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ENVIROMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

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PARACEL

EUCALYPTUS PLANTATION
Departments of Concepción and Amambay – Paraguay

VOLUME III – IMPACT IDENTIFICATION AND ANALYSIS

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7 IMPACT IDENTIFICATION AND ANALYSIS

7.1 Impact Assessment Methodology

This document consists of the Environmental and Social Impact Assessment (ESIA) for the implementation of PARACEL plantation areas, within approximately 190,000 ha of plantation lands which will be acquired in Concepción and Amambay Departments, in Paraguay.

The planting and harvesting of eucalyptus are an essential activity for the production of the wood, necessary for the pulp mill with expected production of 1.5 million (M) air dried tons (ADt) of bleached eucalyptus pulp per year. It should be noted that PARACEL's pulp mill, despite being designed to produce 1,500,000 tons per year, it will be able to produce up to 1,800,000 tons per year of bleached pulp as a result of a greater overall efficiency of the plant, as well as higher equipment performance without the need to increase the constructed area or include new additional equipment.

It is noteworthy mentioning that nursery services is a third party that does not fall within the scope of this ESIA. However, all third parties will abide by Paracel ESMS which has a strong sustainable process bases that requires strict standards to all of its own employees and subcontractors, ensuring the best environmental practices and a safe and healthy working environment.

The eucalyptus forestry areas can undergo changes resulting from the planting, harvesting and transportation of wood, both in own and leased farms of PARACEL. Therefore, it can be said that since there might be changes in the environmental aspects, this ESIA should be evaluated. According to Article 1 of Law # 294/93:

> “Environmental impact, for legal purposes, shall be understood as any modification of the environment caused by human works or activities that have as a positive or negative consequence, directly or indirectly, to affect life in general, biodiversity, the quality or a significant quantity of natural or environmental resources and their use, welfare, health, personal safety, habits and customs, cultural heritage, legitimate livelihoods.”

The methods and criteria used for the evaluation of impacts consist of the analysis of the impacts derived from the enterprise's actions in each environmental component (physical, biological and anthropic), being detailed according to the minimum content established in article 3 from Law 294/93.

Other than that, this document is in line with what established by the Performance Standards (PS) of the IFC:

- IFC PS 1 on "Evaluation and management of environmental and social risks and impacts";
- IFC PS 2 on “Labor and working conditions”;
- IFC PS 3 on “Resource Efficiency and Pollution Prevention”;
- IFC PS 4 on “Community Health and Safety”;
- IFC PS 5 on “Land Acquisition and Involuntary Resettlement”;
- IFC PS 6 on “Biodiversity Conservation and Sustainable Management of Living Natural Resources”;

- IFC PS 7 on “Indigenous People”;
- IFC PS 8 on “Cultural Heritage”.

Therefore, the diagnosis of the area of influence provided greater knowledge of the region, allowing a prognosis related to its future development. Having said this, the knowledge of the characteristics of the project and the environmental aspects of its area of influence made it possible to identify and evaluate the possible consequences for the natural or anthropic environment based on an appropriate methodology. For the analysis of these consequences, the structure of the document was based on the following items:

- Identification of impact generating activities;
- Methodology for environmental impacts assessment;
- Identification of environmental impacts;
- Environmental impact assessment;
- Evaluation summary tables.

The conclusions obtained in the impact assessment phase allowed us to propose mitigation measures, when negative impacts are involved, as well as ways maximize impacts, when positive impacts are involved, thus optimizing the benefits generated by PARACEL's company.

7.1.1 Identification of impact-generating activities

In order to identify the activities that generate environmental impact, a survey was carried out of the actions to be carried out in the different stages of the project: planning, implantation and operation. At each of these stages, due to the actions taken, there may be changes in the environment, which must be recorded and evaluated.

The main impacts generated from activities (generating factor) identified for each phase of the forestry process were:

Planning, implantation and operation phase

- Land acquisition;
- Cleaning the land;
- Vegetation removal;
- Opening accesses and roads;
- Water consumption;
- Generation of sanitary sewage;
- Generation of solid waste;
- Vehicle traffic;
- Vehicle maintenance;
- Transport of chemical products;
- Use of agricultural inputs, such as fertilizers, herbicides, fungicides and insecticides;
- Eucalyptus plantation;
- Eucalyptus harvesting;
- Formation of the eucalyptus forest;
- New economic sector;
- Hiring labor force;
- Hiring outsourced services.

7.1.2 Methodology for environmental impacts assessment

Currently, there are several methodological lines developed for environmental impact assessment: spontaneous methodologies (Ad hoc), checklists, interaction matrices, interaction networks, quantitative methodologies, simulation models, overlay maps, scenario projection, among others.

PÖYRY has a multidisciplinary team with extensive experience and has conducted numerous environmental studies in various segments, and especially in the paper and pulp sector including eucalyptus forestry. Thus, over the years, through the accumulation of experience and the increase in the repertoire of technical and scientific works, PÖYRY has developed its own methodology for the identification and evaluation of impacts.

This methodology is based on the development of a checklist (which in turn already includes interaction matrices), in which the factors generating impacts (activities) and the aspects leading to impacts on the environmental components are listed in the various project phases.

The impact assessment methodology was also based on legal provisions such as Law no. 294/93 and therefore presupposes temporal and spatial scales of impacts. In this study, the planning, implantation and operation phases were used as the temporal scales, and for the spatial scales the area directly affected, the area of direct influence and the area of indirect influence were used. The evaluation was consolidated through discussion among the members of the multidisciplinary technical team.

Thus, impacts were evaluated, qualifying them according to their specificities and indicating their spatial magnitude (qualitative measure) and degree of importance depending on how long they remain in the environment. According to these criteria, the main impacts were characterized by the following attributes:

- The **nature**: indicates whether the impact has beneficial/positive (P) or adverse/negative (N) effects;
- The **form of incidence**: indicates if the impact affects the environmental factor direct (D) or indirect (I);
- The **area of spatial coverage**: can be local (L), when the impact spread in the directly affected area at plantation lands and/or in the area of direct influence; regional (R), when the impact is spread in the municipality of Concepción and/or spreads to the Department of Concepción and Amambay; or strategic (E), when the impact is interconnected with local and/or regional development strategies;
- The **probability of occurrence**: whether the impact is a certain event (C) to occur, or possible (P);
- The **moment of occurrence**: if the impact occurs after the start of the generating activities in an immediate way (I) / short term (CP); medium term (MP) and long term (LP);
- The **temporality or duration**: refers to the duration of the impact on the environment, which can be temporary (T), when it occurs in a determined period, permanent (P), when it occurs throughout the life of the company, and cyclical (C), when the effect is manifested in certain intervals of time;

- The **degree of reversibility**: reversible (R), when the affected environmental factor tends to return to the original conditions, or partially reversible (PR) and irreversible (I), when the factor does not return to the original conditions;
- With respect to **accumulation**: when the impact is established as simple (S), accumulation Type I (I), accumulation Type II (II), and accumulation Type III (III);
    - Simple (S): is not characterized by bioaccumulation or biomagnification processes; does not accumulate in time or space; does not induce or enhance any other impact; does not interact in any way with other impact(s); and does not increase in past and present actions (European Commission, 2001);
    - Type I (I) accumulation: accumulation by bioaccumulation;
    - Type II (II) accumulation: accumulation by repetition or overlap, accumulating in time and/or space;
    - Type III (III) accumulation: accumulation by interactivity or synergy.
- The **magnitude**: refers to the degree of impact on the studied element, which can be low (B), medium (M) or high (A), depending on the area of spatial coverage reached;
- In relation to the **possibilities of mitigation**: possible impact to be mitigated (M), partially mitigated (PM) and not mitigated (NM)
- Regarding **importance**: it establishes as small (P), medium (M) or large (G), taking into account the magnitude and possibilities of mitigation of the environmental factors affected by the impact. In order to establish a combined rule for the attributes of magnitude and mitigation for the definition of importance, the following Table was drawn up

Table 1 – Criteria for environment impact assessment

Importance	Criteria
Small	- Low and mitigated magnitude (or low degree of enhancement for positive impacts) - Low and partially mitigated magnitude (or medium degree of enhancement for positive impacts) - Medium magnitude and mitigated (or low degree of enhancement for positive impacts)
Medium	- Low and unmitigated magnitude (or a high degree of enhancement for positive impacts) - Medium and partially mitigated magnitude (or medium degree of enhancement for positive impacts) - High and mitigated magnitude (or low degree of enhancement for positive impacts)
Large	- Medium and unmitigated magnitude (or high degree of enhancement for positive impacts)

Importance	Criteria
	- High and partially mitigated magnitude (or medium degree of enhancement for positive impacts) - High and unmitigated magnitude (or high degree of enhancement for positive impacts)

* Except when the impact, despite being small or medium and mitigable, is of extreme environmental and/or social importance.
Source: Pöyry, 2018.

Degree of resolution of the measures proposed to reduce or enhance a given impact: low (B), medium (M) or high (A).

In this methodology, the mitigation measures, in the case of negative impacts, or the strengthening of positive impacts are already predicted and related, and their degree of resolution (high, medium or low) is evaluated after implementation.

From the measurement of the impact and the resolution of the proposed measure it was possible to define the degree of importance of the impact, taking into account the environmental situation before the implementation of the company.

In the case of positive (beneficial) impacts, measures must be taken to make the most of the benefits generated; these are the so-called enhancing or compatible measures.

And in the case of impacts that are partially mitigated or not possible to mitigate, compensatory measures are proposed.

Having said that, the qualitative evaluation of each impact was carried out according to the Table below, which explains the attributes that were characterized during the analysis

Table 2 – Basic procedure for the assessment of potential environmental impacts and their mitigation measures

Potential environmental impact
Impacts that can cause changes in the environment.

Environmental aspect
Elements of a company's activities, products or services that can interact with the environment, causing or likely to cause environmental impacts, positive or negative.

Potential impact factor
Any form of matter or energy resulting from human activities that directly or indirectly affect the health, safety, well-being of populations, social, economic activities and infrastructure, and/or biota.

Technical justification
Impact analysis, with the technical-scientific basis for evaluation.

Characterization of the impact
The characterization of environmental impacts is carried out in accordance with the environmental legislation in force and is indicated according to the following specificities and attributes:

Nature:	**positive/beneficial or negative/adverse**
Form of incidence:	**direct or indirect**
Area of spatial coverage:	**local, regional, strategic**
Probability of occurrence:	**certain, possible**
Time of occurrence:	**short term, medium term or long term**
Timing or duration:	**temporary, permanent or cyclical**
Degree of reversibility:	**reversible, partially reversible or irreversible**
Accumulation:	**simple, type I accumulation, type II accumulation and type III accumulation**
Magnitude:	**high, medium or low**
Mitigation possibilities:	**mitigated, partially mitigated or unmitigated**
Importance:	**high, medium or small**
Potential for enhancement:	**high, medium or low**
Degree of resolution of measures:	**low, medium or high**

Mitigation or enhancement measures
Actions that will reduce or minimize negative impacts or enhance positive impacts.

Responsibility for the implementation of the measures
Indicates the person responsible for the implementation of the measures.

Forecast after implementation of measures
Impact analysis after the implementation of measures

The quantitative evaluation of the impacts was carried out through analyses of the magnitude associated with the area of spatial coverage, probability of occurrence and duration of the actions and the importance of the impacts on the environmental factors associated with the action, temporality/duration and degree of reversibility of the action. Therefore, the greater the impact, the higher the assessment. The assessment uses 1 to 3 following the methodology of Leopold et. (1971) so that even the least significant impact is considered in the assessment.

The following Table shows the values of each impact characterization attribute:

Table 3 – Values for each attribute of impact characterization

Spatial coverage area		
Local	**Regional**	**Strategic**
1	2	3
Occurrence probability		
Possible		**Certain**
1		2
Occurrence moment		
Short term	**Medium term**	**Long term**
1	2	3

Timing/Length		
Transitory	**Cyclical**	**Permanent**
1	2	3
Reversibility degree		
Reversible		**Irreversible**
1		2
Magnitude		
Small	**medium**	**Large**
1	2	3
Importance		
Low	**Medium**	**High**
1	2	3

Individually, each impact will have a sum corresponding to the criteria presented above. For positive impacts the values are positive (+), for negative impacts the values are negative (-) and for positive and negative impacts the values are cancelled.

After this individual stage, the results obtained for all impacts are added up, obtaining the total sum of the impact assessment.

The total sum of the quantitative impact assessment is compared with the maximum achievable score (number of impacts x maximum impact score) corresponding to 100%.

The result of the comparison with the maximum score, in %, was assessed according to the following criteria:

- Up to 50%: enterprise is feasible;
- Between 50 and 80%: the enterprise is feasible with the implementation of new mitigation measures, which have not been contemplated in the evaluation;
- Between 80 and 100%: enterprise is not feasible.

7.1.3 Identification of environmental impacts

Based on the characterization of the project and based on the environmental diagnosis in the area of influence, the identification of environmental impacts generated in the physical, biotic and socioeconomic environments for the different phases of the project was performed: planning, implantation and operation.

For the identification of impacts, the environmental components studied in the environmental diagnosis were considered, listed in the following Table:

Table 4 – Environmental components subject to impact

PHYSICAL ENVIRONMENT	Soil
	Water
	Air

BIOTIC ENVIRONMENT	Flora
	Terrestrial Fauna
	Aquatic fauna
SOCIO-ECONOMIC ENVIRONMENT	Urban and rural structure
	Production and economic structure
	Social structure
	Road Infrastructure
	Public finance
	Cultural Heritage

As mentioned, the main mechanism used to identify the impacts was the use of the Interaction Matrix along with the checklist, which contains the list of the main actions associated with the phases of the project that can generate environmental impacts.

The analysis between the impacting actions and their interactions with the environmental components, for the different phases of the project, allowed through the Interaction Matrix the identification of environmental impacts, as described in the methodology.

With the use of this Matrix it was possible to identify 34 environmental impacts on the environmental components in the project's areas of influence, as follows:

Planning, implantation and operation

- Socio-economic Impact to Land Acquisition and Displacement
- Climate Change Long Term Physical Risk Assessment
- Climate Change Short Term Risk Assessment
- Physical Environment Impact to Air
- Physical Environment Impact to Water
- Physical Environment Impact from Effluents
- Physical Environment Impact from Runoff
- Physical Environment Impact to Streams and Morphology
- Physical Environment Impact to Soil
- Physical Environment Impact to Noise
- Biological Environment Impact to Flora
- Biological Environment Impact to Fauna
- Biological Environment Use of Ecosystem Services
- Biological Environment Impacts to Critical, Natural and Modified Habitats

- Biological Environment Impacts to Protected and Internationally Recognized Areas
- Biological Environment Fragmentation of the natural landscape
- Biological Environment Dust generation and suppression of local vegetation
- Biological Environment Noise related disturbance on Fauna
- Biological Environment Eutrophication of rivers due to improper fertilization
- Biological Environment Indirect impacts of pesticide use (fipronil) on community bee keeping
- Biological Environment Harassment of workers to wild fauna and flora
- Biological Environment Spread of invasive species along new roads and fire breaks
- Biological Environment Risk of fire
- Socio-economic Impact to Employment
- Socio-economic Impact to Indigenous Communities and Livelihoods
- Socio-economic Impact to Community health and safety through vector borne and communicable diseases
- Socio-economic Impact to Impact to Community Health, Safety and Security
- Socio-economic Impact to Worker Influx Increase
- Socio-economic Impact to Labor and Working Conditions
- Socio-economic Impact to Human Rights
- Socio-economic Impact to Landscape and Visual
- Socio-economic Impact to Cultural Heritage
- Socio-economic Impact to Community Uses and Dependencies on Ecosystem Services

In the Interaction Matrix, the potential impacts identified are distributed by environmental component. The list of identified impacts, due to project actions, is found in the following table.

Table 5 – Check list of identified impacts

Phases	Component	Activity (Generating factor)	Environmental Aspect	Impact
Planning	**Socioeconomic**	Land Acquisition	- Increase of land prices - (Physical or economic) Displacement and/or isolation of small properties	Impact to Land Acquisition and Displacement
	Climate Change	Formation of the eucalyptus forest	Global warming	Climate Change Long Term Physical Risk Assessment
		Formation of the eucalyptus forest	Global warming	Climate Change Short Term Risk Assessment
Implantation/Operation	**Physical**	Movement of vehicles and machines	Dust generation	Impact to Air
		Water consumption	Availability of superficial and ground water	Impact to Water
		Inadequate disposal of effluent and sanitary sewage	Effluent generation	Impact from Effluent
		- Opening accesses and roads - Formation of the eucalyptus forest	Forest Management Practices	Impact from Runoff
		Formation of the eucalyptus forest	Eucalyptus plantation in appropriate places	Impact to Streams and Morphology
		- Use of agricultural inputs, such as fertilizers, herbicides, fungicides and insecticides. - Formation of the eucalyptus forest	- Inappropriate disposal of solid waste - Loss of soil nutrients	Impact to Soil

Phases	Component	Activity (Generating factor)	Environmental Aspect	Impact
Implantation/Operation	**Physical**	Movement of vehicles and machines	Noise generation	Impact to Noise
	Biotic	- Formation of the eucalyptus forest	Replacement of pasture and/or other plantations areas with eucalyptus forestry planted areas	Impact to Terrestrial and aquatic flora
		- Opening accesses and roads - Formation of the eucalyptus forest	- Risk of running over animals - Hunting risk - Habitat loss	Impact to Fauna
		Formation of the eucalyptus forest	Ecological balance	Use of Ecosystem Services
		Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Impact to Critical, Natural and Modified Habitats
		Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Impact to Legally Protected and Internationally Recognized Areas
		Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Fragmentation of the natural landscape
		Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Dust generation and suppression of local vegetation
		Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Noise related disturbance on fauna

Phases	Component	Activity (Generating factor)	Environmental Aspect	Impact
Implantation/Operation	Biotic	Inadequate use of fertilizer	Use of fertilizer	Eutrophication of rivers due to improper fertilization
		Inadequate use of pesticide	Use of pesticide	Indirect impacts of pesticide use (fipronil) on community bee keeping
		Opening accesses and roads and Formation of the eucalyptus forest	Risk of running over animals and Hunting risk	Harassment of workers to wild fauna and flora
		Opening accesses and roads and Formation of the eucalyptus forest	Risk of spread of invasive species	Spread of invasive species along new roads and fire breaks
		Opening accesses and roads and Formation of the eucalyptus forest	Risk of fire	Risk of fire
	Socioeconomic	Manpower demand for the eucalyptus formation	Hiring of manpower for eucalyptus formation	Impact to Employment
		Land use for eucalyptus plantation	Possibility of affecting cultural indigenous resources	Impact to Indigenous Communities and Livelihoods
		- Cleaning the land - Opening accesses and roads	Accumulation of standing water	Community health and safety through vector borne and communicable diseases
		Mobilization of workforce	Impact the infrastructure services	Impact to Community Health, Safety and Security
		Mobilization of workforce	Impact the infrastructure services	Worker influx Increase

Phases	Component	Activity (Generating factor)	Environmental Aspect	Impact
Implantation/Operation	Socioeconomic	Mobilization of workforce	Compliance with applicable legislation and sustainable standards principles (ISO 45.001 and the IFC Performance Standards)	Impact to Labor and Working Conditions
		Mobilization of workforce	Governance	Impact to Human Rights
		Formation of the eucalyptus forest	Land use change	Impact to Landscape and visual
		- Earth moving activities - Formation of the eucalyptus forest	Possibility of affecting cultural heritage sites	Impact to Cultural Heritage
		Land use for eucalyptus plantation	Possibility of affecting ecosystem resources	Community Uses and Dependencies on Ecosystem Services

7.1.4 Environmental Impact Assessment

After defining the generating activities that causes impacts and the environmental impacts methodology, a qualitative and quantitative evaluation of the environmental impacts was carried out.

Qualitative Assessment

In the qualitative evaluation, the impacts were considered in the different phases of the project: planning, implantation and operation; and mitigation or enhancement measures were proposed according to the degree of alteration that occurred in the physical, biotic and anthropic environments, described in the technical base, as follows.

7.1.4.1 Planning phase

7.1.4.1.1 Socio-economic Impacts

7.1.4.1.1.1 Land Acquisition and Displacement

Environmental aspect

Increase of land prices and Displacement and/or isolation of small properties.

Impact-Generating Factor

Land Acquisition.

Technical justification

The demand for wood purchase was based on mill production line curve as shown in the figure below:

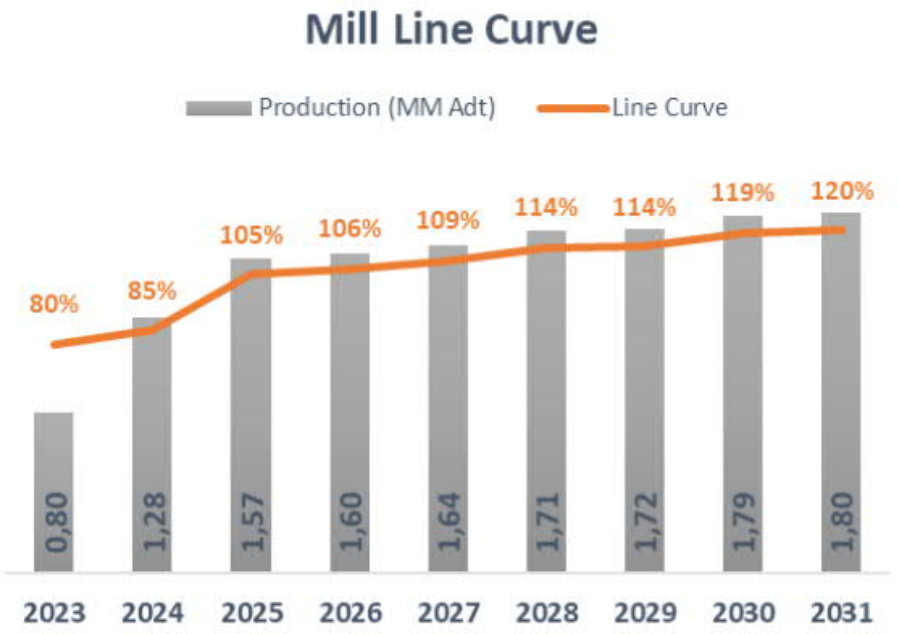


Figure 1 – Mill production line curve.

To supply the mill in the first 6 years, it'll be necessary to buy 30 million m³ of wood, of which: 70% will come from Brazil, 20% from Argentina and 10% from Paraguay.

In order to obtain greater autonomy in the wood demand, PARACEL has purchased 190,000 hectares (ha) of former cattle ranch lands in the Departments of Concepción and Amambay that will be converted to eucalyptus plantations to supply the mill in future years.

By 2029, the mill will be supplied with wood primarily from the Project's own plantations, which will be FSC certified, and a number of out-growers. As mentioned above, PARACEL's purchased plantation lands, approximately 190,000 ha in area, which are former cattle ranches (estancias). PARACEL will develop eucalyptus plantations on the former ranch lands in a phased planting program; 6 years of growth is required to reach suitable size for harvest. Hence, during early operation from 2023 to 2028, PARACEL will obtain early wood supply from existing eucalyptus plantations in Brazil, Argentina, and to a lesser extent Paraguay. PARACEL is in the process of identifying potential early supplier sources and recognizes that not all candidates for early wood supply will be fully FSC certified. As a result, PARACEL plans to produce pulp under the FSC Mix label in the early years.

Products that bear the FSC Mix label are typically made using a mixture of materials from FSC-certified forests, recycled materials, and/or FSC Controlled Wood. The FSC Mix label allows mixing of FSC certified wood with Controlled Wood at a ratio of 70 percent FSC certified / 30 percent Controlled Wood.

There are two FSC certifications required for the Controlled Wood designation: Controlled Wood and Chain of Custody. PARACEL has committed to assure both incoming streams of early supply.

PARACEL has acquired large areas of land and all the transactions made were all based on purchases with private sector, willing seller/willing buyer transactions.

The aspects of infrastructure available in the region, as well as logistics, especially the distance from plantation and existence of protected forest areas, were the fundamental importance for land acquisition.

