arroyo Paso Bravo) with economically viable mosaics.
- Develop a water availability-demand study in the sub-basins aiming to define and propose measures to reduce conflicts between water uses and users.

- Develop micro basins monitoring, involving ecosystems formed by planted and native forests.
- Consolidate the monitoring of surface water, water use in its farms and surroundings, especially with regard to water quality.
- Study the best spacing of the eucalyptus plantation in certain areas with greater water and soil restriction and the increase of native vegetation areas.
- Equate the best proportion between eucalyptus plantation areas and areas with native vegetation.
- Protect riparian areas in properties, especially upstream of water intake for human demand.
- Develop a water availability-demand study to estimate water usage before and after planting of Eucalyptus on grassland, and potential impacts to water supply on surrounding wetlands.
- Perform Biodiversity Management Program which the biodiversity monitoring program demonstrates to result in No Net Loss or a Net Gain to significant biodiversity values with residual impacts from the project, water management program, surface and ground water quality monitoring program – forestry;
- Meet IFC EHS Guidelines for Perennial Crop Production.
- Use the best available technologies (BAT) in the production process to minimize the generation of liquid effluents (flow and organic load).
- Implement an effluent treatment plant based on the best available practical technology (modern and safe), the activated sludge system and tertiary treatment.
- To properly operate the effluent treatment plant so that the discharge of treated liquid effluents complies with current legislation.
- Carry out a periodic inspection of the emissary system and its diffusers.
- Carry out the Effluent Treatment Plant (ETP) Monitoring Program.
- To carry out the Surface Water Quality Monitoring Program.
- Prevent impacting other waterway users activities during dredging works through the correct communication provided.

7 HEALTH, SAFETY, ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

The implementation of PARACEL Health, Safety, Environmental and Social Management System (ESMS) is the mechanism by which Paracel controls, minimizes and mitigates the impacts resulted from the project. Paracel's ESMS chart is presented and it consists of 11 policies, 45 programs, and a number of supporting protocols and guideless as presented in the following table. Planned post-ESIA studies such as the Ecosystem Services Review, Critical Habitat Assessment and No Net Loss / Net Gain Biodiversity Offset Feasibility Study will result in additional programs and management plans in relation to biodiversity and ecosystem services that will be

detailed in an overarching Biodiversity Action Plan (BAP). Net biodiversity outcomes from project interventions will be assured through a Biodiversity Monitoring and Evaluation Plan that will integrate all relevant monitoring data and set adaptive management response thresholds.

PARACEL will implement the Social Management Programs and the Environmental Management Programs through the Communication and Corporate Social Responsibility and Environmental Sustainability departments, respectively, in coordination with the other PARACEL departments, and at a corporate level.[5]

[5] Sistema basado en: principio de Ecuador N° 4, norma de desempeño N°1 IFC y Marco ambiental y social del Banco Mundial