In response to the PS5, it should be noted that the PARACEL project, both in its industrial component and in its forestry component, does not occupy lands with population settlements, or overlap with any indigenous territories and does not require the physical displacement of any person, family, group or community. There is a possibility of economic displacement in some areas where Paracel properties partly overlap with commonly accessed areas for provisioning ecosystem services. It is developed on territory with a history of human intervention including cattle farming on natural grasslands and improved pastures and logging or clearance of natural forests. It does not overlap with any legally protected areas[1], and buffer zones will be established and protected where Paracel properties are adjacent to National Parks. Notwithstanding this, it proposes measures for the conservation and protection of natural habitats on its properties, and revegetation and management programs in historically degraded forest areas.

The land acquisition in the municipalities of the influence area should be planned not to lead the isolation of rural properties by large massifs of eucalyptus planting in the surroundings. Therefore, PARACEL will establish criteria for buying and leasing lands in its planning department, also avoiding the isolation of properties.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Possible	1
Time of occurrence:	Medium term	2
Timing or length:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Simple	

[1] Portions of the buffer zone of the Rio Apa Biosphere Reserve overlap with some Paracel properties but the buffer zone is not a legally protected area.

Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA	

Mitigation measures

Establish criteria for buying and leasing lands in the company strategic planning for wood supply, avoiding the isolation of properties.

Compromise not to occupy lands with population settlements, and that does not require the physical or economic displacement of any person, family, group or community.

Prioritize the development of eucalyptus plantations on territory where cumulative human interventions such as cattle ranching have created Modified Habitat. Totally avoid plantation development in or adjacent to legally protected areas, or on forest and wetland natural habitats, and avoid planting the good condition natural Cerrado habitat complexes.

Undertake an Ecosystem Services Review to establish the extent of potential displacement of access to Priority ecosystem services (i.e., those upon which communities have a high dependence) because of the Paracel project. Mitigate any significant impact if found.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

Not occupying lands with population settlements, and that does not require the physical displacement of any person, family, group or community, as well as prioritizing the development of plantations in anthropized with cattle farming areas, not occupying legally protected areas, forest and wetland natural habitats and the best condition natural Cerrado habitat, as well as avoid the isolation of properties, will bring confidence and satisfaction to the population regarding the implementation of the project, contributing to the good image and transparency of the company. Natural habitats avoided and protected within Paracel properties (and possibly beyond if offsets are implemented) will improve future security of access to provision ecosystem services that indigenous communities derive from lands outside their territories.

7.1.4.1.2 Climate Risk Assessment

7.1.4.1.2.1 Climate Change Long Term Physical Risk Assessment

Environmental aspect

Global warming.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

Nowadays, climate change attributed to the effects of anthropogenic-originated greenhouse gases (GHG), currently represents the greatest environmental, social, and economic threat on the planet. The accumulated level of GHGs in the atmosphere is constantly growing with population and economic activities. If measures are not taken today, it will be increasingly difficult and costly for countries to adapt themselves to the effects of climate change in the present and in the future.

Taking urgent measures to combat climate change and its effects is one of the current sustainable development objectives of the United Nations. In that way, the knowledge of the individual contribution of GHG to climate change through the quantification of emissions, which is known as “carbon footprint”, is important to apply measures that reduce it and thus combat climate change.

From the above mentioned, a growing number of social, business, and political groups are becoming increasingly interested and convinced about the importance of incorporating in their activity’s measures, which aim to a sustainable development. Thus, GHG emissions quantification and reduction has become a common pattern for companies and institutions as an essential part of their corporate social and environmental responsibility programs.

According to the latest GHG Inventory of Paraguay (2015), the Agriculture and Livestock sector is responsible for the 59.89 % of total emissions (27,132 Kt CO_2eq), land use, land use change and forestry for the 30.72 % (15,755 Kt CO_2eq), and for IPPU (industry processes, product use), 1.82% is reported (931 Kt CO_2 eq).

PARACEL is committed to managing and developing its business with the highest international standards of environmental, social and economic sustainability. There is an awareness that this is not only achieved by providing products that satisfy customers, but that production must be done by operating in a socially friendly way, without endangering the environment.

Thus, Master Environmental Engineer Claudia Gómez and Forest Engineer Lourdes González Soria, performed greenhouse gases emissions and capture balance report for PARACEL project, including forestry and industrial component.

The Forestry component considered the following emissions sources:

- Planting and maintenance of clonal plantations of E. *urograndis*: consumption of fossil fuels and application of nitrogen fertilizers.

- Harvesting and debarking: use of fossil fuels by harvesters.

- Forwarding: consumption of fossil fuels for wood cargo.

- Trucking: use of fossil fuels to transport the debarked wood to the industrial plant.

The fundamental formula for estimating the amount of GHG emissions can be expressed as the multiplication of the activity data (AD); by the emission factor (EF), as seen in expression:

Emissions GHG = AD x EF

In the case of fossil fuels, its equivalent in energy used (in gigajoules, GJ) is considered as activity data, this energy is calculated from the amount of heat, a value that depends on each type of fuel2.

Apart from carbon dioxide (CO_2), other greenhouse gases such as methane (CH_4) and nitrous oxide (N_2O) are also emitted during the burning of fuels. Each of these gases has a different emission factor depending on the type of fuel.

Additionally, for gases different from CO_2, global warming potential (GWP) values are used.

In the case of the forestry component, apart from the use of fossil fuels, another source of N_2O emission is the application of synthetic fertilizers. Therefore, the activity data corresponded to the dose, amount of application and nitrogen content of the fertilizers to be applied. With this data the amount of N_2O that will be emitted, and its equivalent in CO_2, was calculated.

The term emission is also used to sequestration/capture, since by convention the capture of carbon or CO_2 is understood as negative emissions, and is calculated according to expression above.

The estimation of carbon sequestration satisfies a very simple rule. In the case of forest plantations, as well as in forests, the level of activity corresponds to the area (hectares) of the species (or forest type) that exists in a year, and the emission factor corresponds to the capture rate (measured in $tCO_2\ ha^{-1}\ year^{-1}$) of each surface unit.

The annual plantation area, of the company's plantation plan, was assumed as the activity data component; and the capture rate ($tCO_2\ ha^{-1}\ year^{-1}$), which constitutes the emission factor component, was estimated.

As we can see in Figure below, there is an evolution of emissions from afforestation for each year of plantation plan, caused by the variation in the amount of fuel (diesel) that will be used each year. This is due to the fact that the plantations are carried out progressively year after year until reaching the 130 thousand hectares required to supply the demand for eucalyptus wood to the pulp mill, and while this required surface is reached, the raw material is imported, which it means longer trips (more fossil fuel consumption). However, in fact, the total plantation area will be 190 thousand hectares.

Therefore, the forestry component, due to silviculture, harvesting, debarking, forwarding, and transport activities, 114,825 tCO_2eq will be emitted annually (Table below). This value corresponds to the self-sufficient stage of the company

in terms of provision of debarked wood, that is, from the moment when raw material is no longer imported.

Figure 2 – Evolution of GHG emission (total tCO_2eq/year).

Table 6 – Forestry component GHG emissions

Source of GHG emission	GHG emissions (tCO2eq)	
	Annual average*	$KgCO_2.ADt^{-1}$
Synthetic fertilizer application	3,793	2.53
Acidity correction	781	0.52
Forestry	13,321	8.88
Harvesting	13,873	9.25
Forwarding	6,148	4.10
Trucking	76,123	50.75
TOTAL	**114,825**	**76.60**

An evolution of carbon sequestration is estimated through the years, due to the progressive planting of Eucalyptus, until reaching 130 thousand hectares necessary for the supply of debarked wood to the industrial plant.

In total, a cumulative sequestration of 15.43 Mt of carbon is expected, which is equivalent to 56.58 $MtCO_2$ for the total surface to be planted (Table below).

Table 7 – Carbon retention and CO_2 removal by forest plantations

Component	Biomass C ($t\ ha^{-1}$)	CO_2 ($t\ ha^{-1}$)	Cumulative in 130mil ha: Biomass C (Mt)	Cumulative in 130mil ha: CO_{2eq} (Mt)
Eucalyptus urograndis plantation	118.72	435.29	15.43	56.58

With that known, under Task 1b and in alignment with EP4 requirements, ERM conducted a climate change physical risk assessment and screening of the Project following TCFD guidance. A physical risk assessment up to the year 2050 was performed based on the latest versions of climate model projections under a business as usual scenario.

For the asset level screening of physical climate risks, were used downscaled models and extracted climate variables using the latest version of the climate model simulations for the "business as usual" climate scenario (SSP3-RCP7) in three periods: historic (2000s), 2030s, and 2050s. The screening assessment was conducted for climate risk indicators of: climate variability (change in monthly and seasonal variability of temperature and rainfall), extreme cold, extreme heat, extreme rainfall (pluvial flooding), riverine flooding (fluvial flooding), water stress, water supply, water demand, water seasonal variability, drought, landslide, hurricanes, and sea level rise & land subsidence.

On average, annual total rainfall and monthly spread of rainfall is not projected to significantly change by 2050s compared to the historic base case, although there are some monthly variations with as much as a 40% decrease in July and August rainfall by 2050s. The range of annual amount of rainfall and monthly amount of rainfall remains almost the same as the historic base case and within the optimal range (1,000 millimeters [mm] – 1, 800 mm) for eucalyptus growth.

Total annual rainfall is not predicted to change significantly by the 2050s. However, seasonal variability of available water is considered to be a high risk, that is projected to change by a large amount. This means even though total annual rainfall is not predicted to change significantly, the seasonal distribution of rainfall will be more variable (hence less predictable) than it was historically. It is noteworthy that these estimates do not take into account the potential change in future effects of human activities.

The optimal growth temperature range for eucalyptus is between 18 °C - 22°C while extreme temperature range of tolerance is between -3 °C and 40°C. It is expected that on average the annual number of days with temperature within the optimal growth range of eucalyptus decrease by about 20 days (from 61 days to 42 days annually) by 2050. However, the maximum temperatures (even though increasing) is expected to remain under 40°C.

Although not modeled, with the predicted decrease in monthly rainfall in the months of July and August by almost 40% in combination with the prediction of medium to very high risk of extreme heat, the fire risks could increase in the Project region.

Table 8 – Potential Change in Number of Days within Eucalyptus Optimal and Maximum Range of Temperatures

Optimal growth temperature range for Eucalyptus species in general is between 18 and 22 C	
Extreme temperature range of tolerance for Eucalyptus in general is between -3 and 40 C	
Optimal annual range of precipitation for Eucalyptus in general is between 1000 - 1800 mm	
Annual number of days when temperature is between 18 and 22C will potentiall decrease by ~ 20 days by 2050s	
Historic (2000s)	61
2030s	47
2050s	42
Annual number of days when maximum temperature is greater than 40C will potentiall increase by 4 days by 2050	
Historic	1
2030s	3
2050s	4

Average temperature in the Project region is projected to increase by 1.7°C, considered a large amount, by 2050s compared to the historic base case (2000s). Even though monthly maximum temperature is not projected to increase beyond the heat stress tolerance range of eucalyptus (40°C), the frequency and intensity of extreme heat events (consecutive number of very hot days) is expected to increase for all the sites. This could potentially impact plantations even though monthly maximum temperatures may remain under 40°C, but the continuous exposure to longer periods of hot days could eventually cause heat stress and impact eucalyptus optimal growth. The minimum temperature is also projected to increase by a large amount (more than 1.5°C) by 2050s. This means plantations may not have a chance to release the heat and cool down during the night. Heat stress events could also have significant impacts on farmers and animals, water reservoirs, as well as soil moisture and the health of other vegetation in the region.

The table below presents the final risk scores for 2050s.

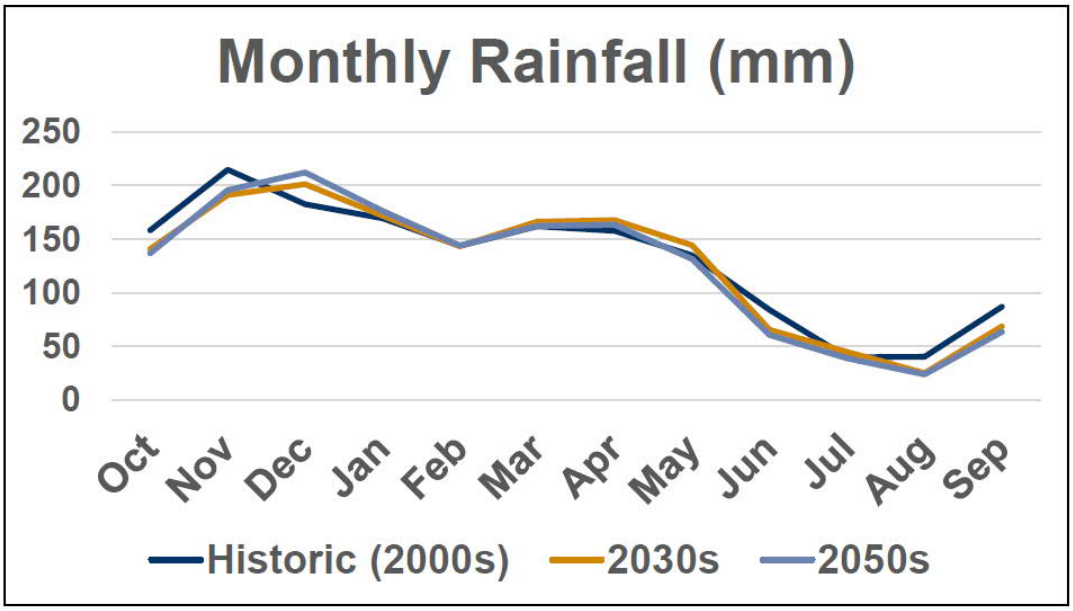
Table 9 – Potential Climate Risk by 2050

Project Feature	Extreme Cold	Extreme Heat	Extreme Rainfall (pluvial flooding)	Riverine Flooding	Water Stress	Water Supply	Water Demand	Water Seasonal Variability	Drought	Landslide	Hurricanes	Sea level rise & land subsidence
Mill Site	Very Low	Very High	Low	High	Low	Low	Low	High	Low	Very Low	No risk	No risk
Cristo Rey Plantation	Very Low	Very High	Low	Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Gavilan Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Isla Alta Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Estancia La Blanca Plantation	Very Low	Very High	Low	Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
La Paraguaya Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Machuca Cue Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Mandiyu Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Rancho Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Ronaldo Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Contorno Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Santa Teresa Plantation	Very Low	Very High	Low	Low	Low	Low	Low	High	Low	Medium	No risk	No risk
Siete Cabrillas Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Silva Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Soledad Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Trementina Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Willers Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Zanja Moroti Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Zapallo Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Medium	No risk	No risk
Hermosa Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk

The screening assessment identified low or very low risk of extreme cold, extreme rainfall, water stress, water supply, water demand, and drought for the mill site and the 19 plantations by 2030s and 2050s. There is no risk of hurricanes or sea-level rise and land subsidence by 2030s and 2050s.

The main results from the climate change assessment are presented as follows:

- On average, annual total rainfall and monthly distribution of rainfall is not projected to significantly change by 2050 compared to historic records (Figure below). The predicted range of annual rainfall and monthly amount of rainfall remains virtually the same as the historic records and within the preferred annual range (1,000 mm – 1,800 mm) for eucalyptus plantations.
- Temperature is projected to increase by a large amount (1.5 ^{o}C) by 2050 compared to the historic records, and though maximum temperature is not projected to increase beyond the heat stress tolerance range of eucalyptus (40^{o}C), the frequency and intensity of extreme heat events (consecutive number of very hot days) is expected to increase. This could potentially impact eucalyptus growth rates, as though maximum temperatures are predicted to remain under 40 ^{o}C, continuous exposure to longer periods of extreme hot days could eventually cause heat stress and impact optimal growth. In particular, minimum temperature is also projected to increase by a large amount (more than 1.5 ^{o}C). This means plantations may not have a chance to release heat and cool down during the night. Heat stress events could also have significant impacts on water resources, soil moisture, and the health of other vegetation in the region.

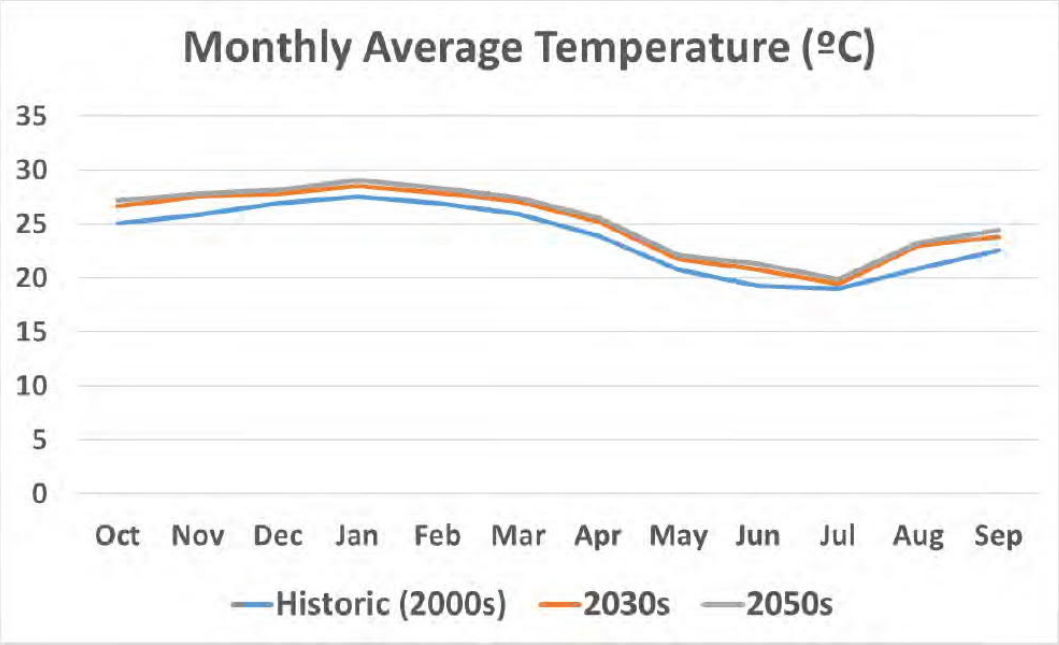


Source: ERM, 2021.

Figure 3 – Estimated Monthly Rainfall: Historic (2000s), 2030s, and 2050s

- Water stress, water supply, and water demand is not expected to change by 2050. However seasonal variability of available surface water is expected to change by a large amount. It is noteworthy that these estimates do not take into account the potential change in future impacts due to human activities.

– The predicted higher temperatures could increase fire risk in the plantation areas. Maintaining fire breaks of grassed areas is one method commonly used in forestry to reduce the spreading of fire.



Source: ERM, 2021.

Figure 4 – Estimated Monthly Average Temperature: Historic (2000s), 2030s and 2050s

– The eastern portion of Santa Teresa and southern portion of Zapallo plantations are located in a potential landslide hazard zone with a potential number of hazard days increasing in the future.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Possible	1
Time of occurrence:	Long term	3
Timing or length:	Permanent	3

Reversibility:	Irreversible	2
Accumulation:	Simple	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA	

Mitigation measures

Carry out periodic monitoring of GHG emissions and C 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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

PARACEL project will contribute to the capture of carbon (net negative emissions) from the atmosphere and will be a source of energy with neutral emissions in terms of GHG. Not occupying lands with a potential landslide hazard zone with a medium potential risk of rainfall triggered landslides, lower the Company Climate Change Risk.

7.1.4.1.2.2 Climate Change Short Term Risk Assessment

Environmental aspect

Global warming.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

The Climate Change Short Term Risk Assessment was based on the same methodology used in the Climate Change Long Physical Risk Assessment. Although it considered risk scores for 2030s instead of 2050s.

The table below presents the final risk scores for 2030s.

Project Feature	Extreme Cold	Extreme Heat	Extreme Rainfall (pluvial flooding)	Riverine Flooding	Water Stress	Water Supply	Water Demand	Water Seasonal Variability	Drought	Landslide	Hurricanes	Sea level rise & land subsidence
Mill Site	Very Low	Medium	Low	High	Low	Low	Low	High	Low	Very Low	No risk	No risk
Cristo Rey Plantation	Very Low	Medium	Low	Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Gavilan Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Isla Alta Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Estancia La Blanca Plantation	Very Low	Medium	Low	Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
La Paraguaya Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Machuca Cue Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Mandiyu Plantation	Very Low	Medium	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Rancho Plantation	Very Low	Medium	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Ronaldo Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Contorno Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Santa Teresa Plantation	Very Low	Very High	Low	Low	Low	Low	Low	High	Low	Medium	No risk	No risk
Siete Cabrillas Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Silva Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Soledad Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Trementina Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Willers Plantation	Very Low	High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Zanja Moroti Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk
Zapallo Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Medium	No risk	No risk
Hermosa Plantation	Very Low	Very High	Low	Very Low	Low	Low	Low	High	Low	Very Low	No risk	No risk

Figure 5 – Potential Climate Risk by 2030

The screening assessment identified low or very low risk of extreme cold, extreme rainfall, water stress, water supply, water demand, and drought for the mill site and the 19 plantations by 2030s. There is no risk of hurricanes or sea-level rise and land subsidence by 2030s.

It is worthy to mention that the predicted higher temperatures could increase due to fire risk in the plantation areas. So, maintaining fire breaks of grassed areas is one method commonly used in forestry to reduce the spreading of fire. By avoiding fire spread in forestry the Transitional Climate Change process may be slowed down.

The fire risk can be due to natural events (lightning), or accidental, caused by cleaning and renovation of pasture areas, aggravating in periods of drought and also due to criminal activities which PARACEL will strictly avoid.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Possible	1
Time of occurrence:	Short term	1

Timing or length:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Simple	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA	

Mitigation measures

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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

PARACEL will contribute to protect areas of plantations against fire, which may slow down the Transitional Climate Change process.

7.1.4.2 Implantation/Operation phase

7.1.4.2.1 Physical Environment

7.1.4.2.1.1 Impact to Air

Environmental aspect

Dust generation.

Impact-Generating Factor

Movement of vehicles and machines.

Technical justification

The forest road access comprises the activities of planning and opening accesses, constructing and maintaining dirt and/or gravel roads, to manage the best harvesting process, including protecting forest resources from fires and inputs and harvested wood transportation. The transport of gravel is carried out from the

places of production of gravel to the road's construction sites, both on own or third-party properties.

So, the activities of Open Access Roads are carried out within other activities such as: Land Plantation Enabling, Production Planning, Harvesting, Mobilization and Transportation.

It should be noted that forestry transport is carried out in trucks, which transit both on public or private roads, whether they are gravel, dirt or with asphalt.

With that said, it is expected that during the plantation and harvesting processes, heavy vehicle traffic, such as machinery and trucks, will increase significantly in the access routes into the farms, since the work requires a great quantity of machinery. Regular maintenance of equipment and vehicles plays a key role in air emissions control and safety, as well as increasing the life span of machinery.

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.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Immediate	1
Time or duration:	Temporary	1
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Low	1

Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It can be stated that, through the implementation of mitigation measures, air quality will not be changed, nor will be disturbances to people/community due to dust generation.

7.1.4.2.1.2 Impact to Water

Environmental aspect

Availability of superficial and ground water.

Impact-Generating Factor

Water consumption.

Technical justification

Eucalyptus plantation needs water for its development. Irrigation can be done in the hottest periods of the year, intermittently and occasionally, especially if prolonged drought occurs during the execution of the planting program, i.e. the first year. However, due to the economic impacts and the importance of reducing water consumption, irrigation is carried out only eventually, in drought periods, since the plantations should be carried out in the most favorable period of rain and humidity. On average, 2 to 3 liters per plant per irrigation are used.

In general, after the planting stage, the rainwater is sufficient to ensure the development of the trees, not needing irrigation.

It is worth mentioning that the water consumption by eucalyptus plants is lower than some traditional crops, as shown in the following table.

Table 10 – Water consumption by eucalyptus plantation compared to other traditional crops

Culture / Coverage	Efficiency in water use
Potato	1 kg potato / 2.000 liters
Corn	1 kg de corn / 1.000 liters
Sugarcane	1 kg sugarcane/ 500 liters
Cerrado	1 kg cerrado wood / 2.500 liters
Eucalyptus	**1 kg eucalyptus wood / 350 liters**

Source: Calder et al. (1992) and Lima (1993).

Compared to other crops, eucalyptus cultivation is less harmful to the environment due to the following characteristics:

- Vegetation cover and minimum crop use giving greater protection to the soil;
- Longer rotation cycle;
- Less need of soil preparation, due to the long period of crop rotation;
- Less use of fertilizers;
- Greater crop tolerance to the attack of pests and diseases, resulting in less need of chemical pesticides use.

Regarding the roots, the edaficatic characteristics (fertility, soil density, soil compaction, porosity, aerating and groundwater depth), in most cases, may or may not limit the root growth system of plants in general. In the case of eucalyptus, depending on the genetic material and the form of propagation used in the production of seedlings, plants may have root systems also with different characteristics. Studies conducted by Schumacher (1989), Schumacher et al. (2004), Neves (2000), Gonçalves & Mello (2004), indicate that on average the roots of eucalyptus are located at depths of 1.5 m to 2.5 m. However, it is noteworthy that the vast majority of fine roots (< 2.0 mm), that are largely responsible for the absorption of water and nutrients, are located in the first 20 cm soil depth.

In planted forests, rainwater infiltrates into the soil easily. In addition, forests contribute to the reduction of the speed of surface water runoff, providing soil conservation and avoiding the occurrence of erosive processes.

Considering, the water availability in the region of the project, measures such as the adoption of larger spacings, as well as the direction of expansion areas to the regions with the highest rainfall in the region and adapt the plantation

management at the rotation crop period should be taken. Besides, adopting forest management with water-saving strategies.

It is also emphasized that the planted forest has a greater control of water consumption than smaller vegetation, due to its peculiar characteristics such as height, extension and perennial aspects.

A plantation plan in the Aquidaban and Apa River basins, and their sub-basins (Arroyo Pytanohaga, Arroyo Trementina, Arroyo Negla, Arroyo Paso Bravo) with economically viable mosaics should also be performed. Developing a water availability-demand study in the sub-basins aiming to define and propose measures to reduce conflicts between water uses and users.

The areas with differentiated management plantation should be defined through monitoring of water micro basin, and at least two paired water micro basins should be monitored (one planted forest and one of natural forest).

These measures aim to adapt the water consumption by the planted forest with the water availability of the region, avoid conflicts between users and ensure the viability of plantings and maintenance of the watercourses flow over the time and helps the trees development.

In addition, there will be effective protection of riparian forests and Permanent Preservation Areas, especially around springs, which were previously used for agriculture and extensive livestock weren't preserved.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative/Positive	- +
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Immediate	1
Time or duration:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	

Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation and potentiation measures

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.

Pre-determine the native areas conversion or not based on PS06.

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 Action Plan, water management program, surface and ground water quality monitoring program and Biodiversity Monitoring & Evaluation Plan;

Meet IFC EHS Guidelines for Perennial Crop Production.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The reduction of water consumption in eucalyptus plantation, the plantation plan in mosaic form and the preservation of legal reserve areas and permanent preserved areas (including riparian areas) reduce possible interferences in water availability in the region of the projects' farms.

7.1.4.2.1.3 Impact from Effluent

Environmental aspect

Effluent generation.

Impact-Generating Factor

Inadequate disposal of effluent and sanitary sewage.

Technical justification

The generation of liquid effluent in the forestry areas basically consists of sanitary sewage generation at workers 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.

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 Standards (including IFC/EBRD 2009).

Highlighting that 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.

On the farm area and on workers camps there is no maintenance workshop, in this way there is also no generation of oily liquid effluent.

It is noteworthy mentioning that nursery services is a third party that does not fall within the scope of this ESIA. However, all third parties will abide by Paracel ESMS which has a strong sustainable process bases that requires strict standards to all of its own employees and subcontractors, ensuring a safe and healthy working environment and the best environmental practices, such as the correct treatment and disposal of effluents and sanitary sewage.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Possible	1

Moment of occurrence:	Immediate	1
Time or duration:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Low	1
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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 boxes with waterproof surface in the storage tanks.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It can be stated that there will be no change in the quality of surface water or groundwaters, since the sanitary sewage generated during the works will be duly treated and disposed of in an environmentally appropriate manner and in accordance with the legislation in force.

7.1.4.2.1.4 Impact from Runoff

Environmental aspect

Forest Management Practices.

Impact-Generating Factor

Opening accesses and roads and Formation of the eucalyptus forest.

Technical justification

For opening accesses and roads activities, the following minimum guidelines should be considered:

- The street must follow the existing inclination of the terrain;

- Adjust the ramps according to the elevations of the plateaus;

- Coating with gravel, with a minimum inclination of 2% from the shaft on both sides, whenever possible.

The planning of routes/ access roads of machines and trucks for the exit of the wood, contemplates the harvest plans in a time horizon of one year or more, having as a background the planning at the technical and strategic level, of greater deadlines. It covers the activities of roads access planning, opening of sashes and Forest Chain of Custody planning in general. In order to protect properly the soil, the water, the community and the company's resources, being that the planning system defines the type of equipment to be used in each work, the planning of road paths and delimitation of the areas to be harvested.

By planning carefully, with location diagnosis the access paths on the farms and in the surroundings, carried out on a detailed scale, to propose actions on the stablished route, the opening of roads and their respective drainage systems, will prevent the road system from functioning as the preferred path of the flood.

Besides the opening accesses and roads, the formation of the eucalyptus forest may also impact the runoff water in the region.

Currently, in the preparation of soil for the purposes of forest plantations, uses the minimum cultivation practice associated with other conservation practices for erosion control. The activities are carried out in the blocks where eucalyptus seedlings will be planted.

With minimal cultivation practice there is soil revolving in the planting line. The planting line is subsolated till the recommended depth, which varies according to the clay content in the soil and the occurrence of soil densification and compaction.

A preventive approach to soil conservation work since the beginning of the farm implementation prevents erosions.

Later, with the closure of the canopy, the forest itself decreases the impact of the rain. Road conservation works and water management are also carried out to the interior of the farm blocks in order to prevent erosion forming from inside and outside the block.

In general, eucalyptus plantation allows greater water absorption by the soil when compared to livestock. Thus, this practice does not make the soil waterproof.

It is worthy to mention that the farm has extensive areas of Legal Reserve (RL) areas and Permanent Preservation Areas (APP), which also contribute to soil conservation and facilitate the absorption of water by the soil.

Highlighting that the crop in planted forests induces greater soil protection against erosion, compared to the pastures planted due to the:

– Suppression of cattle trampled;
– Rooting of planted forest;
– Increased soil cover with increased amount of organic matter;

Possibility of establishing native vegetation near the farms is a good practice, but depends on the previous use conditions of the area.

Fertilization, together with the increase in soil organic matter (compared to pasture areas), can cause an increase in the amount of nutrients in the soil in medium- and long-term periods. Specially because PARACEL eucalyptus logs will be debarked in the forests, and this organic matter will cover the farm soil.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative/Positive	- +
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Certain	2
Moment of occurrence:	Immediate	1
Time or duration:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation and potentiation measures

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.

Reducing soil preparation and planting in curves levels, avoiding surface runoff of rainwater.

Maintaining plant cover between plantation lines.

Keep debarked materials in the forests, to cover the farm soil with organic matter.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

With the adoption of the planting and soil conservation practices performed by PARACEL, there will be no increase on susceptibility to erosion, soil compaction and waterproofing, not interfering significantly on runoff.

7.1.4.2.1.5 Impact to Streams and Morphology

Environmental aspect

Eucalyptus plantation in appropriate places.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

PARACEL will adopt the best forest management practices, certified according to FSC standards, ensuring the maintenance of conservation areas, until their own certificate Paracel plans to acquire wood only from FSC certificated areas;

Springs and/or water courses (and the riparian vegetation zone) are characterized as Permanent Preservation Areas (APP) and thus will be preserved as such.

The actions that will be adopted by PARACEL to preserve the conservation areas of its forests are described below:

Protection of Conservation Areas

In these places (identified by the Plantation Development Management Plan and its micro-planning criteria), as well as potential Biodiversity Offset areas in addition to the conservation areas within the Paracel properties, there will be intensified protection measures through various actions such as: hunting, logging and fishing prohibition (with the potential exception of sustainable use activities by indigenous communities), patrolling by forest surveillance, actions to preserve and mitigate forest fires, reduce the speed of drivers, control of invasive species, etc.

Research in Conservation Areas

As part of the Biodiversity Action Plan, PARACEL will promote studies and research in the conservation areas, which will make a valuable contribution to the understanding of Cerrado ecosystems in the country and whose results will be shared with the scientific community through theses, dissertations, articles and participation in congresses.

Recovery of Existing Degraded Areas

Following Paraguayan forest protection law liabilities incurred by previous property owners, PARACEL plans to invest in restoring areas of forest habitat degraded since 1986 on their acquired properties (identified with the aid of historic satellite imagery) - in particular riparian corridors and possible corridors to improve connectivity between forest patches. PARACEL will monitor existing degraded areas of forest habitats to observe the success of unassisted natural regeneration for a period of at least five years, and maintaining the native plants where necessary. If the occurrence of significant natural regeneration is not verified within this timeframe, then active restoration will take place by planting with an appropriate choice of regional species.

However, given the high conservation value of the Cerrado ecosystem within which the Project is located (see Section 7.1.4.2.2.4 covering the probable Critical Habitat status of the ecosystem), PARACEL will preserve less degraded areas of the dry Cerrado savanna habitat types (i.e. Campo Cerrado, Campo Sucio and High Savanna) from eucalyptus plantation development. This will provide conservation outcomes because they will be allowed to recover from degradation due to historic burning and grazing. Some of these areas could be used as natural fire breaks and/or buffers to the National Parks or Protected Areas depending on location. As part of the post ESIA workplan, a Biodiversity Action Plan will be developed which will include protocols for identification of the less degraded, better condition dry savanna Cerrado habitat types. These protocols will be implemented through the Plantation Development Management Plan.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3

Time or duration:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Adopt methods to restore degraded or destroyed natural forests, including riparian zones of up to 100 m either side of rivers or smaller tributaries;

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;

Preservation and recovery of degraded areas of dry Cerrado savanna habitats that remain in better condition;

Implement the Biodiversity Action Plan and Biodiversity Monitoring and Evaluation Plan.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

One of the solutions to meet the demand to mitigate the problem of deforestation, as well as a strategy for the conservation and recovery of existing degraded land in the tropics, is the establishment of forest plantations and agroforestry systems designed under sustainability criteria. Besides complying with IFC Performance Standards which assure no net loss to Natural Habitats and a Net Gain to the biodiversity features for which Critical Habitat is designated, PARACEL owned plantations will be FSC certified and so will avoid areas of High Conservation Value as defined at the national level under FSC criteria.

7.1.4.2.1.6 Impact to Soil

Environmental aspect

Inappropriate disposal of solid waste and loss of soil nutrients.

Impact-Generating Factor

Use of agricultural inputs and formation of the eucalyptus forest.

Technical justification

During the implantation and operation of the eucalyptus forest, solid wastes will be generated. One source of solid waste generation is from worker accommodations areas, another is from equipment maintenance workshop and another is from pesticide packages.

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 Standards (including IFC/EBRD 2009) and the Workers Accommodation Plan.

Other than that, on the farm area 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.

The use of pesticides is an important tool for the good management of forests, but requires differentiated control attention. In the selection of products used by PARACEL there will be always consideration on the legal aspects related to the use of pesticides and the safety of employees and the environment. Priority is given, whenever possible to the use of toxicological green grade products (practically non-toxic to humans). Employees will be always qualified for application of those products and be protected through the use of personal protective equipment (PPE) suitable for maximum safety.

PARACEL will follow the Forest *Stewardship Council (FSC)* pesticide 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 agricultural inputs 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 within its Agrochemical Management Program. 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.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Immediate	1
Time or duration:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Supervise the collection, packaging, storage and transport of solid waste in accordance with current legislation from worker accommodations areas.

Perform Workers Accommodation Plan.

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, such as fertilizers, herbicides, fungicides and insecticides, 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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The soil, groundwater and/or surface water quality will not change, due to the adoption of measures for the use of pesticides and management of their packaging.

7.1.4.2.1.7 Impact to Noise

Environmental aspect

Noise generation.

Impact-Generating Factor

Movement of vehicles and machines.

Technical justification

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.

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.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Possible	1
Moment of occurrence:	Medium term	2
Time or duration:	Temporary	1
Reversibility:	Reversible	1
Accumulation:	Type II Accumulation	
Magnitude:	Low	1
Importance:	Low	1
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Carry out maintenance on machine, truck and vehicle engines;

Carry out activities in the area predominantly in the work daytime period.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It can be said that, through the implementation of mitigation measures, there will be no significant noise disturbance.

7.1.4.2.2 Biological Environment

7.1.4.2.2.1 Terrestrial and Aquatic Flora

Environmental aspect

Replacement of Natural or Critical Habitat with eucalyptus forestry planted areas or access roads.

Impact-Generating Factor

Formation of the eucalyptus forest or access roads in areas of high conservation value.

Technical justification

The eucalyptus plantation could influence the biological diversity of the Cerrado ecosystem persisting in the area.

Existing converted areas within the landscape (pasture and eucalyptus plantation established prior to Paracel's operations) constitute potential barriers to movement and gene flow natural Cerrado biodiversity.

This is because although some animal species frequent the eucalypt plantations, and although some species of the flora reach the reproductive phase in this environment, the converted areas represent a selective filter of potential pollinators and dispersers, and their extension can exceed the displacement radius of many animal species.

In order to increase biological permeability and in compliance with national law, PARACEL has committed to protect all areas of existing native forest within their approximately 190,000 ha of owned plantation lands (this includes forest, riparian ('gallery') forest and Cerradón), as well as to reforest and/or restore riparian gallery forest with native species within a 100 m buffer along rivers and smaller tributaries. PARACEL estimates that approximately 40 percent of their owned plantation lands support native forest, and the other 60 percent non-forest (i.e., savanna Cerrado grasslands, wetlands or exotic pasture and other anthropogenic land covers).

PARACEL has also committed to establish 1 km wide buffers along the border with the two National Parks (Paso Bravo & Bella Vista) adjacent to three plantations (Soledad and Zanja Moroti, and Zapallo). It has also committed to appropriately manage the Río Apa Biosphere Reserve buffer zone in consultation with stakeholders, which overlaps portions of three plantations (Zapallo, Santa Teresa, and by a very minor amount, Hermosa). As of September 2021, the Biosphere Reserve is yet to have a management plan and the legal status of the buffer zone is unclear (Cartes & Yanosky 2020[2]).

Together, these commitments if effectively managed and implemented, will contribute significantly to the protection of the biodiversity of the Aquidabán ecoregion, provide greater landscape connectivity for flora and fauna, and protect water resources and some ecosystem services.

PARACEL will also examine maximizing the use of internal plantation roads and property perimeters and/or buffers to serve as fire breaks to minimize natural habitat fragmentation.

Preserving and/or recovering areas beyond those required by law is a good practice that will be adopted by PARACEL. The selection of priority areas for

[2] Cartes, J.L. & Yanosky, A.A. 2020, Tropical Journal of Environmental Science Vol 54(2), pp147-64

conservation will be implemented by protocols in the Plantation Development Management Plan according to the strategic priorities and targets set out by the Biodiversity Action Plan (BAP). The BAP will enable conservation of a representative diversity of Cerrado habitats, preserving forest organisms as well as those of open areas.

If rare or threatened flora species are found in areas identified for conversion to plantation, individuals will be translocated to a conservation area. If it is not possible to translocate (e.g. larger trees) then seeds or other material will be collected for propagation.

Before planting eucalypts, any rare or threatened fauna will be either scared out of the area or rescued and placed in a conservation area. For small animals, pitfall traps can be used to rescue them.

The details of species rescued and/or relocation plans will be in specific management plans referred to by the Biodiversity Action Plan.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Conduct road open planning to minimize natural habitat fragmentation; avoid developing roads or services in watercourse, wetland, forest or good condition savanna Cerrado areas;

Delimitate firebreaks to protect permanent preservation areas;

Remove natural tree/shrub cover only where strictly necessary;

Carry out detailed territorial planning (Planting Development Management Plan), avoiding disturbance of natural vegetation or soils in the Riparian Zones; and restoring with species native to the ecosystem any riparian and spring areas where vegetation has been degraded or erosion is occurring;

Implement a landscape ecology design, ensuring conservation areas (i.e., avoidance zones / set-asides and Biodiversity Offsets) and restoration areas (restoring impacts not associated with Paracel so also contributing to the Biodiversity Offset strategy) create ecological corridors and a preserve a representative mosaic of Cerrado habitats where possible;

Eliminate/cut any eucalypt specimens spread into conservation areas, preventing the formation of eucalyptus forests outside plantation areas;

Implement the Biodiversity Action Plan & Biodiversity Monitoring & Evaluation Plan.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL will preserve all wetlands, floodable savanna and riparian zones as well as all areas of native forest vegetation with a patch size of ≥1 ha. Better condition savanna Cerrado habitats will also be preserved toward attaining a No Net Loss or Net Gain biodiversity target.

7.1.4.2.2.2 Fauna

Environmental aspect

Risk of running over animals, dust, noise, harmful chemicals, hunting risk and habitat loss.

Impact-Generating Factor

Opening accesses and roads and Formation of the eucalyptus forest.

Technical justification

During planting, maintenance and especially harvesting it is estimated that several truck journeys are required daily to transport eucalyptus logs to the pulp mill.

On the opening roads activities, it should be considered a wildlife rescue program. An increase in vehicle traffic increases the risk of animals being run over on the access roads.

Losses of animals due to being run over are certain and frequent, mainly in similar rural environments where, on the one hand, the scarcity of native vegetation represents, among other aspects, the need for the transit of animals in relatively large areas to look for food and/or for procreation, simultaneous to the lack of shelter for the movement of these same animals. On the other hand, the network of secondary roads that cross the extensive and continuous cultivation areas, constitutes a scenario of inherent risk.

Therefore, the increase in traffic will lead to an increase in the frequency of being run over, with the consequent loss of wild animals.

Environmental education work, which addresses the issue of "wildlife running over" is extremely important for driver awareness and the application of traffic signs will provide a significant reduction in the risk of animals being run over.

Due to increased access to the region, roads could induce an increase in hunting and capturing of animals in this region.

The presence of people in the area may result in possible pressure to hunt and capture wild animals, both for the consumption and illegal trade of these animals.

Besides, environmental education work to make population aware of this fact, PARACEL should avoid fragmentation by roads in the Cerrado areas because, in addition to facilitate the displacement and entry of hunters, it also increases the risk of animals run over, as well as may influence some small species that considers this road a barrier to displacement. In order to avoid animals hunting PARACEL should consider to carry out inspection on farms mainly on weekends and holidays.

In some areas, Paracel will improve connectivity for faunal species through the passive and active restoration (removal of grazing, and, plantings) of natural forest areas as well as the conservation of some contiguous better condition savannah Cerrado areas.

Preserving and/or recovering areas beyond those required by law is a good practice that will be adopted by PARACEL to align with IFC Performance Standards. The selection of priority areas for conservation over and above legal requirements will be done according to strategies and protocols to be developed in the Biodiversity Action Plan (BAP). The BAP will ensure the preservation of a representative range of the diverse physiognomies (along the gradient from forest to open savanna) of Cerrado habitats to retain the diversity of fauna that use either or both forest and open areas.

Paracel’s BAP will be the overarching document to detail the biodiversity strategy, targets and management programme. It will refer to specific management plans that will include detailed implementation protocols for the following objectives:

* 1 km buffer zone from protected areas.

* Conservation of riparian forests.

* Conservation of existing forests patches and some existing savanna Cerrado patches in better condition and/or in optimal spatial configuration with other habitats.

* Restoration of corridors between forest patches.

* Regeneration of riparian forests where they were removed.

* Fauna relocation

* Training on the protection of biodiversity in the forest area upon entry of each own staff, upon hiring of each contractor.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	3
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Perform wildlife monitoring/research and rescue/relocation program, prior to works;

Install signs on the main access routes to the planted areas through the wildlife safety and alert program, including installation of fauna passageways;

Intensify surveillance activities in partnership with local authorities and neighbors to prohibit hunting and logging in Paracel properties;

Perform worker education on hunting prohibition;

Consider the mosaics and characteristics of native habitats in the Plantation Development Management Plan;

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 riparian zones;

Recover currently degraded forest areas;

In addition to conservation approaches applicable to the Paracel properties in general, commit to establish buffers along the border with the National Parks adjacent to two plantations (Soledad and Zanja Moroti) and to pay special attention to managing the biosphere reserve buffer area, which overlaps portions of three plantations (Zapato, Santa Teresa, and Hermosa), in accordance with affected stakeholder consultations in the absence of an existing management plan for the Biosphere Reserve..

Perform Biodiversity Management Program as per the BAP.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It can be stated that the risk on local fauna will be minimized by the implementation of the proposed mitigation measures.

7.1.4.2.2.3 Use of Ecosystem Services

Environmental aspect

Ecological balance.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

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.

IFC PS 4, on “Community Health and Safety”, establishes that the decline or degradation of natural resources, such as adverse impacts on the quality, quantity and availability of fresh water, can cause risks and impacts related to the health of the communities. Considering that the implantation of the project's forest fields

takes place mainly in the Aquidabán river basin, the AID communities could be affected by project activities that potentially impact on water resources.

According to Natán report, the ecosystem services of water used in the DIA are mainly those of provisioning and cultural. 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. Likewise; 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 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.

Tourist attractions linked to water resources

As indicated in the section "Tourism and Culture in DIA" of this document, there are numerous tourist attractions in the area, particularly those related to water resources such as rivers and streams; these make it possible to carry out sports activities in the open air, walks, navigation, fishing, among others.

Figure 6 – Picture Registry of Economic Activities

SOURCE: VARIED SUPPLY IN THE NORTH ABC (2016)

Source: Picture record of field work Consulting Team. Concepción. August-September 2020.

Source: Concepción News (2017).[3]

Source: Picture record of field work Consulting Team. Concepción. August-September 2020.

Figure 7 – Picture Record of Economic Activities

3 Available at: https://www.Concepción-py.com/2017/12/Concepción-ofrecen-bellas-playas-para.html?m=1

Wetlands

Still in the context of water resources, wetlands are important ecosystems, protected by the Ramsar Convention, a Convention on Wetlands of International Importance, which is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and sustainable use of wetlands and their resources (WCRP, 2014).The characteristics of the natural resources of the Río de la Plata Basin indicate that the wetlands represent the main ecosystems of the region (WCPIC, 2014).

These wetland areas are recognized as highly productive ecosystems and one of the most obvious indicators of their wealth and diversity are the wetland birds; these birds constitute a natural resource of great intrinsic human and ecological value, throughout history they have appeared prominently in human culture, as a source of food or ornamentation as well as in the folkloric sense (PMCIC, 2014).

These ecosystems 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).

Other than that, hunting and fishing are some of the main sources of food for the families of the indigenous communities, being an important ecosystem services provisioning and cultural use for livelihoods. Some of indigenous communities use self-made tools, such as bows, arrows, and spears, while other families use firearms. Some families use trained domestic dogs for hunting, which warn their owners where the prey is located and the possible dangers that may exist.

The frequency of which hunting activities are carried out depends on the indigenous families; most of the people consulted stated that they hunt once or up to three times a week. It is important to mention that the animals they hunt and fish are used for their own consumption.

Hunting and fishing activities are one of the main sources of food for some indigenous families. 92.12% 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 ostrich.

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.

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

C. thous (Crab-eating fox)*; L. pardalis* (ocelot) *and L. tigrinus* (oncilla) are under hunting pressure to obtain and market their skins.

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 table below:

Table 11 – 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			
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		

N	Scientific names	Subsistence	Commercial	Ornamental
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*			

The activities of gathering wild fruits are also 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.

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.