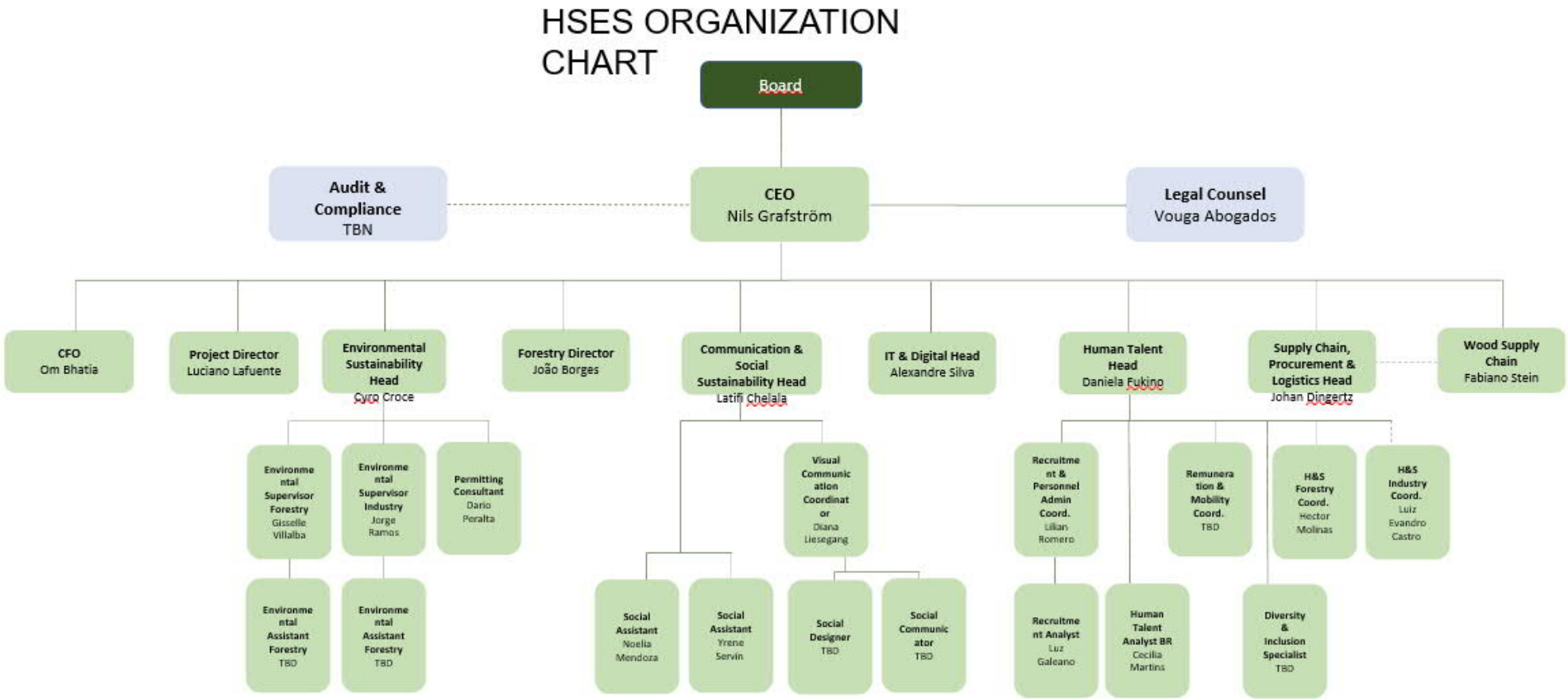


Figure 26 – Organizational chart

Table 1 - List of Social and Environmental Management Programs, Policies, Procedures, Codes, Plans, Tables, Protocols and Instructions Documents for the project

Scope	Name	Code
Plans		
Environmental	1.1. Environmental Management Plan	PL/SA/PGA
Social	1.2. Communication Plan	PL/CM/COM
	1.3. Workers Accommodation Plan	PL/TH/ACO
	1.4. Employee Influence Management Plan	PL/TH/INF
	1.5. Stakeholder Management Plan	PL/CO/COM
	1.6. Job Reduction Management Plan	PL/TH/RED
	1.7. Relationship Plan with the Community and other Social Actors	PL/SS/ASO
Health and Safety	1.8. Emergency Preparedness and Response Plan	PL/TH/EME
Governance	1.9. Forest Master Plan	-
Social	2.1. Dissemination and Communication Program	PR/SS/DCO
	2.2. Local Supplier Development and Promotion Program	PR/SS/PDP
	2.3. Complaints Management Program, Suggestions and Inquiries	PR/SS/QRI
	2.4. Community Relationship and Social Investment Program	PR/SS/RCI
	2.5. Road Safety Program	PR/SS/SEV
	2.6. Program for Development and Linkage with the Local Workforce	PR/SS/MDO
	2.7. Social Management Program	PR/SS/MSC
	2.8. Community Health and Safety Program	PR/SS/SSC

Scope		Name	Code
		2.9. Social Monitoring Program	PR/SS/MSO
		2.10. Program for The Protection and Valorization of Cultural Heritage	PR/SS/PCU
		2.11. Awareness and Follow-Up Program for Contractors and Workers Regarding Compliance with Regulations	PR/SS/CON
		2.12. Relationship Program with Indigenous Communities	PR/SS/RPI
		2.13. Internal Management Program for Land Affection and Risks by External Agents	PR/SS/AAE
		2.14. Social Contingency Prevention and Management Program	PR/SS/PCS
		2.15. Equal Opportunities and Non-Discrimination Program	PR/TH/IGU
		2.16. Women's Empowerment Program	PR/SS/MUJ
Environmental	Forestry Plantations	2.17. Comprehensive Waste Management Program	PR/SA/F02
		2.18. Agrochemical Management Program	PR/SA/F07
		2.19. Hazardous Materials Management Program	PR/SA/F01
		2.20. Invasive Exotic Species Control Program	PR/SA/F03
		2.21. Water Management Program	PR/SA/F08
		2.22. Biodiversity Management Program in the Forest Area	PR/SA/F05
		2.23. Surface and Underground Water Quality Monitoring Program	PR/SA/F04
		2.24. Biodiversity Monitoring Program in the Forest Area	PR/SA/F06
		2.25. Soil Management Program	PR/SA/F09
		2.26. Erosive Process Control and Monitoring Program	PR/SA/C01