During and after the use of chemical products (fertilizers, pesticides), both during the plantations and in the maintenance stage, these could be carried by runoff to the surface water courses of the area and/or infiltrated into groundwater. Fertilizers could cause exceptional fertilization processes of surface waters, with consequent degradation of the quality and habitat of the fauna for fishing, not to mention that the current use of land for grazing will be replaced by afforestation, and according to FAO data, livestock is the human activity that generates the greatest impact on water quality (Paracel, 2021), so although this potential impact could be considered on a smaller scale compared to the current situation of land areas, to intervene by the project, pesticides that could reach watercourses and/or groundwater would also degrade the quality of the water and the habitat of fauna. In all cases, these events represent a direct risk to the health of the population through the consumption of water and fishery products, contact with potentially contaminated water, and a risk of decreased fishery productivity. Likewise, recreational activities would also impact due to the fear that contamination risks could instill in the population. Also, although to a lesser extent, the management of solid waste (containers, packaging, rags, papers, obsolete personal protection equipment, earth, sand, sawdust, etc.), and derived effluents (washing implements in contact with agrochemicals), the use of chemical products may cause these effects on water resources, with their economic, health and social consequences.

Although, according to the experience in Mato Grosso do Sul -Brazil and in Uruguay, afforestation with eucalyptus reduces erosive processes in relation to the grazed pasture or deforested area (Paracel, 2021), the tillage activity could eventually cause erosive processes in the time with drag; both soil and chemical products applied to surface water courses. Soil sedimentation in waterways could decrease the quality of drinking water, the productivity of fishing, and the recreational attractiveness of smaller waterways.

Likewise, during the road adaptation and maintenance works and the construction and maintenance of drainage works, there may be risks of sedimentation and alteration of the hydrological regime of the surrounding water courses, which in turn are used by the communities of the area for various purposes.

According to studies carried out in plantations in the MS-Brazil area, eucalyptus plantations present a water balance similar to that of the Cerrado native forest, and other studies carried out in Uruguay show that there are no significant differences in water availability in similar plots of grazing versus forested with eucalyptus (Paracel, 2021). However, it is considered that, at the stage of implementation and maintenance of forest plantations, the consumption of water from these plantations could compete with the consumption used by the communities that use groundwater, especially in cases where a shortage at certain times of the year is already observed. Although not only forest plantations absorb water -but also other agricultural and native forest uses-, specific studies to monitor water levels will be undertaken by the project, in order to confirm that the resources are not affected, or failing that, implement additional mitigation measures throughout the project cycle, not to mention that in Paraguay there is data that indicates that the water table remains the same or even increases in the presence of eucalyptus plantations (Paracel, 2021).

Controlled burning, in the event of being used, could affect the ecosystem services of the native or implanted forest reserve areas, both in the Paracel fields (riparian forests, reserve), and in reserve areas (private / public) adjacent to some of the fields with extensive current vegetation coverage (Paso Bravo Public Protected Wild Area and Bella Vista Private Reserve).

All the potential impacts mentioned will be prevented and/or reduced with strict measures of good practices in the field and of appropriate design (in the case of roads and drains). Furthermore, periodic monitoring of the actual occurrence and perception of the occurrence of these potential impacts will be crucial to implement the corresponding mitigation measures.

Finally, regarding the ecosystem service of supply of raw materials for artisan production and sale; It is possible that the forestry component of the project could affect the populations of karanday (*Copernicia alba*) that grow naturally in the fields of the AID area and that are used as raw material for the production and sale of objects woven with vegetable fiber. In the field survey, in the AID communities (Isla Hermosa, Domínguez Nigó, Anderí, Paso Mbutu, Paso Barreto), karanday crafts have been manifested as one of the main income-generating activities and there are artisan organizations.

Paracel also plans to monitor the quality of the water; likewise, permanent monitoring of perception in the communities would be carried out, these being addressed in the Project's Environmental Management Plan, complemented by the PGS.

Other measures to preserve water resources are:

Maintain high forests and riparian forests. These forests hold rich biodiversity, 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. Thus, preserving hunting and fish species. By preserving forests, they can provide ecosystem services 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.

Maintain representative samples of forest interconnected with the other types of Cerrado (Cerradón, “dirty and clean grasslands” - campos sucios y limpios). Wetlands in these types of habitats could serve as representative samples and would not affect the potential area of plantation.

Monitor the Cerrado biodiversity. Given the Cerrado degradation and fragmentation and the changes in the environmental and climatic is dynamics, the Cerrado is subject to different processes; therefore, it is important to monitor annually the biodiversity using indicator and flagship species. This monitoring should also evaluate the scope of the connectivity and its effectiveness, thus preserving wild fruits and hunting species.

Planning of plantations. Together with the recommended in the previous paragraphs, maintain high forests and riparian forests, maintain representative samples interconnected and monitor the Cerrado biodiversity, planning plantations should avoid harvest during breeding period, species chasing, thus preserving forests areas because they provide ecosystem services.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	3
Mitigation possibilities:	Mitigated	

Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Maintain high forests and riparian forests.

Maintain representative forest samples interconnected with the other types of Cerrado.

Monitor the Cerrado biodiversity.

Planning of plantations.

Implement an Ecosystem Services Review to establish the level of dependency vulnerable communities have on the Ecosystem Services which are derived from within the Paracel properties. Evaluate the net impacts of Paracel's road network improvements, plantations and conservation activities upon the 'Priority ecosystem services' (i.e., those upon which vulnerable communities have high levels of dependence for their well-being) and design mitigation measures as appropriate.

It is noted that the reduction in cattle grazing because of Paracel plantations establishment could reduce an important source of protein for some families in the Indigenous communities and increase their reliance on hunting, because previous landowners of Paracel's estancias used to share part of the cattle slaughter with IP.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL to preserve the areas of native vegetation, with all types of Cerrado, riparian permanent persevered areas and legal reserve of its own forest lands, in addition to the legal requirement, will aim not to impact significantly in the ecosystem services.

7.1.4.2.2.4 Impacts to Critical and Natural Habitats

Environmental aspect

Potential conversion of Critical and Natural Habitats with eucalyptus forestry planted areas.

Impact-Generating Factor

Formation of the eucalyptus forest on less degraded non-forest areas.

Technical justification

The Critical Habitat and Natural Habitat concepts as defined by International Finance Corporation (IFC) Performance Standard 6 (PS6)[4] require specific attention to establish the nature and significance of impacts, and to assure outcomes of no net loss and net gain respectively.

APPROACH TO CRITICAL HABITAT SCREENING

Biodiversity which potentially meets the thresholds for Critical Habitat (IFC updated Guidance Note, 2019) was determined by:

1. Identifying an appropriate Area of Analysis (AoA);
2. Desk-top collation and verification of available information on biodiversity from the ESIA baseline surveys, literature review, and global data-base analysis; and
3. Assessment against IFC criteria and thresholds for species and ecosystems to identify which biodiversity features may qualify the area as Critical Habitat.

These three steps are described in detail below.

Identifying an appropriate Area of Analysis

A CH-screening against the five IFC criteria was carried out at the landscape scale, to define an '*ecologically appropriate area of analysis to determine the 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 boundaries of this area take into account the distribution of species or ecosystems (within and sometimes extending beyond the project's area of influence) and the ecological patterns, processes, features and functions that are necessary for maintaining them'* (GN 59 in IFC (2019)). An Area of Analysis (AoA) is identified at a landscape scale, considering large-scale ecological patterns, and so is often much larger than the project site or impact area itself. This precautionary approach ensures all potential risks are taken into consideration and demonstrates transparency to relevant stakeholders.

The AoA is *not* a management unit and there are no management obligations on the project within this area implied by its use for assessing risk.

A preliminary review of the region's ecology identifies an appropriate AoA as the Aquidabán Ecoregion (after MADES, Resolution 614/2013) of Paraguay (with an approximate area of 1,700,000ha or 17,000 km^2). 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 a significant proportion (c. 10%) of its coverage. The AoA highlights any potential CH-qualifying biodiversity which might be present in the Project area of influence, complementing the Project ESIA baseline data, and putting the importance of the area of influence for biodiversity conservation into context. The AoA is designed to ensure that the significance of the Project landscape is appropriately evaluated from the

[4] IFC (2012) Performance Standards on Environmental and Social Sustainability - 2012 version. International Finance Corporation, Washington DC, USA.

perspective of maintenance of a representative range of the Cerrado biodiversity as expressed in the local Aquidabán Ecoregion.

Collect and verify available biodiversity information

The information on species confirmed to be present in the baseline (either by observation or eDNA) was complemented by a preliminary scoping of additional species that may be present by a search of the Integrated Biodiversity Assessment Tool (IBAT) records for an area[5] comprising most of the AoA. The resulting 'longlist' of biodiversity features were screened against applicable criteria and thresholds (IFC 2019) by using global databases (e.g. the IUCN Red List spatial data layers[6]) to produce a candidate list of potential Critical Habitat-qualifying features within the AoA based on their known or suspected presence, their threatened status and their mapped distribution.

Apply IFC Criteria for Critical Habitat

The potential CH-qualifying biodiversity features were screened against the applicable criteria and thresholds (IFC 2019). Appropriate population surrogates, including extent of occurrence or known sites of occurrence (mainly derived from the IUCN Red List data, and also GBIF records), were used to determine threshold status with respect to the global population (see IFC (2019) Guidance Note 77)[7]. Nature Positive's expert opinion and professional knowledge were used to make a reasonable judgement of likely threshold status.

In this screening, CH qualification uses a scale of probability based on expert interpretation of a desk-top analysis of current knowledge. Four categories describe the screening outcomes for potentially qualifying features:

- **Qualifying**: sufficient evidence that:
  - The feature is confirmed present in the AoA (through Project baseline studies, ESIA research, or data-base searches); *AND*
  - The feature likely triggers the CH threshold (at levels that meet/approach the threshold) based on the size of the AoA as a proportion of the geographic distribution data as a proxy for population estimate (when population data is not available)

- **Likely:** There is reasonable evidence that
  - The biodiversity feature is present in the AoA; *AND*
  - At levels that meets/approaches the threshold

- **Possible**:

[5] Citibank IBAT search using a radius of 75km from a central point in the project area of influence

[6] Note that IUCN range maps are not available for all species, subspecies and populations on the Red List, inaccuracies and uncertainties are inherent and many do not reflect the latest information. The IUCN Red List is not an exhaustive list - many species, subspecies and populations have not yet been assessed under IUCN Red List criteria and therefore do not have threat status assigned to them; for example, there are very few global distribution maps available for the plants which are assessed on the Red List.

[7] Note that Paraguayan National threatened status has only triggered screening in this study where the species is endemic and no global red list assessment has been made. Further investigation is required to confirm if national species threat lists have been derived following IUCN guidelines for application for red list criteria at regional levels.

- Low evidence that the feature is present in the AoA but if confirmed likely to meet the threshold; *OR*
- Good evidence that the feature is present in the AoA but unclear if it would meet the threshold

➢ **Unlikely**:
- Reasonable evidence that the species, although present, does not meet the threshold

Constraints and limitations of this CH-screening

This CH-screening is based on the best data available at the time of analysis (September 2021). This includes publicly available information found through online searches, global biodiversity data obtained through IBAT, GBIF, IUCN, and other on-line resources, and Project-related baseline data. It is noted that on-line conservation status data can sometimes be out of date or incomplete, and the Project baseline data sampling did not cover all of the land area within the properties so is not exhaustive (although species accumulation curves indicate the majority of species present in the groups surveyed were detected). Also baseline data were not collected with the intention of being used for a CH-screening, so there are no quantitative data to indicate population sizes for those species found to be present. Species listed as Nationally Threatened were only screened in detail if they are endemic and had no IUCN global threat assessment, although all such species were rapidly screened for their Paraguayan populations not being isolated – a full Critical Habitat Assessment should return to these species to investigate their national listing basis and importance in more detail.

CRITICAL HABITAT SCREENING FINDINGS

The Critical Habitat (CH) screening of biodiversity features of importance finds that the AoA most probably qualifies as Critical Habitat due to possible qualifying features under IFC CH Criteria 1, 2, and likely qualification under Criterion 4. The findings result from: a) confirmed or likely presence of globally threatened and restricted range species but with uncertainty on population size, and, b) the confirmed presence of good condition habitat representative of the local Cerrado ecosystem which has an uncertain IUCN Red List status but is very likely threatened. With the data available, no features were definitively confirmed to qualify.

Summary results of the screening are presented per Criterion below. Detailed justifications for the five species with the highest likelihood of qualifying the AoA as CH are given in Table 14. For all species considered, summary justifications for assignment of screening categories among the four grades of ‘potential to qualify’ (see descriptions above) are provided in Table 51. Features for which available information clearly indicates that the species will not meet any of the CH criteria or thresholds were deemed to have no potential to qualify and so were classified as non-qualifying; justifications for these screening judgements are not provided.

Criterion 1: Critically-Endangered and Endangered species
Three bird species possibly qualify the AoA as Critical Habitat under Criterion 1 (Table 12). See Table 14 for justifications.

Table 12 – Criterion 1 CH-qualifying features

Taxa	Scientific name	English name	IUCN status	Confirmed by the baseline[1]	Presence in AoA[2]	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**

Criterion 2: Endemic and Restricted-range species[8]
One reptile, and one frog species possibly qualify the AoA as Critical Habitat under Criterion 2 (Table 13). See Table 14 for justifications.

Table 13 – Criterion 2 CH-qualifying features

Taxa	Scientific name	English name	IUCN status	Confirmed by the baseline[1]	Presence in AoA[2]	CH screening result
Reptiles	*Phalotris nigrilatus*	-	EN	No	Potential	**Possible**
Amphibian	*Rhinella scitula*	Cope´s toad	DD	Yes (*Genus*[9])	Potential	**Possible**

Footnotes:

[1] Confirmed by the baseline = Presence confirmed by the Volume II, Book II Poyry ESIA Baseline report via observations or eDNA.

[2] Presence in AoA: Confirmed = presence confirmed beyond a reasonable doubt through previous surveys, monitoring data in the AoA and/or bibliographic sources; Potential = presence considered possible given the overlap between AoA

[8] For the purposes of IFC PS6, endemic is defined by thresholds of extent of occurrence by species groups and does not refer to nationally endemic species. Note the baseline report mistakenly identifies several species as nationally endemic which have broad distributions including other countries.

[9] The eDNA analysis shows that there is evidence of to Rhinella sp., but it does not identify the species

and species range and/or suitability of habitats or record found but cannot be established beyond a reasonable doubt that the record is valid and reliable. Data sources: IUCN; GBIF, eBird, Birdlife, Poyry baseline report.

Criterion 3: Migratory and Congregatory species

Birds

No migratory species were observed as occurring within Paracel project area and recorded in the ESIAs and post on the field surveys.

There are no Ramsar sites within the AoA. The closest Ramsar Site is the National Park Estero Milagro, downstream of the Project and 60 km south of the city of Concepción. Estero Milagro 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 two Important Bird Areas (IBAs) within the AoA:

- Arroyo Tagatiya which sits greater than 15 km west of the Soledad plantation; and
- Cerrados de Concepción which overlaps with both the UNESCO Biosphere Reserve and the PN Paso Bravo, and which borders three Paracel owned plantations: Soledad, Zanja Moroti, and Hermosa.

However, according to http://datazone.birdlife.org/country/paraguay/ibas, neither of these IBAs meet the criteria for being important sites for congregatory species; criteria A4 states that "the site is known or thought to hold congregations of > 1% of the global population of one or more species on a regular or predictable basis.

Bats

The Mexican greater funnel-eared bat (*Natalus stramineus*) is one of the rarest bats in Paraguay, and is associated to caves. The southernmost site where there are records of this bat being present is in Concepción, with most reports corresponding to Mexico and the Caribbean. There is no evidence that supports that the AoA sustains more than 1% of the global population of a migratory or congregatory bat species at any point of the species' lifecycle.

Fish

None of the fish species recorded qualify the AoA as Critical Habitat under Criterion 3. The ESIA reports one vulnerable species *Potamorrhaphis eigenmanni*. GBIF shows a broad distributional range across Paraguay, Bolivia and Brazil. Based on the baseline studies or data-base searches, the AoA does not sustain on a cyclical or otherwise regular basis more than 1% of the global population of any migratory or congregatory fish species.

Based on the above, the project is not considered to be located in CH for migratory and/or congregatory species.

Criterion 4: Highly Threatened or Unique Ecosystems

The Cerrado is one of the largest and biologically richest tropical savanna regions in the world and as such is considered a global biodiversity 'hotspot' (Mittermeier et al. 2004[10]). It supports highly diverse biological communities with many species endemic not only to the hotspot, but also to single sites or ecosystems within it. Such species are highly vulnerable to habitat loss, hunting, poaching, pollution and other pressures.

Relatively little effort has been put into Cerrado deforestation monitoring compared to tropical evergreen rainforest ecosystems, however, the Cerrado biome as a whole has been assessed as threatened due to the pace and scale of habitat conversion - mainly because of expansion and intensification of agriculture and forestry with approximately 50% of the original habitat cover having been lost between 1965 & 2015 (CEPF 2018[11]). It has been projected that the continuing uncontrolled activities of the Cerrado may lead to loss of 82% of the original vegetation cover of the biome by 2050 (Machado et al. 2004; Machado 2015[12]). The process of land-use change now extends from Brazil into Paraguay. Eastern Paraguay in particular has attracted a strong flow of direct foreign investment, in part because land on the Brazilian side of the Cerrado has become more expensive and because of emerging state and federal environmental restrictions in Brazil. Land-use change monitoring shows that conversion of natural habitats has been most pronounced in the Paraguayan Departments to the east and south of the AoA but that the process is intensifying and ongoing within the AoA, particularly outside of the protected areas and in closer proximity to the city of Concepción.

These regional and national patterns are important context for the Criterion 4 screening, but due to the enormous scale of the Cerrado biome, and consistent with the scale at which the Red List for Ecosystems has been assessed in other countries, it is appropriate to define a smaller scale than the entire Cerrado for consideration of the ecosystem threat concept. We consider the appropriate scale to be the Concepcion representation of Cerrado in Paraguay, which equates to the delimitation of the Aquidabán Ecoregion (after MADES, Resolution 614/2013) chosen for the AoA.

The classification of ecosystem types and mapping of their extent is under development in Paraguay and there is currently not a completed IUCN Red List of Ecosystems assessment for Paraguay. Criterion 4 establishes that areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning, need to be screened against IUCN Red List of Ecosystems (RLE) Criteria to identify potential CR/EN Ecosystems. According to the IUCN RLE Criterion A, subcriterion A1, which

[10] Mittermeier, Russell A. *et al.* 2004. Hotspots revisited: earth's biologically richest and most endangered terrestrial ecoregions. Washington, D.C.: Cemex

[11] Critical Ecosystem Partnership Fund 2018. Ecosystem profile Cerrado biodiversity hotspot: Supernova, Brasília.

[12] Machado, Ricardo B. *et al.* 2004. Análise de lacunas de proteção da biodiversidade no Cerrado – Brasil. In: Anais do IV Congresso Brasileiro de Unidades de Conservação, 2004. v. II – Seminários. Curitiba: Fundação O Boticário de Proteção à Natureza. p.29-38.
Machado, Ricardo. 2015. Unidades de Conservação no Cerrado. Presentation at the Seminário Bioma Cerrado: Normas de Conservação e Uso Sustentável, Chamber of Deputies, National Congress, Brasília, Sept. 17-18.

considers the reduction in geographic distribution, the Cerrado ecosystem could qualify for the category of EN, as there are indications that more than 50% of the ecosystem has been converted. The Paracel properties sum to 188,000 ha, which covers around 10% of the AoA Cerrado ecosystem.

There are no accurate data for the scale and pace of habitat loss in the AoA to make a definitive Criterion 4 assessment. Peter T. Clark in 2018[13] reported on preliminary work toward a Paraguayan Red List of Ecosystems, asserting that historic habitat loss for Paraguayan Cerrado was 60% over a 50-year period. However, this assessment covered an area of 2,740,775 ha representing the AoA (Aquidabán ecoregion) as well as the Palmar de las Islas and Cerro Chaqueño area in the north of Paraguay occidental which has subsequently been reclassified as Cerrado chaqueño - a distinct ecosystem. A study by the University of Maryland[14] analyzing forest cover change within the Cerrado ecosystem in Paraguay showed a 13.3% loss of natural vegetation cover between 1990 and 2000. Global Forest Watch on-line data[15] show that between 2002 to 2020, the total area of humid primary forest in the Concepción Department decreased by 21%[16] with a strong bias to the southern regions of the department (Concepción & Horqueta) - these being responsible for 69% of this loss compared to only 15% for northern regions of San Carlos and San Lázaro. Whilst these data use different methods, cover different, if overlapping, areas, and are only considering the forested habitats present in the Cerrado ecosystem, they do corroborate our preliminary analysis that the rate of loss indicates a likelihood that the Cerrado ecosystem represented in the AoA would qualify as having a Critically Endangered or Endangered classification under Criterion A1 of the IUCN Red List for Ecosystems.

Notwithstanding the screening analysis above, to make a definitive assessment of Criterion 4, 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.

Criterion 5: Areas associated with key evolutionary processes

The Cerrado shows high-levels of diversity which can be explained by broadscale evolutionary processes associated with the linkage Cerrado provides between the

[13] http://nationalparksofparaguay.blogspot.com/2018/01/developing-red-list-of-ecosystems-for.html, also referencing Bonzi, V. R. & Hugo Cabral. 2017. Informe lista roja de ecosistemas amenazados del Paraguay

[14] http://mades.gov.py/sites/default/files/Evaluaci%C3%B3n%20de%20datos%20secundarios%20para%20la%20construcci%C3%B3n%20de%20Niveles%20de%20Referencia%20en%20Paraguay.pdf

[15] University of Maryland and World Resources Institute. "Global Primary Forest Loss". Accessed through Global Forest Watch on 08/09/2021 from www.globalforestwatch.org

[16] This data set defines primary forests as "mature natural humid tropical forest cover that has not been completely cleared and regrown in recent history." Researchers classified Landsat images into primary forest data, using a separate algorithm for each region. Tree cover is defined as all vegetation taller than 5 meters in height as of 2000. The tree cover data set is a collaboration of the University of Maryland, Google, USGS, and NASA, and uses Landsat satellite images at 30-meter resolution. “Loss” indicates the removal or mortality of tree cover and can be due to a variety of factors, including mechanical harvesting, fire, disease, or storm damage. As such, “loss” does not equate to deforestation.

major South American forest types (Amazon and Atlantic Forest), the largest South American dry habitats (Chaco and Caatinga) and other biomes. However, the definition of key evolutionary processes in IFC PS6 refers to a relatively fine-scale rather than broad biogeographic regions (e.g. an unusual outcrop of a rock type that holds unique and endemic plant assemblages), and there is no evidence of the presence of such areas in the AoA.

Other species of conservation or stakeholder concern

Some species of ecological importance which are valued for the ecosystem services they provide, or those which have a Global IUCN threatened status but are present in quantities not meeting thresholds for CH qualification, or those which have been declared as Nationally Threatened, may nonetheless be of high stakeholder concern (e.g., the Jaguar, *Panthera onca*). It is good practice to include such taxon groups as priorities in the Project's Biodiversity Action Plan to ensure that appropriate monitoring or mitigation measures are developed and applied. In many cases mitigation measures that would already be in place to protect species' habitats will be sufficient and monitoring can confirm effectiveness, providing stakeholders with assurance.

Table 14 – Justifications for Critical Habitat Screening Results for IFC Criterion 1 & 2 species.

Scientific name	Common name	IUCN Cat.	Presence in the AoA [2]	IFC CH Criteria	CH screening result	Justification
Birds						
Amazona vinacea	Vinaceous-breasted Amazon	EN	Potential	1a	Possible	The global population estimates of this globally Endangered species is likely to be in the range of 1000-2499 mature individuals, with an Extent of Occurrence (EOO) (breeding/resident) of 1,230,000 km2. The distribution range of the Vinaceous-breasted Amazon overlaps with the AoA, as shown by the IUCN Geographic range map, although it has been reported as possibly extinct in the AoA. eBird shows the distribution of *Amazona vinacea* in the AoA with a frequency of 0-2%. On the other hand, GBIF shows 1849 occurrences of this species, nearly all of them in southern Brazil and eastern Paraguay, None of them in the AoA. This species is classified as Endangered because recent population estimates indicate that the global population is very small, and has suffered a rapid decline owing to extensive habitat loss and fragmentation, compounded by trade, and rapid declines are projected to continue. Further clarification is needed as to whether any Brazilian subpopulations exceed 250 individuals (Birdlife). The Vinaceous-breasted Amazon is also present in the SEAM (Secretaría del Ambiente) Paraguay National list of Conservation Status as “En Peligro de Extinción” (Endangered/Critically Endangered).
Buteogallus coronatus	Crowned solitary eagle	EN	Resident	1a	Possible	Global population estimates of this Endangered species is thought to be in the range of 250-999 mature individuals, and decreasing. Its EOO (breeding/resident) is 6,590,000km2. This species can be found in Argentina, Bolivia, Brazil and Paraguay, and it is not endemic to Paraguay. According to Birdlife, this species qualifies as Endangered because it has a very small, fragmented population, and the severity of the

						threats it faces strongly suggest a significant and continuing decline in numbers. The IBAT Citi Paracel report shows that *Buteogallus coronatus* are potentially found within 50km of the area of interest. According to the IUCN map of Geographic range, 0.1-0.5% of the global population of the Crowned solitary eagle may potentially overlap with the AoA. In Paraguay, it appears to be most numerous in the Cerrado of Concepción department. GBIF and eBird do not distribution of *Amazona vinacea* in the AoA.
Sporophila palustris	Marsh seedeater	EN	Potential	1a	Possible	The IUCN assessment states that there are 600-1700 mature individuals of this Endangered species, and its population is decreasing. According to Birdlife, trapping pressure and habitat loss are rapidly reducing the very small population of the Marsh seedeater, and its breeding habitat (and therefore the population) is fragmented. The IBAT Citi Paracel report shows that *Sporophila palustris* are potentially found within the area of interest. The overlap between the distribution range of a potentially non-breeding area with the AoA can be around 0.5%. GBIF shows a broad distributional range across Paraguay, Brazil, Uruguay and northern Argentina, with one record in the AoA. This species is nationally listed by the MADES as “En peligro de extinción”.
Reptiles						
Phalotris nigrilatus	-	EN	Potential	2	Possible	The colubrid snake *Phalotris nigrilatus* is endemic to San Pedro Department (Paraguay), within 75 km of the AoA, and is known from a very few historical specimens. Limited information is available on the distribution and ecology of most species of *Phalotris* because of their fossorial behavior and the rarity with which they are encountered. (Cacciali et al., 2020). *Phalotris nigrilatus* species is an Endangered species, and with an EOO potentially of less than 50,000km2, if found in the AoA could possibly qualify the AoA as CH under criterion 2.

Amphibians						
Rhinella scitula	Cope´s toad	DD	Potential	2	Possible	This species is Data Deficient (IUCN), and is reported by the ESIA (Poyry) as an endemic species to the Cerrado, found exclusively within the Departments of Amambay, Concepción and San Pedro. This is one of the species only found in Amambay and Concepción, that are not found in any other region of the country, which suggests this area as an endemic center for anurans in Paraguay (Cabral et al., 2020). The IUCN only shows distribution in a very small area of Brazil, near the border with Paraguay and the AoA. GBIF also shows 102 occurrences of this species in the same areas of Brazil. The information available therefore shows that the EOO of this species may be of less than 50,000km2, and if found in the AoA, it could possibly qualify the AoA as Critical Habitat.

IMPLICATIONS FOR THE PROJECT OF CRITICAL, NATURAL AND MODIFIED HABITAT DESIGNATIONS

The **Critical Habitat screening concludes that the Project is to be developed within an area likely to contain Critical Habitat**. This needs to be confirmed with a full Critical Habitat Assessment (CHA) focusing on analysis of historic land-use trends in the Aquidabán ecoregion and specialist consultation for some species of interest (particularly those that have been flagged as 'potential' in Tables 12 and 13). If important information gaps remain after CHA expert consultation and desk-top analyses, then further baseline or monitoring data collection (including ground-truthing for satellite imagery interpretation for example) may be recommended.

Baseline studies show the Project properties to contain many patches of Natural Habitat according to the IFC definition. These are areas where native species still dominate with fauna and flora communities characteristic of the original Cerrado ecosystem - including all of its forest, savanna and wetland habitat types that form its characteristically variable physiognomic mosaic. This means that in addition to the apparently less disturbed areas, many areas in the Paracel properties which look disturbed - having undergone alteration versus a 'pristine' state due to the centuries of historic human activities such as selective logging, cattle grazing and burning recorded in the area - would also be considered Natural Habitat.

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)[17] can be demonstrated. Natural Habitat patches are likely also to represent Critical Habitat.

If further analysis under a Critical Habitat Assessment (CHA) scope confirms the Critical Habitat status of these Natural Habitats, as indicated by the screening reported on herein, then an additional level of scrutiny should 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.

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.

Based on the existing mitigation measures committed to, it is highly likely that a Net Gain for forest and wetland habitat types of the local Cerrado ecosystem is already 'designed-in' to the Project. Further work will be required to assure the same outcome is achieved for the savanna-Cerrado habitats (i.e., Campo Cerrado, Campo Sucio, High Savanna, and possibly transitional Savanna Inundable). Such an outcome for this Project in this landscape is highly likely to include implementation of Biodiversity Offsets including land both within and beyond the boundaries of Paracel properties.

[17] 'No net loss is defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

The CHA should map the Critical / Natural Habitat to the feasible resolution at this large scale. This mapping will serve as the basis for a 'residual impact assessment' to semi-quantify[18] the impacts to important biodiversity features (i.e., the species and habitats of concern) after mitigation measures are applied in accordance with the Mitigation Hierarchy[19]. The residual impact assessment results can be translated into the compensation targets for attainment of biodiversity NNL or NG outcomes goals as appropriate according to Critical-Natural habitat status. The development of the full Biodiversity Action Plan should describe the strategy, including a feasibility-tested Biodiversity Offsets strategy, for achieving NNL or NG aligned targets. Where the residual impact assessment determines potential impacts upon specific important biodiversity to be uncertain, then the BAP would include monitoring actions to determine status and impacts.

Conversion of Modified Habitat areas to Eucalypt plantation would not normally imply any compensatory biodiversity requirement. Extensive areas within the Properties that have undergone the most intensive human alteration including most obviously those areas that have been entirely converted to exotic pasture with African grasses, to food and fiber (short rotational Eucalypts) croplands, or various built environments, are de facto Modified Habitat.

There will also be areas that have not been entirely converted but which would also be considered Modified Habitat because they have been so degraded that regeneration back to a natural ecosystem would be unlikely to occur (e.g., where erosion is advanced or where exotic grasses are well established). This class of heavily degraded but not entirely converted Modified Habitat is much harder to identify, and remote sensing techniques are unlikely to achieve an accurate classification to distinguish grades of degradation. Based on the baseline information collected to date, it is not possible to reliably map Modified versus Natural habitats across the extensive landscape.

A recommended approach for evaluating the true extent of Modified Habitat within Paracel's properties would be:

a) further analysis of satellite imagery cross referenced with baseline data to resolve an improved habitat condition classification which can be used as a guideline for the Biodiversity Action Plan's NNL / NG Strategy, and,

b) progressive field verification using agreed species indicators & structural descriptors implemented through the 'microplanificación' protocols described in the Plantation Development Management Plan.

With this approach, the progressive verification of Modified (versus Natural) Habitat extent within each Paracel property parcel as the plantations are developed can be checked against the BAP Strategy to assure that NNL / NG outcomes for the whole Project remain feasible without adjustment of the Strategy.

In some cases, Modified Habitat can be considered Critical Habitat because despite being degraded it supports the persistence of important concentrations of threatened

[18] Semi-quantification refers to the use of both empirical data and expert judgement.
[19] http://www.csbi.org.uk/our-work/mitigation-hierarchy-guide/

species in a landscape. In this AoA it is likely that only Natural Habitats, in their natural mosaic formation, would support significant permanent populations of the biodiversity values that have been screened to potentially qualify as Critical Habitat; this would need to be confirmed through biodiversity monitoring.

Current knowledge of vegetation cover in the Project area

Preliminary analyses involving manual classification and digitization of satellite imagery have mapped the vegetation cover in the Project area into 5 classes type: native forest, riverside forest, Savanna/Floodable/Cerrado area, Grassland/Pasture/Agriculture area and Forest plantations (Figure 8). These classes do not directly translate to Natural or Modified habitat *sensu* IFC. This mapping is translated into absolute area (ha) and percentage of the Direct Impact Area (i.e., all the Paracel properties combined) in Table 15 below.

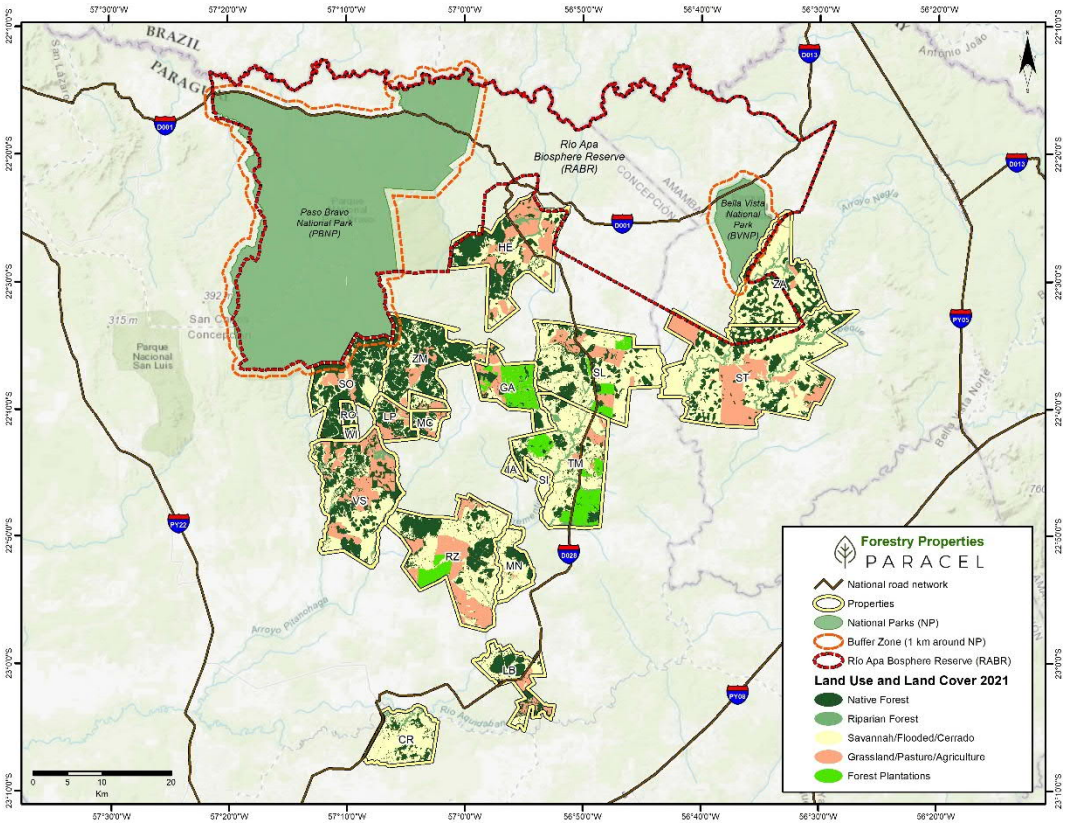


Figure 8 – Preliminary Land Use and Land Cover analysis by Paracel

Table 15 – Preliminary quantitative analysis of vegetation cover in Project area (all Paracel properties combined)

Class ID	Class type	Area (ha)	Percentage
1	Native forest	52697.11	28.5%
2	Riparian forest	8642.29	4.67%
3	Savanna/Floodable/Cerrado	83147.86	44.97%

4	Grassland/Pasture/Agriculture	31324.74	26.94%
5	Forest plantations	9105.05	4.92%
TOTAL		**184,917.05**	**100%**

Classes 4 & 5 of Table 15 represent Modified Habitat areas, including land-covers such as improved pasture implanted with African grasses, built environments, cleared areas, crop lands, agroforestry plantations, and roads. Class 3 - the savannah, seasonally inundated savanna and Cerrado habitat types – represents a gradient of disturbance and degradation including both Modified and Natural habitats: this is where further investigation is required to better determine habitat importance status *sensu* IFC. The two forest classes (1 & 2) represent the areas that the Project is already committed to avoid and protect; they include subhumid forests, riparian gallery forests, fragmented forests (which includes "Cerradón" open dry forests), and seasonal and herbaceous wetlands.

The biodiversity strategy and design criteria to deliver appropriate NNL/NG outcomes at the landscape scale will be covered in the Biodiversity Action Plan; this will provide assurance that any Natural or Critical Habitats that are converted can be appropriately compensated in terms of quality and quantity. On the ground protocols will be detailed in management plans including most importantly the Plantation Development Management Plan for the implementation of avoidance and minimization measures consistent with the Biodiversity Strategy. A Biodiversity Monitoring and Evaluation Plan will be developed to assure the strategic BAP outcomes are delivered with an adaptive management approach.

The presence of threatened, endemic species and strictly forest habits species, associated with the remnants of native forest in the DIA, point out the need for a continuous fauna monitoring, seeking a better understanding of the impacts that will be caused by PARACEL, though a Biodiversity Monitoring and Evaluation Plan.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	

Magnitude:	High	3
Importance:	High	3
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

A full Critical Habitat Assessment will be developed to spatially determine habitat importance (i.e., Critical, Natural, Modified) as per PS6 definitions.

Eucalyptus plantations will be designed to implement the Mitigation Hierarchy, avoiding Critical and Natural Habitats where feasible and implementing a Biodiversity Action Plan (BAP) designed to achieve Net Gain for biodiversity values designating Critical Habitat, and No Net Loss for values designating Natural Habitat. The BAP will include design of Biodiversity Offsets where necessary.

It is considered highly likely that Biodiversity Offsets will be required for the Project in its current configuration to align with IFC Performance Standard 6. A detailed feasibility study will be required to confirm the likelihood of possible offset strategies to achieve NNL or NG outcomes, however preliminary assessment by Nature Positive indicates that there are both the potential mechanisms and scale to achieve such outcomes for target habitats in this landscape. Possible mechanisms include:

- Within Paracel properties:
  - Protection of set-asides
  - Recovery of set-asides
  - Restoration of degraded areas
- Outside of Paracel properties:
  - Improved management of Protected Areas, their buffer zones, and Indigenous People's territories

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 Parks adjacent to three plantations (Soledad, Zanja Moroti and Zapallo) and to manage the Biosphere Reserve buffer area, which overlaps portions of three plantations (Zapallo, Santa Teresa, and Hermosa). To appropriately manage the buffer zone, resolution 200/2001 Art. 31 regarding biosphere reserves will be considered, consultation with affected parties will need to occur and a management plan will need to be approved.

Maintain high forests and riparian forests in plantations farms.

Maintain a representative mosaic of interconnected Cerrado habitat types of Cerrado.

Monitor the Cerrado biodiversity within the farms.

Planning the plantations areas avoiding impacts on fauna and flora.

Perform Biodiversity Monitoring and Evaluation Plan to confirm outcomes described in the BAP.

To assist with implementing the Mitigation Hierarchy, Paracel commit to the criteria for establishing conservation vs planted areas in the plantations, as shown in the table below. Note that criteria for establishment of plantations in savanna Cerrado habitats in order to meet PS6 requirements are to be developed.

Table 16 – Paracel criteria for establishing conservation vs planted areas

Forest Management	Criteria
1km PNBV	Buffer area with a distance of 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) .
Plantable area	Area available for Eucalyptus plantations without restrictions in environmental legislation. With the clarification that these are "potential" areas where prior soil analysis and on-site verification must be carried out to accurately determine their aptitude for planting.
RBRA - Río Apa Biosphere Reserve	In the areas where the RBRA overlaps with Paracel's properties, resolution 200/2001 was taken into account in its Art. 31 regarding biosphere reserves. Art. 31 The following are characteristics of the 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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The mitigating measures, if effectively managed and implemented, should make an important contribution to the protection of the biodiversity of the region, provide greater landscape connectivity for flora and fauna, and protect water resources and ecosystem services.

7.1.4.2.2.5 Impacts to Legally Protected and Internationally Recognized Areas

Environmental aspect

Replacement or degradation of habitats

Impact-Generating Factor

Formation of the eucalyptus forest or indirect impacts

Technical justification

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. If these areas contain Critical or Natural Habitat and impacts are foreseen then the CH/NH compensatory requirements apply in addition.

Legally Protected Areas

There are three IUCN Category II national parks (Parques Nacionales – PN) in the vicinity of the plantations:

- PN Serrania San Luis is approximately 15 km west of the Soledad property;
- PN Paso Bravo borders two Paracel properties: Soledad and Zanja Moroti;
- PN Bella Vista borders the Zapallo property;

Note that 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.

Internationally Recognized Areas

There is one Biosphere Reserve, Cerrado del Río Apa, overlapping with the Project, established in 2001 by Executive Decree No. 14,431. The core areas of the reserve border two (Soledad and Zanja Moroti) 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, thus the 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 so has no formal protection.

There are two KBAs near Paracel plantations, qualifying due to their status as Important Bird Areas[20] (IBAs):

- Arroyo Tagatiya which sits greater than 15 km west of the Soledad plantation and has some protection from two private protected areas; and
- Cerrados de Concepción 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;

There are no World Heritage Sites nor Alliance for Zero Extinction sites near the Project.

For PARACEL project, KBAs are shown in the following map.

[20] Note that according to http://datazone.birdlife.org/country/paraguay/ibas, IBA's within PARACEL areas do not meet the criteria for being important sites for congregatory species.

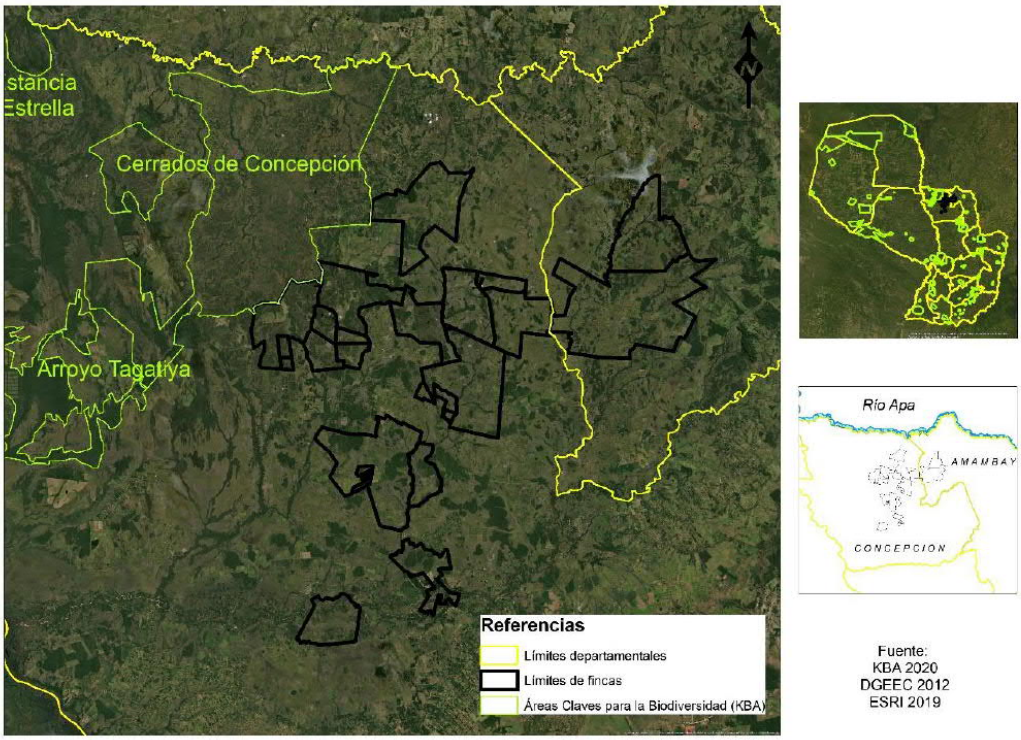


Figure 9 – Map of key areas for biodiversity conservation in relation to PARACEL properties. Produced with data from KBA (2020), DGEEC (2012)

Produced by S. Ríos y L. Rejalaga

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	3
Mitigation possibilities:	Partially mitigated	

Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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.

The Project is proposing 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 committed to establish 1 km buffers along the borders with the National Parks and the three adjacent properties.

It is recommended that the Biodiversity Offset strategy 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 it is feasible for any party to implement management actions to reduce the ongoing and future threats to the biodiversity features within the Protected and Internationally Recognized Areas. This evaluation of threats will involve an analysis of rates and drivers of land-use change and habitat degradation in the region which should be used to inform an assessment of the potential indirect impacts to the Protected and Internationally Recognized Areas from the Project (e.g., by facilitated access to the areas).

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 so protect plantations and natural habitats from encroachment by illicit crops.

Forecast after implementation of measures

The mitigating measures, if effectively managed and implemented, could make an important contribution to the protection of the biodiversity of the region, provide greater landscape connectivity for flora and fauna, and protect water resources and ecosystem services. The mitigation possibility category of ‘partially mitigated’ is applied owing to the uncertainty of both the potential adverse indirect impacts and positive (offsetting) impacts on these areas that are partially outside of the direct control of Paracel.

7.1.4.2.2.6 Fragmentation of the natural landscape

Environmental aspect

Replacement of Habitats with eucalyptus forestry planted areas.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

The eucalyptus plantation, made within an extensive Cerrado area, can influence the Fragmentation of the natural landscape.

Both landscape elements (pasture and eucalyptus plantation) constitute potential barriers to gene flow for most plants and natural Cerrado animals.

This is because although some animal species frequent the plantations grove, and although some species of the flora reach the reproductive phase in this environment, these represent a selective filter of potential pollinators and dispersers, and their extension certainly exceeds the displacement radius of most of these animals.

Develop technical criteria for fauna and flora classification prior to plantation, performing occupation planning and territorial planning in addition to, if needed, prioritize the acquisition of pasture land if forestry expansion is needed, is really important to improve genetic flow.

By increasing connectivity with the creation of ecological corridors between Cerrado fragments and with differentiated management of eucalyptus, including a management in Forest Mosaics, it improves not only genetic flow but also soil recovery and does not significantly impact the micro-basin.

Preserving and/or recovering areas beyond those required by law is a good practice that will be adopted by PARACEL, however the selection of priority areas for conservation should be done carefully, contemplating different physiognomies of habitats to preserve as many forest organisms as well as those of open areas.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	

Area of influence:	ADA, DIA	

Mitigation measures

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.

Open areas not planted will be retired from grazing and so if free of invasive grasses will recover to improve connectivity.

Paracel plans to not establish plantations in some Properties will serve to protect natural mosaics of the full range of Cerrado habitats that are connected with the National Parks.

The Biodiversity Offset design should consider opportunities to reduce fragmentation and improve connectivity at the landscape scale, for example through sustainable management of the Biosphere Reserve buffer zone.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL preserve the areas of native vegetation, riparian permanent persevered areas and legal reserve of its own forest lands, in addition to the legal requirement, minimizes the impact. When compared to the non-project scenario of ongoing conversion and degradation of Natural Habitat throughout the Project landscape, well designed Biodiversity Offsets have the potential to have a Net-Gain with respect to fragmentation of the Cerrado habitats mosaic.

7.1.4.2.2.7 Dust generation and suppression of local vegetation

Environmental aspect

Replacement of Habitats with eucalyptus forestry planted areas.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

An important factor in terms of machine movement is the increase in noise and dust at this time, and may impact the nearby population as the local fauna, driving it away.

As described in the characterization of the enterprise, the preparation of eucalyptus planting areas requires prior cleaning of the areas. Depending on the type and quality of vegetation, habitat loss for specialized or generalist fauna will occur, imposing its displacement to less disturbed areas.

In the phase of implementation and operation of forestry, there may be increased noise and dust from the movement of people, trucks and equipment, which can enhance the level of disturbance to the local fauna.

Thus, it is recommended to 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 and plan a management through Forest Mosaic, in order to favor the displacement of fauna species.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Short term	1
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL preserve the areas of native vegetation, riparian permanent persevered areas and legal reserve of its own forest lands, in addition to the legal requirement, minimizes the impact.