Scope		Name	Code
	Industrial Site - Construction Phase	2.27. Water and Effluent Management Program	PR/SA/C02
		2.28. Waste Management and Monitoring Program	PR/SA/C03
		2.29. Vehicular Emissions and Dust Control Program	PR/SA/C04
		2.30. Noise Monitoring Program	PR/SA/C05
		2.31. Vegetation Suppression Program on Industrial Site	PR/SA/C06
		2.32. Landscape Recompositing Program	PR/SA/C07
		2.33. Restoration, Compensation and Management Program of Biodiversity in the Industrial Site	PR/SA/C08
	Industrial Site - Operation Phase	2.34. Integral Management of Industrial Waste Program	PR/SA/O01
		2.35. River Transport Management Program	PR/SA/O08
		2.36. Effluents Monitoring Program	PR/SA/O02
		2.37. Surface and Ground Water Quality Monitoring Program	PR/SA/O04
		2.38. Atmospheric Emissions Monitoring Program	PR/SA/O05
		2.39. Air Quality Monitoring Program	PR/SA/O07
		2.40. Noise Monitoring Program	PR/SA/O03
		2.41. Biodiversity Monitoring Program on the Industrial Site	PR/SA/O06
		2.42. Industrial Hazardous Materials Management Program	PR/SA/O09
Governance		3.1. Drafting Procedure and Control of Documents and Records	PC/CM/DOC
		3.2. Procedure for Complaints, Suggestions and Inquiries	PC/SS/QSC
Health and Safety		4.1. COVID-19 Prevention Protocol	PT/TH/COV

Scope	Name	Code
Social	4.2. Fortuite Findings Protocol	PT/SS/HFO
Sustainability	5.1. Sustainability Policy	PO/SS/SUS
Social	5.2. Communication Policy	PO/CM/COM
	5.3. Human Talent Policy	PO/TH/TAH
	5.4. Recruitment and Selection Policy	PO/TH/REC
	5.5. Equal Opportunity and Non-Discrimination Policy	PO/TH/GEN
	5.6. Policy of Linkage with Indigenous Peoples	PO/SS/PIN
	5.7. Social Investment Policy	PO/SS/ISO
	5.8. Corporate Travel Policy	PO/TH/VIA
	5.9. Stakeholder Engagement Policy	PO-CM-COM
Health and Safety	5.10. Labor Health and Safety Policy	PO/TH/SSL
Governance	6.1. Supplier Code of Conduct	Not applicable
	6.2. Code of Ethics Paracel	Not applicable
Health, Safety, Environmental and Social	7.1. Corporate Security Management Manual	MA/TH/SEG
	7.2. HSE Guidelines – Industrial Site	-
	7.3. Occupational Health and Safety Manual – Forestry Component	MA-SL-SSL
	7.4. Health, Safety, Environmental and Social Management Handbook	MA/SA/MSG
Sustainability	8.1. Stakeholder Table	Not applicable
	8.2. Materiality Matrix	Not applicable

Scope	Name	Code
	9.1. Impact Measurement Instruction	IN/SS/IMP
Sustainability	10.1. List of Objectives of the Socio-Environmental System of Paracel S.A.	LI/CO/VIG

8 CONCLUSION

PARACEL plans to build a world-class pulp mill, in compliance with the highest sustainability standards, on the left embankment of the Paraguay river in the Concepción region of Paraguay, 400 km north of Asunción.

The mill was conceived to produce 1 500 000 ADtB/year of bleached eucalyptus pulp. In order to obtain greater autonomy for wood supply, PARACEL has purchased 190,000 hectares (ha) of former cattle ranch lands in the Departments of Concepción and Amambay. The mill is expected to produce 200 MW of renewable energy, generating a surplus of 100 MW, therefore the project also includes a 220 kV Transmission Line, of which the stretch will be between the Concepción Substation and the new Estancia Zapatero Cue Substation, presenting an approximate 33 km length to get energy to the mill. Paraguay river will be used to transport wood and pulp, so there will be a River Port on the left bank of the Paraguay River near the mill.

PARACEL project is committed to meet the IFC Performance Standards (2012) and applicable EHS Guidelines.

Regarding PS6, there is potential for the Project make a net-positive contribution to the conservation status of the local Aquidabán Cerrado ecoregion compared to the no-project scenario. Further post-ESIA studies are planned to confirm the level of conservation importance (i.e., Critical & Natural Habitats as per PS 6 definitions) of the Paracel properties within their area of influence and quantify the residual biodiversity impacts per habitat type under different plantation development scenarios. These studies' metrics will be inputs into a No Net Loss / Net Gain Feasibility Assessment that will examine the socio-economic feasibility and scale of biodiversity offset management interventions necessary to attain the net-positive outcome goal. Preliminary analyses of available information indicate that for forest habitats the Project already has a net-gain designed into existing management plans and that for the non-conserved area of savanna Cerrado habitats to be converted into plantations there are possibilities to avoid future degradation and loss through increasing the management effectiveness and scale of Protected Areas.