7.1.4.2.2.8 Noise related disturbance on fauna

Environmental aspect

Replacement of Habitats with eucalyptus forestry planted areas.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

An important factor in terms of machine movement is the increase in noise and dust at this time, and may impact the nearby population as the local fauna, driving it away.

As described in the characterization of the enterprise, the preparation of eucalyptus planting areas requires prior cleaning of the areas. Depending on the type and quality of vegetation, habitat loss for specialized or generalist fauna will occur, imposing its displacement to less disturbed areas.

In the phase of implementation and operation of forestry, there may be increased noise and dust from the movement of people, trucks and equipment, which can enhance the level of disturbance to the local fauna.

Thus, it is recommended to 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 and plan a management through Forest Mosaic, in order to favor the displacement of fauna species.

According to Study of hearing and quality of life in truck drivers, harvest bitrem truck similar to ones that will be use in the project emits about 74 dBA.

The perception of noise levels in the receivers varies depending on the distance from the emission source and is associated with other noises emitted in the area. The sum of the noises comprises the equivalent noise perceived by the receiver.

Noise emissions vary according to operations and development of the work. But, at first, they vary in the range of 70 to 100 dB (A), at source, for reference operations. However, the contribution in the increase of perceived noise in the receivers varies depending on the distance from the source.

In the open field, with each doubling of the distance the noise decreases by 6 dB (A). Since sound pressure is inversely proportional to the square of the distance, the decrease in intensity can be expressed by the equation:

Noise reduction: NPS (R 1) – NPS (R 2) = 10 log R 2^2/R 1^2

Note: NPS = Sound Pressure Level

The NPS is expressed by NPS = 10 log I/I_0, where I represent the average amount of energy transmitted by a sound wave in the unit of time by the surface unit and I_0 is a reference intensity (for air propagation has a value of 10^{-12} Watt/ m^2).

Therefore, an equipment that emits a noise measured value of 74 dB (A) about 1.5 meters away will show the noise decrease according to the following table.

Distance in meters	**1,5**	**3,0**	**6,0**	**12**	**24**	**50**	**100**
Sound level dB(A)	74	68	62	56	50	44	38

Since, the generated noise drops fast and within 12 meters the machine emits about 56dBA, almost the same noise as croaking frog noise, it is possible to state that the generated noise will not impact significantly the fauna and neither the neighbors.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Short term	1
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL will minimize the impact.

7.1.4.2.2.9 Eutrophication of rivers due to improper fertilization

Environmental aspect

Use of fertilizer.

Impact-Generating Factor

Inadequate use of fertilizer.

Technical justification

In addition to good preparation and establishment of planting and adequate choice of spacing, fertilization is yet another extremely important pillar in forest productivity, being responsible for significant gains in increasing the volume of wood (SANTANA et. Al., 2008).

The decision for any fertilization should always be based on economic and technical criteria. The strategy of a fertilization program consists of knowing the soil, its physical and morphological chemical characteristics, in short, its pedology, as well as the characteristics of the growth curve of the genetic material to be planted, its potential productivity and nutritional demand to support the expected yields.

The knowledge of the growth phases and rainfall distribution are fundamental to determine the fertilization operations, since the use of the fertilizer by the plant depends on its nutritional demands, as well as the availability of water in the soil to make nutrients accessible to the seedlings, that is, soil conditions and their portion explored by the roots.

The knowledge of the nutrient balance is also essential for the sustainability of forest production, which reinforces the need for adequate long-term management strategies. Thus, it is necessary to have knowledge of the relationship between the amount of nutrients that are exported and the bioavailability of nutrients at the place of cultivation, in order to be able to apply techniques aimed at sustainable forest management for several rotations (SANTANA et. Al., 2008).

Fertilization in general has the basic NPK formulation, which represents the main primary macro nutrients: Nitrogen, Phosphorus and Potassium. The NPK formulation can contain different combinations of concentration of these 3 elements, in order to meet the needs of each plant, according to its stage of development and soil fertility.

Nitrogen (N) is the component of greatest importance for the initial growth, as it is present in the composition of the most important biomolecules, such as ATP, NADH,

NADPH, chlorophyll, proteins and numerous enzymes (BREDEMEIER & MUNDSTOCK, 2000 apud MIFLIN & LEA, 1976; HARPER, 1994). This way, this is the most important nutrient for the first fertilization, carried out before planting. Phosphorus (P) is also essential for the initial growth, as it is directly related to energy storage and root formation. In turn, potassium (K) has direct responsibility for the development of plant tissue and assists in resisting water deficit by regulating the functions of opening and closing the stomata of the leaves, which in turn regulates the "loss" of water by plants.

Therefore, for the first fertilization, a higher dosage of N and P is recommended to guarantee the initial development of the plant, while in following fertilizations K becomes the key component in the growth and health of more adult plantations.

Although high levels of N might cause Eutrophication of rivers. Therefore, PARACEL will perform agrochemicals management program, as well as hazardous materials management program in order to prevent any accidental leakage risks to the environment and protect the health of all employees.

Other than that, PARACEL in compliance with the FSC pesticide policy on use of Highly Hazardous Pesticides - HHP (SCPOL-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, as well as any agrochemicals whose active components are part of IDB Invest Exclusion List.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Medium term	2
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	

Area of influence:	ADA, DIA	

Mitigation measures

Perform agrochemicals management program and hazardous materials management program, in order to prevent risks to the environment.

Exclude the use of all hazardous pesticides that contain or main contain active ingredients listed as prohibited by the FSC.

Monitor the leaching of nutrients and agrochemicals and their potential impacts on freshwater ecosystems.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL will minimize the impact.

7.1.4.2.2.10 Indirect impacts of pesticide use (fipronil) on community bee keeping

Environmental aspect

Use of pesticide.

Impact-Generating Factor

Inadequate use of pesticide.

Technical justification

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.

In compliance with the FSC policy on use of Highly Hazardous Pesticides - HHP (SCPOL-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.

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 nonchemical treatments, subject to exhaustive analysis of environmental and social risks for the active ingredient to be used.

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 policy on the use of pesticides highlights importance of monitoring the use of pesticides and the impact of the policy itself.

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 policy, 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 in its management units.

This requirements applies to all PARACEL's operation areas and to all organization, work groups and entities 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. It includes all facilities and surfaces:

- Located inside or adjacent to the areas under PARACEL's valid title or control, or operated by, or on behalf of PARACEL, in order to contribute to the management activities; and

- Located outside or in non-adjacent areas to those aforementioned areas, operated by PARACEL, or on behalf of PARACEL, in order to contribute to the management activities.

The present policy applies to all key contractors, split-off area of the management unit, biological control, pesticides used for purpose other than pest control in the management unit (e.g. as fertilizers), impurities in fertilizers and the use of pesticides once the forest products left the management area.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Medium term	2
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2

Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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 main contain active ingredients listed as prohibited by the FSC.

Interview periodically the local bee keepers and compare their local bee colonies monitor data with the use of pesticide (fipronil).

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL will minimize the impact.

7.1.4.2.2.11 Harassment of workers to wild fauna and flora

Environmental aspect

Risk of running over animals and Hunting risk.

Impact-Generating Factor

Opening accesses and roads and Formation of the eucalyptus forest.

Technical justification

During planting, maintenance and especially harvesting it is estimated that several truck journeys are required daily to transport eucalyptus logs to the pulp mill.

On the opening roads activities, it should be considered a wildlife rescue program. An increase in vehicle traffic increases the risk of animals being run over on the access roads.

Losses of animals due to being run over are certain and frequent, mainly in similar rural environments where, on the one hand, the scarcity of native vegetation represents, among other aspects, the need for the transit of animals in relatively large areas to look for food and/or for procreation, simultaneous to the lack of shelter for the movement of these same animals. On the other hand, the network of secondary roads that cross the extensive and continuous cultivation areas, constitutes a scenario of inherent risk.

Therefore, the increase in traffic will lead to an increase in the frequency of being run over, with the consequent loss of wild animals.

Environmental education work, which addresses the issue of "wildlife running over" is extremely important for driver awareness and the application of traffic signs will provide a significant reduction in the risk of animals being run over.

Due to increased access to the roads in the region, to the areas of farms by third parties and surrounding population, can induce the activities of hunting and capturing animals in this region.

The presence of people in the area may result in possible pressure to hunt and capture wild animals, both for the consumption and illegal trade of these animals.

Besides, environmental education work to make population aware of this fact, PARACEL should avoid fragmentation by roads in the Cerrado areas because, in addition to facilitate the displacement and entry of hunters, it also increases the risk of animals run over, as well as may influence some small species that considers this road a barrier to displacement. In order to avoid animals hunting PARACEL should consider to carry out inspection on farms mainly on weekends and holidays.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Medium term	2
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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, and police speed limits;

Intensify surveillance activities in partnership with local authorities and neighbors to avoid animal hunting and breaches of traffic control rules;

Prohibit hunting by workers and install signs prohibiting hunting.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It can be stated that the risk on local fauna will be minimized by the implementation of the proposed mitigation measures.

7.1.4.2.2.12 Spread of invasive species along new roads and fire breaks

Environmental aspect

Risk of spread of invasive species.

Impact-Generating Factor

Opening accesses and roads and Formation of the eucalyptus forest.

Technical justification

The forestry enterprise, to a large extent, is already in altered areas by anthropic action through the various agricultural and livestock cycles practiced there. On the other hand, part of the areas did not undergo major changes.

As described in the characterization, the implementation of the areas for the planting of eucalyptus requires the prior cleaning of the land.

Although the plantations mitigate, at least for a certain period of time, the edge effects on the fragments, these two landscape elements (pasture and eucalyptus) constitute potential barriers to the gene flow of plants between fragments. This is because although some animal species frequent the understory of the plantations, and although some plant species reach the reproductive phase in this environment, these represent a selective filter of potential pollinators and dispersers and their extent certainly exceeds the flight radius of most of these animals.

Depending on the successional stage of the areas to be interfered with, the suppression of vegetation may imply the reduction of environments of the various Cerrado formations in a region marked by the decharacterization of its original vegetation cover.

In order not to have a spread of invasive species along new roads and fire breaks, a continuous monitoring should be performed.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2

Moment of occurrence:	Short term	1
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Monitor continuously the invasive species along new roads and fire breaks;

Plant native grasses within fire breaks.

Implement an Invasive Species Management Plan to avoid and control the spread of invasive species due to the plantation operations, focusing on invasive pasture grasses and machinery, fire breaks or road verges as means of transmission.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL will minimize the impact.

7.1.4.2.2.13 Risk of fire

Environmental aspect

Risk of fire.

Impact-Generating Factor

Opening accesses and roads and Formation of the eucalyptus forest.

Technical justification

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 vegetation and vegetal, in order to avoid the start and propagation of fires. The fire breaks must be more intensively managed the greater the potential risk of fire, that is, where there is a greater intensity of traffic of vehicles, machines and other vehicles not related to the forest operation. This practice must be 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, in order 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.

According to Venturi et.al., 2007, the 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. Therefore, it is important that the plots have climatology networks to assess humidity, temperature and wind speed, for the classification of potential risk areas.

Once preventive measures are taken, the likelihood of fire occurring decreases in the same proportion, but it is never possible to completely eliminate the risk of fire. 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.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Short term	1
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	2
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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.

Take into account climate change predictions (drier and more extended dry season, and more extreme temperature frequency and duration) to ensure that fire-breaks between plantations and native forest patches are of sufficient width to avoid fire spread into the native forests.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The actions adopted by PARACEL will minimize the impact.

7.1.4.2.3 Socio-economic Impacts

7.1.4.2.3.1 Impact to Employment

Environmental aspect

Hiring of manpower for eucalyptus formation.

Impact-Generating Factor

Manpower demand for the eucalyptus formation.

Technical justification

Employment opportunities will be generated from the installation and operation of plantations and forest nurseries. According to the data provided by PARACEL, it will be required up to 70% unskilled labor, 20% qualified professionals and 10% qualified technicians. Up to 95% of the workforce is expected to be national; and of this, around 50% is local (from the Project's DIA), with the remaining 50% from the other

departments of the country (IIA and others). Part of the jobs will be continuous over time and part will be temporary and cyclical, according to the sub-stage of the forest production cycles.

It is estimated that the project will progressively employ a growing number of staff, so the flow of workers will also increase, directly and outsourced (hired, through intermediaries), from around 270, through 1,335, 2,545, 2,750 to 3,050 people in the different sub-stages of the installation phases - in a period of approximately21 54 months - and operation - henceforth. Most of the jobs will be outsourced, between 94.44% and 98.36% as one moves from planning to operation. The project will comply with the principles of IFC PS 2 on “Labor and working conditions”, clearly defining the labor links, depending on whether the employees are direct workers, contracted (outsourced), or workers in the supply chain, as the case may be. Likewise, FSC Principle 4 on “Community relations and workers' rights” will be considered.

The jobs will be related to the different activities/processes of installation and operation of the forestry component, from planning to the transfer of wood to the industrial plant and the start of a new cycle of plantations. Likewise, it should be noted that not all forest fields will have exactly the same planting cycle simultaneously, so the number of workers in each field will vary at the same time.

According to the socioeconomic data, the people of the department of Concepción will be able to cover the demand for unskilled employment, since there is a large number of available ones. In the department of Concepción, a large part of the population is young; of which 72% are under 35 years of age, with an average of 7.61 years of studies. For its part, the department's working-age population (PET) is 186,627 people, of which 58.33% are economically active. The approximate total of the population of the 6 districts of the department of Concepción, within the DIA of the forestry component, is 111,950 people by 2020. With these data, it is estimated that a large part of the unskilled labor that will be employed by the project could be local, in the same department of Concepción.

To a lesser extent, the department of Concepción could also provide a certain amount of skilled labor. According to the data observed in the LBS (Linea de Base Social – *Social Baseline*), different types of technical courses are taught in the department with rapid job prospects, especially in the urban areas of the department, in various public and private training centers. The technical sectors of interest in which there are people trained in the department are: automotive, commercial, electricity, accounting, labor law, finance, taxation, information technology, computing, welding, metalworking, construction, plumbing, carpentry, light and heavy vehicle and machinery driving, safety in road works, painting, among others. In this sense, the project constitutes a job opportunity for unskilled labor that could come primarily from the DIA localities directly, neighboring the forest plantations; and technical manpower that could come from other districts within the department of Concepción.

The departments of Amambay and San Pedro, considered within the project's IIA, will also be able to provide labor, mainly unskilled, 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. The working age population (PET) is 127,915 and 330,995 people in Amambay and San Pedro, respectively; with an economically active population (EAP) of 64.03% and 63.11%.

21 PARACEL, Mampower, 2020.

The generation of jobs at the local level will contribute to the decrease in unemployment, which is 6.66% (about 7,247 people) in the department of Concepción, higher than the national average rate. And to the reduction of income poverty and structural poverty, which in the department of Concepción are high, of more than 40% in terms of income poverty and more than 50% in terms of at least one (1) Unsatisfied Basic Need (UBN), above the national average. Likewise, the creation of sources of employment, although mostly seasonal, may contribute to reducing the levels of migration from rural to urban areas observed in the department of Concepción, which are mainly motivated by work and study; and that also constitute another outstanding problem in the DIA. Unemployment, job insecurity, poverty and associated migration are four of the problems most highlighted by the people interviewed in the DIA.

Salaries for direct jobs generated by the project's forestry component are expected to be higher compared to current average salaries in DIA and IIA. However, this impact may be limited considering that the amount of direct labor (hired by PARACEL, without third parties as intermediaries) is between 5.55% (basic engineering stage), and 1.64% (operation stage) of the estimated total of jobs to be generated in the substages of the installation and operation stages. Most of the jobs will be outsourced (contract workers); likewise, PARACEL will guarantee compliance with current labor regulations, and in accordance with IFC's Performance Standard 2, to all personnel linked to the project.

In terms of direct jobs, the project could provide higher salaries than the current average per capita income in the IIA departments, taking into account the related national regulations and the profiles or qualifications demanded. The average per capita income is Gs 896,026 in Concepción, Gs 981,516 in San Pedro and Gs 1,530,906 in Amambay, all below the current legal minimum wage of Gs 2,192,839. Although the quintiles with the highest incomes make up more than 50% of the population, they are around the minimum wage in force in Concepción and a little more than the minimum wage in force in San Pedro. Furthermore, according to the economic characterization of the IIA, the total poverty level by income in Concepción and San Pedro is above 40%.

Most of the population of the three IIA departments is rural (Concepción 57%, San Pedro 80%, Amambay 33%); being agriculture and extensive livestock an important sector of employment of the population, although behind the tertiary sector (commerce and services). As for the population of the DIA districts, the majority is dedicated to activities in the primary sector, both for sale and for self-consumption, followed by the tertiary sector. Compared to these productive sectors, especially the primary one, the project is expected to offer better paid jobs.

It is considered a positive impact because of the increase in the level of income; a priori means an increase in the purchasing power and debt capacity of employed persons and their dependents, contributing to a greater consumption of goods and services and, therefore, to a greater development of the local economy and quality of life. Thus, a decrease in the level of poverty is expected, not only due to income, but also structural, which is high in the DIA districts, where between 49.1% (San Alfredo) and 89.4% (Sergeant José Félix López) of the population have at least one Unsatisfied Basic Need (UBN).

The possible loss of sources of employment and/or income would take place due to the change in land use, which will produce the implantation of forest plantations on sites that are currently dedicated to livestock production. This change in production will affect employees currently working in the establishments planned for the project, all linked to stays. The owners of the establishments are not considered, since they will have the freedom of decision and negotiation for the sale/lease of their land.

As indicated before, it is possible that the change in land use produces the geographical migration of workers accustomed to the livestock sector who would not/could not reconvert to the forestry sector. However, some workers are also likely to be unemployed, if they are unable to migrate to other establishments.

The project will train interested persons who will be able to be employed in both stages of the forestry component. This will be in order to counteract, to some extent, the lack of locally available skilled labor; and to strengthen the existing one according to the specific technical needs of the project in the area of forestry production. Along these lines, the training offered by the project will have a positive impact on the personal training of future workers in the forestry component; and at the level of hiring local labor.

In addition, the impact of leaving “installed capacity” in the project's area of influence, especially the DIA, in the medium and long term is considered positive. People who have been trained by the project and who have settled in the area and/or intend to settle in any of the DIA or IIA municipalities, will have greater possibilities of hiring in other enterprises in the area, or in those that are projected in the department of Concepción or San Pedro, especially, even more taking into account the possible development of more forestry production ventures that may take place in the future. It is highlighted that the project will establish alliances with the public and/or private technical training centers/institutions for rapid job opportunities in the DIA; Therefore, in addition to the people trained in the forestry component of the project, the capacities of the local technical training centers/institutions will be strengthened.

It is worth mentioning that in the surveys carried out among the population of the DIA localities, one of the most highlighted aspects as a problem for further development of the communities was the absence of training programs for young people. In relation to this, one of the expectations of the interviewees is the installation of technical training courses with possible job opportunities. In this context of need and expectation, the actions of the project, in this area, will generate a very important positive impact on local technical capacities.

Furthermore, the development of the project is expected to have multiplier effects, in the long term, on the development of other similar projects and on the economy in general of the area of influence, even beyond the DIA; and attract new investment. For this scenario, the installed capacity in the area would be key, and it is estimated that the items related to construction, nurseries and forest plantations, among others, could have a rapid labor insertion.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Positive	+
Form of incidence:	Direct and indirect	
Area of spatial coverage:	Local, regional and strategic	3
Probability of occurrence:	Certain	2
Time of occurrence:	Immediate	1

Timing or length:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type III Accumulation	
Magnitude:	Medium	2
Importance:	Great	3
Possibilities of potentiation:	High	
Degree of potentiation	High	
Degree of resolution of measures:	High	
Area of influence:	DIA and IIA	

Measures of enhancement

Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program;

Articulate 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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

Following the implementation of the enhancement measures, it can be assumed that PARACEL will promote the hiring of available labor in the department of Concepción, San Pedro and Amambay, as well as train the local population.

7.1.4.2.3.2 Impact to Indigenous Communities and Livelihoods

Environmental aspect

Possibility of affecting cultural indigenous resources.

Impact-Generating Factor

Land use for eucalyptus plantation.

Technical justification

The "Indigenous component Study" prepared by the Natán Foundation Technical Team, began in October 2020. It is consistent of a Free, Prior and Informed Consultation and Consent Process that has been carried out with indigenous communities in the direct influence area (DIA).

It describes technical and regulatory aspects that have been taken into account in designing, planning and implementing the entire process of dialogue and linkage of

indigenous communities with PARACEL within the framework of respect for human rights and the rights of indigenous peoples and communities.

The study was intended to contribute to the development of the Indigenous Component, delimiting as such those indigenous communities within the DIA of the PARACEL Cellulose Plant Project and with particular emphasis on monitoring and complying with the recommendations of Performance Standard 7 on Indigenous Peoples, which recognizes that "indigenous peoples are social groups with identities other than those of dominant groups in national societies", and which "are often among the most marginalized and vulnerable segments of the population".

With regard to cultural values, the results of the consultations, which were carried out in a Free, Prior and Informed Consent manner, have shown that indigenous communities did not manifest themselves to carry out ancestral activities and rites within PARACEL's property, however, they stated to practice hunting and/or fishing in and out of their territories and the collection of plants for domestic activities, such as food and therapy.

It should be highlighted that according to Fundación Natan Report on Indigenous Component study not all IP communities will be affected in the same way by the project, especially due to distance from properties and different habits.

As reported in the field work by the families of rural indigenous communities, their times for getting up and going to bed are often strongly influenced by the cycles of nature and the sun, such as dawn and dusk, the song of the animals that begins at dawn, among others. Although the indigenous people state that they use alarm mechanisms - such as their cell phones - to wake up earlier when they have to go to activities outside their community, such as meetings or go to a health center, this is usually atypical to their daily lives and does not hinder carrying out other practices of their daily life, such as drinking hot mate before breakfast.

A very typical dynamic of work in the Paraguayan field is that the laborers usually stop their work to form rounds of 4 to 5 people who gather to drink tereré (yerba mate with cold water) and rest from the heat. This practice carried out by the workers and which is deeply rooted in the customs of life in the countryside, has its roots in indigenous customs, who tend to come together to share rounds of tereré while they work. In many cases, these dynamics are considerably accepted in the field, both due to the great difficulty of preventing them and the obvious need for workers to cool off in seasons when the heat exceeds 40º Celsius, as well as because of the informal work conditions that allows pawns certain licenses.

The formalization of the work that PARACEL proposes for the departments where it will have operations and the high levels of excellence that it will demand from the ventures of its value chain, could mean that the hired indigenous people have to adapt to new schedules and customs.

Indigenous women around the world represent a vulnerable group that faces greater barriers than others, because they face triple discrimination, this means that they are discriminated against for being women, indigenous and poor (United Nations, 2021).

The inclusion of indigenous women through education and work will represent one of the great challenges that the PARACEL project will have to deal with if it intends to favor this vulnerable group. When reviewing the PARACEL documentation that could institutionalize the promotion of the hiring of indigenous women, it has been detected that in the Human Talent Policy and in the PARACEL Recruitment and Selection Policy, it is declared that vulnerable groups, including indigenous and women will be

favored and not discriminated against in job calls and opportunities; and in the Equal Opportunities and Non-Discrimination Policy, it is declared that PARACEL assumes the commitment to promote gender equality by creating initiatives that allow the participation of women in activities, responsibilities.

Finally, contributing to the empowerment of indigenous women favors the achievement of 4 of the Sustainable Development Goals -goals 5, 8, 10 and 15- and contributes to guaranteeing full respect for the rights of indigenous peoples.

The construction, adaptation and improvement of roads that PARACEL will carry out will allow indigenous families to move more easily from one place to another.

The improvement of the Ramal Paso Barreto / Puentesiño route will allow the indigenous communities Vy'a Renda and Takuarendyju, located on one side of the same route, to travel more easily on foot or vehicle, reducing the effort they make and the travel times. The improvement of the roads surrounding the communities will be of benefit so that families can enter and leave their communities more easily, both for carrying out leisure activities and to go to health and educational centers. However, if these roads lead to increased wildlife hunting and road mortalities then some communities may find it more difficult to obtain protein from bushmeat.

Likewise, the Takuarita indigenous community will be able to take advantage of the construction, adaptation and improvement of roads that will be carried out for the forestry undertakings of the Hermosa and Gavilán ranches, located 1 km away.

The agricultural species that indigenous families have mainly chosen to produce are cassava, beans, corn, sweet potatoes, peanuts, bananas and squash. And the animal species that they mostly breed are pigs, chickens, goats and cows.

In relation to barter, there are some indigenous communities within the AID that claim to barter products in exchange for meat in ranches that are owned by PARACEL and that are currently being used for livestock production. In this context of bartering, some families of the Takuarita indigenous community usually do it frequently in the Gavilán ranch and, occasionally, in the Zanja Moroti ranch, on the other hand, some families of the Vy'a Renda indigenous community do it in the ranch. Turpentine. The move from livestock to forestry production in PARACEL farms could mean a reduction in protein intake for these families, which should be of special care given the vulnerable conditions in which these families find themselves, as mentioned before.

Although for the present study no specific diagnoses were made to know the degree of malnutrition of girls, boys and adolescents, in light of the results of the III National Census of Population and Housing for Indigenous Peoples carried out by the DGEEC in 2012 that they mention Since 41% of indigenous children under 5 years of age suffer from chronic malnutrition, it could be assumed that a large part of the families in these communities could be within these rates. However, 72% of families state that they eat three times a day, 24% state that they eat twice a day, and 4% of rural indigenous families state that they eat only once a day.

Due to the aforementioned, the hiring of indigenous people in PARACEL activities or in the ventures of its value chain, can become an opportunity for many families of the communities within the AID to improve their food and nutrition conditions, accessing a greater dietary diversity.

Of all the indigenous communities within the DIA, there are three that state that they make use of ecosystem services within PARACEL's properties, carrying out hunting, fishing and gathering activities: forty families from the Vy'a Renda indigenous

community and two families from the community indigenous Takarendyju declare that they make use of ecosystem services in the forests of Estancia Trementina and thirty-four families of the indigenous community of Takuarita that claim to use ecosystem services in Estancias Gavilán, Trementina, Hermosa, San Liberato and Zanja Morotí.

Indigenous families mostly use the following species from ecosystem services:

▪ Hunting: mborevi (*Tapirus terrestris*), capybara (*Hydrochoerus hydrochaeris*), tajy kati (*Tayassu pecari*) and tatu guazu (*Priodontes maximus*).

▪ Fishing: tare´yi (*Hoplias malabaricus*), mandi´i (*Pimoledus clarias*) and piraju (Salminus brasiliensis).

▪ Collection: honey, yvapuru (Plinia cauliflora), guava (*Psidium*), inga (Inga) and apepu (*Citrus aurantiumen*).

Law No. 904/81 of Paraguay makes it explicit that any organization outside the indigenous communities is strictly prohibited from influencing their political administration or the election of representative leaders. However, it is important to be aware that the majority of indigenous communities are vulnerable groups that, in many cases, have fragile governance that is administered by family groups that prioritize their own interests, the mere fact that an external organization such as PARACEL has The initiation of relations with the communities through the mediation of the chiefs is already an action that can trigger the strengthening or weakening of the internal governance of the community, depending on how this relationship develops.

According to the indigenous families in the participatory rural diagnosis activities, they are satisfied with their leaders for having started relations with PARACEL and for allowing surveys and meetings to be carried out within the community.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative/Positive	-+
Form of incidence:	Direct and indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Possible	1
Time of occurrence:	Immediate	1
Timing or length:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II and III	
Magnitude:	Medium	2
Importance:	Medium	2

Possibilities of potentiation:	Medium	
Degree of potentiation	Medium	
Mitigation possibilities	Mitigated	
Degree of resolution of measures:	Medium	
Area of influence:	DIA and IIA	

Mitigation and potentiation measures

Perform Indigenous Consultation and Consent Procedure.

Promote indigenous labor inclusion in PARACEL and in the ventures of its value chain, considering the cultures of origin of indigenous workers.

Monitor the adaptation of indigenous people who must reside in temporary accommodation.

Prevent disrespect for the rights of indigenous peoples and 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 used in a shared way by the project and the indigenous communities.

Perform Relationship Program with Indigenous Communities.

The ESR (Ecosystem Services Review) (mentioned as a mitigation measure to be implemented in the ‘Use of Ecosystem Services’ and ‘Land Acquisition & Displacement’ sections) should place special attention on the potential impacts of the Project on access to Priority Ecosystem Services for Indigenous communities which could affect their wellbeing.

If significant conversion of Natural Habitat is predicted to occur (subject to confirmation by the Critical Habitat Assessment), then IFC PS6 requires consultation with affected communities and any Indigenous Peoples communities that would have used ecosystem services in these areas should be consulted; this consultation could form part of the ESR.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It can be said that there will be a negative Impact to Indigenous Communities and Livelihoods due to change of land use to eucalyptus plantation, but the development of the forestry component of the project could lead to a greater attractiveness for the sale of real estate by the current owners to those interested in expanding the business, may be considered a positive impact. Other than that, PARACEL will make efforts not to cause any disturbance to Indigenous Communities and Livelihoods, compromise to get Indigenous Consent in the direct influence area (DIA).

7.1.4.2.3.3 Community health and safety through vector borne and communicable diseases

Environmental aspect

Accumulation of standing water.

Impact-Generating Factor

Cleaning the land and Opening accesses and roads.

Technical justification

In addition to the specific preventive signage measures mentioned in the road safety program for institutions and communities of the ADA and DIA, as well as the planned training, PARACEL will establish specific alliances with local health institutions (USF-Unidad de Salud Familiar, health centers) identified in the DIA/ADA, in order to contribute to the management and monitoring of information related to water-borne diseases, vector diseases, respiratory diseases, sexually transmitted diseases, pregnancy, drug use, alcohol, among others.

In response to the pandemic declared by the WHO, special attention will be paid to supporting and disseminating the MSPyBS (Ministerio de Salud Pública y Bienestar Social) campaigns, both in measures against COVID-19, and other vector diseases that may occur.

Disease awareness campaigns

PARACEL will support health campaigns in the DIA communities, promoted by the MSPyBS, as well as in the distribution of awareness materials on sexually transmitted diseases, protocols against COVID-19, preventive measures against dengue and other vector diseases. Likewise, specific campaigns will be carried out to prevent diseases of water origin (with emphasis on children and women), considering the low quality of the water and the lack of treatment systems in certain areas; as well as the dissemination of water quality results in the DIA water courses (Paraguay River, Aquidabán River, others).

Other diseases can occur due to the inappropriate use of solid waste (many times generators of vectors) or due to poor disposal of packages of chemical products used, as could be seen in previous chapters; especially in the forestry component, which is why specific campaigns will also be carried out on the proper management and disposal of solid waste, as well as on the management of hazardous waste.

The information related to the attended campaigns, the number of people who receive the materials, the talks given by PARACEL staff will be recorded; as well as possible claims related to illnesses that may be attributable to project personnel and/or activities, among others.

Disease baseline studies

PARACEL will help carry out specific studies to systematize information from the USF; and then deliver them to the MSPyBS, as well as to the Municipalities, in order to contribute in establishing the bases to have reliable statistical data in the area; moreover, taking into account the recent breakdown of some districts, of which there is no baseline data for subsequent monitoring.

In addition, a record will be kept of the illnesses associated with the work personnel; and related to these issues, in order to prevent the spread of diseases to communities. According to the results, specific awareness campaigns will be carried out with PARACEL staff, always promoting the norms of conduct with the communities.

Health impact monitoring

Specific studies will be carried out in order to monitor the health data of the community; and those that may be attributable to the project (accidents, sexually transmitted diseases, by vectors).

In addition, third-party health and safety impacts will be monitored, as mentioned in the impact assessment chapter; in order to document possible causes related to diseases related to water (of water origin or transmitted by it).

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	3
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

Support health campaigns in the DIA communities;

Carry out specific studies to systematize information from the USF; and then deliver them to the MSPyBS, performing a disease baseline study.

Monitor the health data of the community.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The proliferation of vectors will be minimal to maintain surveillance activity for guiding measures that neutralize the conditions favorable to the proliferation of mosquitoes and other vectors in the space occupied by the project and its area of influence.

7.1.4.2.3.4 Impact to Community Health, Safety and Security

Environmental aspect

Impact the infrastructure services.

Impact-Generating Factor

Mobilization of workforce.

Technical justification

The temporary and definitive increase in the population in the DIA communities, generated by the hiring of personnel and consequent increase in the flow of workers in the area, for the installation and operation of forest plantations and by the potential arrival of other people attracted by the indirect effects of the project, as well as the needs of the facilities of the forestry component of the project and the potential increase in people visiting the area, will produce a certain increase in the demand for public and non-public services, both existing and of those currently non-existent, although it is estimated that it will be lower compared to the industrial component of the project.

These services are: Collection and final disposal of solid waste, drinking water, sanitation, electricity, transportation, health care, police and security, emergencies, education, communications and information, lodging.

The project will provide temporary and mobile accommodations as housing solutions for the workers, which will be located within the buildings of the forest plantations and away from the urban centers and/or communities near/neighboring the buildings. These accommodations will rotate in the fields where the plantations are made and will have all the basic services, provided by the company. In this context, the potential impact on each of the public and/or private services by the project workers is described below.

- **Collection and final disposal of waste, drinking water, sanitation, electricity, communication and information technologies, emergency infirmary, security, lodging:** As the project workers will predominantly settle within the plantation buildings, it is estimated that the pressure on these basic services in the DIA will be practically non-existent. Regarding the management of effluents and collection/disposal of waste, these will be attended to by PARACEL in accordance with national regulations.
- **Transportation:** It is presumed that the majority of the workers will use their own vehicles of the type of motorcycles for their eventual transfers between the forest plantations (accommodation) and the urban/rural areas of the DIA, according to the background that is between 70% and 80 % of households with motorcycles in the DIA. Therefore, the impact on existing public transport services –which are very limited in DIA– will be insignificant.
- **Health care:** It is estimated that only in situations of illnesses or other minor ailments, the existing healthcare centers in the DIA will be used. For mild cases, there will be own infirmaries within the forest plantation buildings. In this way, the pressure of project workers on existing public and private health services will be significantly reduced.

- **Police and security:** It is estimated that only in cases of emergencies and conflict situations of great magnitude/importance and/or when the nature of the event requires the intervention of the public authority, the public police/security service will be used. The project properties will have their own security personnel, which is common in private enterprises. In this sense, the need for the project to have the support of the public police/security service is reduced. However, as it is a sensitive aspect that could involve the violation of human rights, the project will observe, as a minimum, IFC PS 4 on "Community Health and Safety", regarding the safeguarding of personnel and properties; on the one hand, and the minimization of security risks for the surrounding communities.
- **Emergencies (volunteer firefighters, municipal and/or national police, highway police):** It is estimated that only in cases of major emergencies or that occur on public roads will the existing public emergency services be used; as, for example, in cases of uncontrolled forest fires, road accidents during the transport of project loads, etc. The project will have its own emergency care brigades in all the buildings of the nurseries and forest plantations, thus reducing the need for support from the public emergency service. It should be noted that, as described in the study on the industrial component, the volunteer fire services and the national police in the DIA could be insufficient in the event of an increase in emergency situations.
- **Education:** It is presumed that since the jobs in the forest plantations will be mostly temporary, there would not be the case of massive removals of relatives of non-local laborers to DIA; therefore, existing educational services would not be significantly impacted. It is important to mention that some localities do not have tertiary education, which could mean that some families need to refer relatives to the populated centers, predominantly the district capitals, for the educational development of the secondary cycle.

Regarding the potential transitory and permanent population indirectly induced by the project in the DIA and the people who could visit the area, it is estimated that all of these could put pressure on all existing public and non-public services; and an increase in the problem of the lack of some of the basic services. As for the existing services, the increase in demand could affect the current service levels in the DIA, since, if the development of these does not adequately accompany the population increase, the capacity of the services will be exceeded. Regarding the currently non-existent services that are basic for human populations, the lack of these, together with the temporary and definitive increase in the population, may generate situations of deterioration of the urban/rural and housing environment in the affected communities and living conditions with basic needs dissatisfied.

In the social base line, it has been indicated that there is a problem in the supply of social services in the department of Concepción, and that the cause of these lies in the inefficient geospatial distribution of the same (for example, along communication routes important), in the quality of the provision (for example, the number of schools is not an indicator of the quality of education), in the slow growth of their coverage (which does not accompany the population growth), and in lack of adherence to anthropocentric drivers (population or socio-economic growth) for the development of services (development depends more on political wills of the moment than on development plans). In this context, an indirect impact of the project may be the temporary and definitive pressure of the population induced by the development produced by the

project on the existing services and on the environment, due to insufficient or lack thereof.

In the event of a temporary and definitive population increase in the DIA, indirectly induced by the development of the forestry component of the project, there may be also an increase in the demand for housing in the DIA, although on a smaller scale compared to the component industrial. Most of these people will be geographically located according to some indicators, such as the magnitude of the movement of people associated with the project in the DIA communities, the degree of development of the DIA communities (existing services, business/service opportunities), and leasing capacity (the existing offer of lodgings, rentals and houses).

There is no data on homes that are for rent or sale in the DIA communities. Regarding lodgings, there are data from the Horqueta and Loreto districts, but these are probably concentrated in the district urban areas, not in rural communities such as those of the DIA. In the event that the induced population cannot access housing with minimum habitability criteria -both due to the scarcity of supply, and due to lack of resources to acquire or rent them-, there is a risk of establishing irregular and precarious settlements in the DIA communities, contributing to the deterioration of their urban/rural environment and the quality of life of the people in said settlements.

Regarding the demand for housing by the project workers, it is estimated that this will be insignificant since the project will provide temporary and mobile housing that will be installed within the buildings of the forest plantations and that will rotate in the fields where plantations are made. The workers who are current residents of the DIA communities closest/neighboring to the forest plantations will be able to live in their own homes or in these accommodations, without the need for new housing solutions.

There will be an increase in vehicular traffic in relation to that currently existing in the area of influence; and especially in the DIA due to the needs of transporting harvested wood, materials, supplies, machinery, equipment, solid waste and effluents that will have the installation and operation stages of the forestry component of the project, particularly during the harvest season and timber transfers to the industrial plant, which is expected to occur at a rate of 1 truck every 4 minutes approximately, from years 6-7 after the installation of the plantations in each forest field. However, as the plantations in each field will be implemented at different times starting in 2020, it is not expected to have timber transported from all the fields at the same time, especially in the first years of installation and harvest.

On the other hand, the increase in the transitory and permanent population will also contribute to the increase in traffic in the DIA, due to the increase in the flow of workers linked to the project, as well as the potential population induced by the project. This population will have transportation needs that, considering the context, would more likely be covered with their own vehicles, mainly motorcycles.

Although the project vehicles will not be the only ones traveling in the DIA since there are heavy loads of livestock and agricultural products in the area; this increase in traffic may lead to a decrease in service levels (speed, travel time, freedom of maneuver, interruptions, comfort) or traffic flow on the affected roads, during peak hours of use of the roads. According to observations of the existing roads in the DIA, the national routes and some branches are paved, have widths of up to 10 meters and two traffic lanes; other secondary roads are dirt (in some cases gravelly) and wide that allows two traffic lanes; these will be the routes shared by the project with other users in the DIA.

The increase in vehicular traffic would particularly impact the communities of the districts of Loreto, Paso Barreto, Arroyito, Horqueta and San Alfredo, which are located on the DIA roads to access/exit the properties of the forest plantations and to connect these plantations with the industrial plant.

Likewise, the project will require the conditioning and maintenance of certain sections of existing roads in the DIA for access/exit of the properties of the forest plantations. In this case, it is not ruled out that the adaptation and maintenance of communication routes for use in the installation and operation stages of the forestry component of the project produce an effect of increasing traffic on these roads, due to the theoretical proportional relationship that, the greater the supply of roads, the greater the demand for vehicular traffic. Just as roads are impacted, road safety is affected, attending to the low and almost zero signaling in the area, with emphasis on areas with concurrence of children, women and the general population (schools, churches, health centers).

The increase in vehicular traffic of all kinds –traffic of vehicles loading harvest wood (mainly), materials, supplies, machinery, equipment, solid waste and personnel transportation–, in the area of influence of the project's forestry component ; especially in the DIA, it could mean the faster deterioration of the existing roads, in terms of their structural conservation and their useful life, affecting not only the traffic of the project vehicles but also the other users of these roads, such as people who use them on a daily basis, the logistics of other productive activities in the area, the logistics of materials and/or passing products, etc. This impact will be minimized through the conditioning and maintenance of the access/exit roads of the forest plantation buildings by the project.

However, even with the roads that the project could condition in the immediate surroundings of the plantation properties, it is clear that there will be greater vehicular circulation on the roads beyond this environment, since materials, supplies, machinery and equipment will be received from populated centers outside the DIA districts and/or the same department of Concepción. Vehicle loads of the project in its installation stages; and above all of operation - scheduled at a rate of 1 truck every 4 minutes approximately, during the working day at harvest time - will be communicated to local and national road authorities, in order to establish a strategy for the least impact on existing roads. PARACEL has already started talks with the Ministry of Public Works and Communications (MOPC) to define joint strategies for the adaptation/improvement of access roads.

The duration of the causes of this impact is transitory, cyclical and continuous. In the installation phase, it is expected that only for a few months, of the total of 2 to 3 years that it will last, there will be peaks in the circulation of heavy vehicles, according to each substage of the installation (example: installation of nurseries, of accommodation, transport of inputs and machinery). In the operation stage, it is expected that from 6-7 years of the implementation of the plantations in each forest field there will be continuous transit of cargo trucks to transport the harvested wood to the industrial plant. It is estimated that the types of vehicles that would produce the greatest impacts are conventional and non-conventional cargo trucks, but not the private vehicles of project personnel and/or the induced population, which are presumed to be mostly motorcycles and/or other light vehicles.

On the other hand, in case of adaptation of existing roads, on the one hand, it will temporarily affect the pedestrian and/or vehicular traffic that currently uses said roads, since the space of the same will be physically occupied to carry out the works; and, on the other hand, it will contribute to improving the conservation of the roads, several of

which are currently in poor condition according to observations in the field and statements by residents of the DIA towns. Once these are adequate, compared to the current situation, the structural improvement and paving of all the public routes used for the transport of wood will imply a drastic change in the current situation, reducing travel times (note that traveling the 70 km between Jhugua Ñandu and Puentesiño it takes 1.5 hours today), improvements in road safety, as well as facilitating access to/from emergency services (ambulances, police, firefighters).

It should be noted that the "limited access to local roads" is one of the problems pointed out by the consulted populations of the DIA communities, with consequences for local development. Along these lines, although in a lower percentage, the interviewees stated "that the improvement of the road be guaranteed" as one of the expectations in relation to the project in its forestry component. It should be remembered that "infrastructure and road safety" was the aspect most mentioned by the representatives of institutions and communities of the DIA of the industrial component (districts of Concepción, Loreto, Horqueta and Belén), in relation to the aspects necessary for a greater development of their communities/districts. In this sense, they have highlighted the need to improve the state of roads and neighborhood roads. As Loreto and Horqueta are also part of the DIA of the forestry component of the project; and the situation of the inadequate state of some roads is reproduced in the other DIA districts of the forestry component; in addition to the already existing perception regarding these in the DIA and the loading of the project vehicles, it is estimated that the impact of the project will be important on the road infrastructure from a social perspective.

As already mentioned, as well as an impact on the roads is expected, road safety on the access roads to the forest fields would be affected, attending to the low and almost zero signaling in the area, with emphasis on areas where children, women and the general population attend (schools, churches, health centers).

Private land holdings will be affected for the access/exit of the forest plantation properties in the event that it is chosen to use an existing road that crosses private livestock establishments from the so-called “Crossing X” (Paso Barreto), towards the northwest zone of the plantations. Taking as a precedent that this road is already being used for the access/exit of the existing establishments in the area, the project could use it since it offers a significant reduction in the route to connect the areas of forest plantations to the northwest with the area of the industrial plant southwest of the department of Concepción.

The activities of the forestry component that may need to use this route; and, therefore, they would cause the affectation, will be those of various transports, both materials, supplies, equipment and machinery, temporary and mobile accommodation; and residues for the installation and maintenance of the plantations, the potential conditioning of the road that the project could offer in exchange for its use; and, mainly, the transfer of wood to the industrial plant once the forest harvests begin, from years 6-7 of the planting of trees in the buildings in the area.

As the road in question is already being used by other establishments and as there are no populations settled on it; the impact on the part of the project will not be significant as it would be in the case of the opening of a new road and/or the passage through populated communities. However, this impact on properties will generate rights of way that the project will agree on with each of the owners of the affected properties. In a private legal agreement setting, there would be less difficulty in defining the precise precautions, mitigations and/or compensations that the project will implement to be in compliance with the requirements of the affected owners. The project will observe the

principles of IFC PS 5 on “Land Acquisition and Involuntary Resettlement”, relating to measures in the event of temporary/permanent impairment or obstruction of properties.

On the other hand, in relation to land tenure, it should be noted that all properties linked to the forestry component of the project have property titles; and that peasant producers will not be affected, since almost all of the land belonged to large fields (or ranches), private cattle farmers with large-scale production. All forest fields are owned by PARACEL, and are connected to existing public roads except for the aforementioned road that crosses private properties and could be used by the project. Likewise, the project must ensure, in the medium and long term, that the condition of land tenure always guarantees compliance with local regulations and international standards (minimally, IFC ND 5, FSC Principle 2); in order to minimize claims by third parties, especially small peasant groups in the area and other vulnerable groups (for example: indigenous communities, with the exception that the in-depth analysis of this group is addressed by another specific study).

Direct economy, associated with the forestry production area

The hiring of labor –local, regional, national– for the installation and operation of the forestry component of the project, including outsourced workers, will contribute to the development of the local economy, considering that the flow of workers in the area will increase over all during the installation stage; due to the greater purchasing power that they will have for the consumption of goods and services, and even investment in their own businesses.

Likewise, the acquisition of significant volumes of agricultural inputs, conventional and specialized equipment and machinery, materials and services for the construction of temporary and mobile accommodation, and forest nurseries with all basic services, vehicles and their parts and repair and maintenance services thereof, materials and services for conditioning and maintenance of access/exit roads and other related works, services for the collection and final disposal of garbage/waste and/or special effluents. Transportation services for these loads and forest harvest wood will also be required. All these will be for the installation and operation of forest plantations, which will generate a greater dynamism of the local and regional economy, depending on the local/regional feasibility of production and provision of the same.

On the other hand, the project is expected to satisfy 20% of its wood needs through the provision of existing small and medium-sized local forest producers, initiating these articulations through a “pilot and incentive project” that is already coordinated with the National Forest Institute (INFONA). This will promote the development of local producers and the dynamization of the economy associated with the sector, beyond the forest fields of the project. This is a significant aspect, taking into account that, in the field data collection, part of the interviewees –especially in Paso Barreto, Loreto, Sergeant José Félix López (Puentesiño) and Horqueta– expressed the expectation that the project “link local producers” and/or establish a “safe purchase and sale system”, as well as “generate local development (growth of investors and the population)”.

With all the different needs that the forestry component of the project will have, it is estimated that it will contribute to the development of small and medium-sized local, regional and national companies for the acquisition/supply of the necessary goods and services. It is observed that in the department of Concepción there are sectors of the secondary sector (industry) that carry out activities related to the materials that may be required for the subcomponents of works of the forestry component of the project; such as: extraction of stone, sand and clay; wood sawmill; manufacture of non-metallic mineral products; manufacture of metal products for structural use; manufacture of

other fabricated metal products and metal working services; furniture manufacturing; maintenance and repair of fabricated metal products, machines and equipment. In addition, there are also forest plantations in the IIA departments (Concepción, San Pedro and Amambay) and others in the country, so it is possible that these producers enter into a commercial link with the forestry component of the project.