Paracel is developing an integrated land use development management plan for the large plantation area that commits to maintaining all forested areas (so no existing natural forest areas will be affected by the Project's plantations), restoration of natural forest areas degraded by logging, protection of all riparian corridors and wetlands, and incorporating ecological corridors to connect forest areas with riparian corridors for wildlife transit. In addition, the project will establish one km wide buffers where its properties are adjacent to the National Parks Paso Bravo and Bella Vista, and the three plantations which overlap the Cerrado del Rio Apa Biosphere Reserve buffer zone will have a differentiated management plan to implement a minimum of 50% conservation areas. Because the Biosphere Reserve is both legally protected and Internationally Recognized [conservation] Area and there is project overlap, Protected Area managers, affected communities and stakeholders will be consulted in line with PS 6 requirements. Opportunities will be sought to enhance the effective management of the area, most likely as part of a biodiversity offset strategy. The buffers, riparian corridors, and ecological corridors will preserve a mosaic of the different Cerrado habitats whose condition will be protected through management plans, including the control of invasive African grasses introduced during cattle ranching. Overall, Paracel expects to dedicate over 90,000 hectares, or up to 47% of its total land holdings exclusively to conservation.

Furthermore, Paracel is exploring REDD+ and other mechanisms to assure set aside or offset areas can be preserved in perpetuity.

As already mentioned in the Forestry Social Baseline, there would be an important change in land use in the lands occupied by the Project, although highlighting that the land is already intervened by agricultural and livestock activities; and in the medium term, it would move to a purely forestry activity. Therefore, the impact on the following social factors, resulting from the evaluation of the impact of the enterprise, could generate cumulative impacts on the following social factors or VECs: Ecosystem services, local and regional economy, quality of life and customs; primarily due to the change in land use and possible effects that could occur in the area's water resources. The VEC linked to the health and safety of third parties is also related to possible conditions derived from the increase in traffic, which to the extent that all forest fields are developed or are even expanded over time, could generate cumulative impacts related to road safety and the safety of the people who live in the communities settled in the localities located on the access/exit roads to/from the forest fields.

The Project identified positive impacts related to the socioeconomic aspects that are fundamentally related to the increase in direct and indirect employment, the increase in tax collection and the dynamism of the local economy.

PARACEL is in the early stages of construction and pre-operation planning. It is estimated that the forestry area will generate approximately three thousand jobs. The workforce required to establish the PARACEL pulp mill is estimated at approximately 8,000 workers during the peak construction and assembly period. The total labor force, including PARACEL employees and third parties necessary for the operation of the PARACEL pulp mill will be approximately 1,200 persons, including the transmission line maintenance operations.

The operation of the pulp mill in the municipality of Concepción, as well as the creation of direct and indirect jobs, will promote an increase in tax collection, which will provide the government with investment possibilities in social and economic areas. This process is called the multiplier effect and is based on economic theories to estimate the economic impact of the main initiatives.

Thus, the increase in the collection of taxes derived from the company is considered a positive impact and of great importance.

Although the population increase, represented by the manpower hired, tends to raise the demand for public services like: education, health, sanitation, transportation, etc. the Project will have a positive impact. The project will have a positive influence over time in the structural improvement and of paving of all public routes to be used for the transport of wood,, through: i) decrease in travel times (note that traveling the 70 km between *Jhugua Ñandu* and *Puentesiño* takes today 1,5 hours), ii) improvement of road safety; iii) reduction of the emission of rolling dust, with its consequent benefits to the environment and public health in general, iv) facilitation of access to/from emergency services (ambulances, police, firefighters).

PARACEL will make every possible effort to meet the expectations of the indigenous families, not only to satisfy their needs, but rather to seek the permanent and honest development of synergies with the indigenous communities that promote the construction of solid, collaborative and lasting relationships based on commitment and mutual trust. This will be achieved through establishing and maintaining a continuous relationship with the communities and Indigenous Peoples, fostering full respect for

human rights, dignity, aspirations, culture and means of subsistence dependent on the natural resources of Indigenous Peoples,

According to the analyses carried out during the Environmental and Social Impact Assessment (ESIA) from both industry and forestry component, it can be stated that no environmental impact was identified that, in the opinion of the Poyry technical team that developed those ESIAs, question the environmental feasibility of the company's implementation project. The environmental aspects identified as being of greater vulnerability will be mitigated, thus it is required that the environmental control measures must be considered and implemented correctly.

The project is feasible from the economic, social, environmental, technical and legal points of view, which will contribute to the social and economic growth of the region, the departments of Concepción and Amambay as well as Paraguay as a whole.