Indirect economy

The temporary and definitive increase in the population, directly associated with and/or induced by both stages of the project's forestry component, will generate a demand for local goods and services that will necessarily be higher than the current one; by the same number of people who will settle or spend time in the DIA. This will generate higher income and investment stimuli for the establishment and/or expansion of providers of goods and services of different types (food, communication, vehicles, transportation, recreation, education, health, etc.), formal and informal. As possible examples, we can mention the opening of commercial and/or service stores with products due to the flow of workers linked to the project, in the vicinity of the forest plantation buildings (dining rooms, supermarkets/pantries, telecommunications, mechanical workshops, etc.); the opening of new commercial and/or service premises along the communication routes used, with the expectation of selling products to carriers; the expansion and/or habilitation of currently insufficient or non-existent public services; the creation of jobs by the aforementioned enterprises, which will be able to employ more local people.

On the other hand, the conditioning of access/exit roads to forest plantations may also contribute to the development of the local and regional economy; since an improvement of the existing roads would facilitate the logistics of products, supplies, materials of ventures and/or producers of the DIA outside the project.

The greater dynamism of the local economy has, as positive effects, the increase in household income associated with the provision of goods and services, the possibility of accessing goods and services that are currently non-existent, limited, insufficient or inaccessible.

In the tertiary sector, it is observed that commercial and/or service activities are carried out in the department of Concepción that could be required to a greater or lesser extent during the installation and operation of the forestry component of the project, and that could be enhanced with this: trade, maintenance and repair of vehicles (including motorcycles), their parts and accessories; food and beverage trade; fuel trade; trade in cultural and recreational goods; land transportation service; temporary accommodation service; restaurants, bars and the like; telecommunications; financial services; real estate services for sale and lease; administrative support services for businesses; amusement and entertainment services. Regarding the DIA, according to data collected in the field, it is observed that part of the population is dedicated to trade and the offer of services (pantries, minor sales, motorcycle workshop, snack bars/dining rooms, sale of telephone mini-charges). Another important part of the interviewees declared that they are devote to trades for wages in the areas of masonry, plumbing, cleaning and wiring of land, etc. All of these may benefit from the increase in population in the DIA associated with, and/or induced by the installation and operation of the forestry component of the project.

Greater dynamism in the local economy will be very beneficial for local communities, since the total poverty rate by income in the department of Concepción is higher than 40%.

Additionally, it is worth highlighting the potential development in the medium and long term of more ventures in the forestry sector in the DIA, possibly induced by the initial venture (at least the first of such magnitude) which is the project. Studies of the National Forest Institute (INFONA) document the existing forest plantation areas in the districts of the Concepción department that are part of the project's DIA; as well as production forest coverage areas and potential forest development areas, at the national and departmental level. According to INFONA data, the districts with the most forest plantations in the department of Concepción are Sargento José Félix López (Puentesiño) with 3,785.78 ha –which constitutes almost half of the total (48%) - and Concepción with 3,207.04 ha –with more than 40% of the total–; thus, between these two districts almost 90% of the totality of existing forest plantations is reached. Two other districts with less planted area are Horqueta and Yby Yaú; and, finally, the district with the smallest area is San Lázaro with just 8.24 ha. Along these lines, it is important to highlight the potential use of DIA for forestry exploitation (without negative impacts to the soil since they are suitable for said development), provided that sustainable management measures are implemented. A potential development of forestry production induced by the project would entail benefits for the nearby/neighboring towns, creating jobs and contributing to the development of the local and regional economy.

The presence in the DIA of non-local people who work directly or in outsourcing for the project -particularly foreigners, people from other DIA localities and/or from other departments of the country- which will represent an increase in the flow of workers in the area; and of the people who will settle in the area due to the expectations of development induced by the project, it may involve the visit of these same people to different sites of the DIA in search of recreation and/or the frequent visit to the DIA of other people related to the first (relatives, close friends).

The temporary presence in the DIA of non-local people related to the logistics of materials, supplies, machinery and equipment for the installation of forest plantations, representatives of suppliers, personnel of international certifiers, etc. is also foreseen.

These visits and movements of people to the DIA, although transitory, could contribute to energize various sectors of the local economy, such as food, lodging, recreation, tourism, etc. To give an idea, there are currently approximately 43 beds in five establishments in Horqueta; and 52 beds in two Loreto accommodations. In this context, it can be estimated that the accommodation sector could grow accompanying the potential local development induced by the forestry component of the project.

It is estimated that the development of the forestry component of the project may induce an increase in the appreciation of land in the area, especially in the DIA; but probably also in parts of the IIA. One reason may be the value of the land for production in a booming industry; as it would be forestry, since the trend in the price of wood is increasing and the importance of the resource in the country is high due to the demand for buildings in general as well as for biomass, in addition to the type of demand that the project for industrial pulp production will have. However, it is presumed that the increase in value would not be very marked since currently the lands for livestock production already have high valuation. Another reason would be due to the induced development that the project may generate in the area with the movement of people and the need for goods and services.

This impact is positive for property owners, both of large areas of land and of average land that could benefit from the greater traffic of people in the vicinity of their properties, the installation of shops and services, etc.

The establishment of a temporary and definitive population in the DIA directly associated with, or induced by both stages of the project in its forestry component, may increase the probability of crime and/or violence events in the DIA due to the increase in population and the flow of workers. According to PARACEL's forecasts, direct and outsourced labor would increase as more forest fields are developed for the project. Regarding the induced population, this may also increase in the medium and long term, accompanying the development in the DIA. The impacts on local security are estimated taking into account that there could be cultural differences; as well as criminal acts due to the greater commercial and service dynamics; and the consequent increase in the circulation of money and assets. This could be favored if the public police service is insufficient for the size of the population that will be in the DIA.

Likewise, there is a risk that people who come to the area solely to commit criminal acts will settle in the DIA; in view of the aforementioned conditions that would be generated by the presence of the project's forestry component. The increase in the flow of workers could also imply a greater number of cases of gender violence in the area.

According to the information collected in the field already during the social studies process of the industrial component, in the DIA of the industrial plant, which includes the districts of Horqueta and Loreto that are also part of the DIA of the forestry component, "security" is the third and second most valued aspects, respectively, by the interviewees regarding the positive aspects of living in their communities. Likewise, according to those surveyed in the DIA, “violence” appears as one of the least mentioned aspects in terms of the problems identified in the territory. This indicates that people currently feel that there is an important level of citizen security and low levels of violence; so, their alteration, induced by the project, could be abrupt.

Furthermore, during interviews in the field, in the DIA communities –particularly Sargento José Félix López (Puentesiño), Paso Barreto, Loreto, Arroyito–, it has been stated and confirmed that “there is tranquility”, that people “are supportive and they know among everyone in the community", "good coexistence", "unity among the inhabitants", "security" as outstanding aspects of the area. In the communities near the forest fields, there has been no concern about crime, as had been observed in the DIA of the industrial plant.

Impact Characterization

	Qualitative	Quantitative
Nature:	Positive	+
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2

Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	3
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Potentiation measures

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 health, hygiene and safety in the Relationship Plan with the Community and other Social Actors;

Request public agencies to supervise safety, to inhibit illegal acts.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

PARACEL has compromised to adopt the best environmental practices regarding water, effluent, solid wastes and noise controls, not to cause disturbance according with the Community Health, Safety and Security Plan.

7.1.4.2.3.5 Worker Influx Increase

Environmental aspect

Impact the infrastructure services.

Impact-Generating Factor

Mobilization of workforce.

Technical justification

It is anticipated that the forestry component of the project may impact the migration of people in different ways, due to the increase in the flow of workers in the area.

One type of migration may occur due to the change of workers from one productive sector to another, bearing in mind that today the predominant activity in the area is livestock and to a lesser extent agriculture. The employment opportunity generated in both stages of the forestry component (plantation and harvest) of the project may attract people who currently already have a job in another productive and/or service sector and promote migration to the project, due to various factors that could make the offer of Project employment more attractive than the existing job/income generation offer, such

as: better wages/income, job formalization, related benefits, proximity to the home, desire for experience in a project with such characteristics, etc. The impact would be positive if migration means an increase in the level of income and quality of life of the people who have migrated to the project sector. The impact will be negative for the productive/service sectors that will lose employees and will have to hire new personnel and train them, or that will stop producing due to the lack of labor.

A second type of migration could be indirect. The economic development that may be induced by the project in the DIA at the forestry component, may generate attractions for: local laborers (Amambay and Concepción Departments), non-local laborers (other regions of Paraguay) and foreign laborers (other countries), who are currently engaged in certain productive areas and can migrate to productive sectors that can be indirectly promoted by the project, such as shops and/or services (tertiary sector, in general). In these cases, the impact would be similar to what was previously described in terms of migration from one productive sector to another.

In the department of Concepción, the main productive items historically have been agriculture and extensive cattle ranching, remaining predominant even before the authorization in recent years of some industries. This has also been the case in the departments of Amambay and San Pedro, maintaining this at least in San Pedro. In the DIA districts and communities, it is observed that the main economic activities are related to the primary sector, involving between 48.9% (San Alfredo) and 80.3% (Arroyito) of the population.

In the field data collection in the DIA, most of the interviewed population declared to work in activities of the primary sector, including agriculture and small-scale livestock; mainly for self-consumption and, as needed, for sale. Part of the population referred to commerce and services (pantries, minor sales, motorcycle workshop, snack bars/dining rooms, sale of mini-phone charges) as their activities. An important part declared their wage-earning activities (in ranches, masonry, plumbing, chainsaw operators, cleaning and wiring of land, others) as their income-generating activity, which constitute forms of informal employment.

In the context described, it is estimated that the main migration of workers may occur from the extensive and small-scale agriculture and livestock sector; that is to say, small producers, as well as self-employed workers –mainly informal ones– towards the project. According to the surveys carried out among residents in the DIA, the low profitability of agricultural production is one of the economic problems that affect the communities, which may give a notion that, given better income opportunities, people would choose to change productive area. As for the current informal workers (changas), these could offer services for forest plantations, since some activities used to carry out in the cattle ranches of the area would also be necessary in the forest area (for example: maintenance of fences, pruning). On the other hand, it is probable that people who are already employed in other specific areas (for example, industrials); and, depending on the type of employment, they may have fewer incentives (comparative wages and/or working conditions, they already have specific training for their field) to leave their current jobs.

According to the data from the IIA characterization, the departments of Concepción and San Pedro are the ones with the highest levels of pendular migrants (migration of a periodic nature and that does not translate into a change of residence); generally, for work reasons and at the intra-departmental level. At the level of the DIA residents (especially in Jhugua Guazú, Loreto, Paso Barreto), in the field information surveys, they indicated "migration" due to lack of job opportunities as one of the most afflicting

social and economic problems to the communities, which could be pendular or permanent migration, which produces uprooting. All this could indicate a favorable context for the people interested in migrating from their productive sectors or their current jobs to the project sector to be mostly from the department of Concepción and even from San Pedro.

Finally, a third type of migration would be geographical; since it is expected that workers in the livestock sectors (workers in ranches) may migrate to other establishments due to the change in land use, predominant in the project's buildings, since they will spend, for the most part, livestock production to forest production. In some establishments visited where the forestry plantations of the project are planned to be implemented, people have reported that the workers are used to working in livestock, and it is unlikely that they will want to change their area. In this context, both in the DIA, the IIA and other areas of the country (for example, the Chaco) there are livestock establishments that could attract these workers, considering that livestock is an area in growing development, both at the level of quantity of establishments and occupied geographical areas nationwide. The owners of the establishments are not considered, since they will have the freedom of decision and negotiation for the sale/lease of their land, and the possible migration of these would be voluntary and, furthermore, financially compensated.

There will be an increase in the population, due to an increase in the flow of workers, as a result of the need for the project of between 1,335 and 3,050 qualified and unskilled personnel; and professionals for the installation and operation of the forestry component, plus the families that these people could bring with them to live in the DIA communities. In the case of male employees, it is estimated that many could travel alone to the project sites, since there is a history of single male migration for work reasons (pendulum migration). This increase will be temporary, during the period that the installation activities last, which will be 2 to 3 years and the cyclical activities of the operation where a temporary increase in personnel is required; for example, the times of harvest and transport of wood.

The transitory population may be local or non-local laborers. Local population refers to people from DIA and the department of Concepción. Non-local laborers population refers to the population of the rest of the IIA (San Pedro, Amambay), of the other departments of the country and abroad.

Additionally, a transitory population increase in the DIA is expected due to the arrival of people not directly related or outsourced, with the installation and operation of the project's forestry component, but who see opportunities to generate income through businesses and/or the offer of services, due to the population, commercial and service dynamism that the project would generate.

In general, DIA districts are medium and small depending on the size of their population. There are about 5,799 people in San Alfredo; 7,242 in Sergeant José Félix López; 4,185 in Paso Barreto; 18,879 in Loreto; 13,181 in Arroyito; 62,664 in Horqueta and 17,765 in Bella Vista Norte, distributed in urban and rural areas, with a predominance in rural areas. The communities in the immediate surroundings of the forest plantation buildings are small towns, with up to around 1,000 inhabitants, with the exception of Sergeant José Félix López, who has more than 5,000 people.

These data would indicate that the population associated directly and indirectly with the installation and operation of the forestry component of the project could be important compared to the local population according to the current size of the populated centers where they could settle, especially in the case of the communities closest to DIA.

However, it is presumed that, due to the existing population density, the location of the additional transitory population is physically feasible, even more so, providing for the installation of temporary and mobile housing solutions for part of the workers, within the same buildings intended for the Forest plantations.

The direct workers of the project, as a result of the increase in the flow of workers linked, in case of being people outside the DIA, would become part of the DIA on a more permanent basis than the seasonal workers. However, it is estimated that these "permanent" workers would be a very small percentage of the total personnel mobilized by the project in each cycle of forest production. In addition, the project will also provide accommodation for permanent staff inside the forest plantation buildings, with all the necessary basic services. In this sense, this incremental population in the DIA would have little significant impacts on the existing accommodation capacities in the communities closest/neighboring to the plantation properties.

Additionally, and in line with the impact mentioned in the preceding section, the installation and operation stages of the forestry component of the project may constitute an attraction not only for those interested in being employed in the direct and outsourced activities of the project. But also for local or non-local laborers people who could obtain a benefit from the commercial development and services that the project could induce in the DIA communities, such as, for example, the creation of demand for basic goods and/or services; and the creation of jobs associated with them; also, for people who see opportunities for a better quality of life in the vicinity of the project, due to the potential for greater consumption options, etc. These people would come to increase the definitive population of the DIA communities.

Likewise, the increase in vehicular traffic by project vehicles, particularly those with heavy loads, and the conditioning and maintenance of existing communication routes, which connect with the forest plantation buildings for project use, may attract people, local or non-local laborers, seeking to settle in the immediate proximity of these roads, due to the economic opportunities that the greater dynamism of vehicles and people could generate along these roads. These would also go on to increase the definitive population in the DIA.

Thus, the increase of the population, represented by the labor force of the construction phase and people possibly attracted by the possibility of professional insertion in the activity, tends to increase the demand for public equipment such as: education, health, sanitation, transportation, etc., as well as tends to seek social interaction in the city of Concepción and the region.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative/Positive	-+
Form of incidence:	Direct and indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Possible	1
Time of occurrence:	Immediate	1

Timing or length:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II and III	
Magnitude:	Medium	2
Importance:	Medium	2
Possibilities of potentiation:	Medium	
Degree of potentiation	Medium	
Mitigation possibilities	Mitigated	
Degree of resolution of measures:	Medium	
Area of influence:	DIA and IIA	

Mitigation and potentiation measures

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;

Articulate 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;

Offer Labor and Working Conditions for the employees especially in terms of health plan and transportation.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The migration will impact on the available infrastructure, but it is estimated that the main migration of workers may occur from the extensive and small-scale agriculture and livestock sector; that is to say, small producers, as well as self-employed workers –mainly informal ones– towards the project. According to the surveys carried out among residents, the low profitability of agricultural production is one of the economic problems that affect the communities, which may give a notion that, given better income opportunities, people would choose to change productive area.

7.1.4.2.3.6 Impact to Labor and Working Conditions

Environmental aspect

Compliance with applicable legislation and sustainable standards principles (ISO 45.001 and the IFC Performance Standards).

Impact-Generating Factor

Mobilization of workforce.

Technical justification

Both implantation and operation stages of the forestry component of the project will create direct formal jobs (hired by PARACEL, without third parties as intermediaries); that is, in compliance with current national legislation. Regarding the jobs generated that will be outsourced, these will be monitored by the company in order to comply with national legal requirements, in compliance with the principles of IFC PS 2 on “Work and working conditions”, which defines requirements applied to workers. contracted (outsourced).

This will be beneficial, comparatively, in the area of influence; since only a little more than a third of the salaried population employed in the three departments of the IIA have formal working conditions, in the sense that they are registered and make contributions to a retirement system. In absolute values, as of 2017, this involved only 13,969 people (38.41% of the population) in the department of Concepción, 19,171 people (38.24%) in the department of San Pedro and 14,167 people (35.36%) in the department of Amambay. In the field data survey in the DIA, job insecurity (low pay, unsafe employment links) has been mentioned as a relevant problem.

Access to formal employment conditions is beneficial for workers and their dependents, since the system of pension contributions and social security is now integrated. Other labor rights and guarantees are accessed, contributing all this to a better quality of life for the worker (greater peace of mind regarding the future, etc.) and the dependents of him.

Work is essential to life, development and personal satisfaction. Whenever work is carried out, there will be risks, due to the processes, operations, and materials that, to a greater or lesser extent, create risks to the health of employees, neighboring communities, and the environment in general.

The organization works toward the personal development of each employee and focuses on behavioral development, always aiming for Zero Accidents and not getting sick.

Compliance with the legislation applicable to our activities, in any of the countries where the company operates, will always be the minimum standard to be met by the organization. It is expected that the execution of the activities in a safe manner will be carried out through continuous actions of sensitization, training, and involvement of the teams and the evaluation of the results, always aiming at the continuous improvement of the processes, in compliance with the principles of ISO 45.001 and the IFC Performance Standards, agreed upon during the elaboration of the Paracel pulp project.

Once these purposes are fulfilled, the performance of the employees in Paracel's forestry component and its contractors and subcontractors, in the performance of any activities, will be based on the knowledge and belief that prevention will always be the best way to avoid work-related illnesses and injuries caused by accidents.

In Paraguay, through Decree 14,390/1992, Resolution 785 of May 29, 2020, and Law 5,084 of 12/15/2017- Law that regulates the standards of Safety, Hygiene, and Comfort at Work in accordance with the provisions of the country's Labor Code, and in Brazil through Ordinance 6,730/2020 of 09/03/2020 and Ordinance 1,295/21 of 03/02/2021, which will come into effect on 01/08/2021, the levels to be met by the corporation are established.

The use of the methodology of the Occupational Health and Safety Management Plan - OHS, is based on the principles established by ISO 45.001 and, according to the protocol of practices, is based on the structuring of a system that aims to ensure, through preventive actions, the safety of employees and to avoid injuries and illnesses, and in a more comprehensive way the interaction with communities where there is influence of its activities.

With this system, practices are established, through the standardization of activities, improvement of the conditions of the work environments, training of employees for safe work, based on their attitudes (beliefs), and made explicit through their actions (behaviors). Our great objective is to develop people.

Occupational health

During both stages of the forestry component of the project, the health of the personnel could be affected by the following activities and/or hazard events: The handling of, and/or exposure to dusty construction materials and/or toxic and/or dangerous inputs (especially products chemicals –fertilizers, pesticides– and objects that have had contact with them); exposure to chemically controlled areas; exposure to disease vectors (dengue, chicungunya, chagas disease, among others); exposure to solar radiation and heat; exposure to high noise levels and/or vibrations; exposure to stings or bites of wild animals; exposure to dust, fumes, particulate matter; etc. These incidents affecting occupational health could occur in any of the installation and daily operation activities, as well as in more exceptional practices; as, for example, controlled burning. All are dangerous activities and events present in any medium and/or large-scale facility and operation, varying according to the environmental context in which the project in question is developed.

Likewise, occupational health may be affected during the solid waste and effluent management of the facility, in the case of contact with contaminated substances and/or materials that could have adverse effects on human health, for example; organic solid waste, inert and powdery solid waste, solid waste and/or hazardous effluents (waste that has had contact with agrochemicals: obsolete containers, packaging, rags, papers, personal protective equipment, earth, sand, sawdust, etc.), effluents from washing implements in contact with agrochemicals (oils, paints, other chemical agents, etc. or materials contaminated with them), sewage effluents, emissions of agrochemicals, paints or other constructive chemical agents, etc.

Likewise, taking into account the pandemic declared by the World Health Organization, zoonotic diseases could spread, such as COVID-19, and specific measures must be established to avoid or minimize contagion between workers.

Occupational security

The two stages of the forestry component of the project will entail risks of affecting the safety of the personnel employed, in each of their activities, just like any other project

that involves medium-sized civil works, handling of tools, equipment and machinery, handling of different types of transport vehicles and controlled burning.

The impact on the safety of the personnel could be due to the following events: Traffic accidents inside and outside the project grounds; accidents of the type of falls to the same level, from places in height and/or inside excavations; blows by fallen objects and/or by use of tools, equipment and/or machinery; cuts by equipment and/or machinery; electrocution during electrical installations and/or handling of electrical tools/equipment; burns and/or skin injuries due to welding, contact with burning fire and/or chemical inputs; hazards associated with manual handling of loads; eye damage; fires; among others.

The activities in which there would be risks of affecting occupational safety are practically all the activities involved in the installation and operation of forest plantations: The works and installation of forest nurseries; the implementation of forest plantations; the construction/adaptation and maintenance of roads and drains; the installation of temporary and mobile accommodation; waste and effluent management; the transport of materials, supplies, machinery and equipment; mechanical control of plantations; forest harvesting; the transfer of harvest wood; the eventual controlled burning.

The impact on the health and safety of the personnel may present different degrees of severity, depending on each case, from slight affectations to the death of the personnel. However, these impacts are preventable and/or mitigable through specific measures to protect occupational health and safety. In all cases, prevention will be chosen first, as established in ND 2 of the IFC, on “Work and working conditions”; as well as the World Bank Group guidelines on the environment, health and occupational safety. PARACEL foresees that all its components are certified; and the forestry component would be through FSC, so it is expected to implement the best operational practices in order to minimize risks in OHS, as well as to have the necessary number of specialized technicians in the subject.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and indirect	
Area of spatial coverage:	Local, regional and strategic	3
Probability of occurrence:	Certain	2
Time of occurrence:	Immediate	1
Timing or length:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type III Accumulation	

Magnitude:	Medium	2
Importance:	Medium	2
Possibilities of potentiation:	Medium	
Degree of potentiation	High	
Degree of resolution of measures:	High	
Area of influence:	DIA and IIA	

Measures of enhancement

Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program, offering all benefits for 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 benefits for good work conditions;

Perform Program for Development and Linkage with the Local Workforce;

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The local economy tends to benefit from the emergence of jobs demands, linked both directly to the activity of the company's execution and indirectly, and potentialized through offering benefits for good work conditions.

7.1.4.2.3.7 Impact to Human Rights

Environmental aspect

Governance.

Impact-Generating Factor

Mobilization of workforce.

Technical justification

PARACEL fully support the principles of the United Nations Global Compact, basing our fundamental values on respect for human rights, labor rights, the environment and the fight against corruption.

The project plans to employ 90% of women in forest nurseries, thus contributing to reducing the existing gender gap in employment opportunities. The jobs related to the nurseries will be around 150, including more than 80% of unskilled profiles that will be trained by the project. In this sense, it is expected that most of the jobs may be held by local women, considering that the technical/professional qualification of labor in the area is low, with the additional advantage that the nurseries operate throughout the cycle of the project.

In the DIA districts, women make up an average of 47.97% of the population. As for the Bella Vista Norte district of the Amambay department, also part of the DIA, 49.44% of the population are women. According to the data collected in the field in the localities of these districts close to/neighboring the forest plantations (with emphasis on Paso Barreto, Loreto and Jhuguá Guazú). Women are mainly engaged in household chores, the farm, handicrafts, the raising of small animals, the sale of dairy products and their derivatives, trade, decoration, rentals, gastronomy, hairdressing, dressmaking, among other activities and/or they migrate in search of job opportunities, both to Asunción and its metropolitan area; the departmental capitals of the IIA as well as abroad. Regarding training aimed at productive employment for women, the lack of opportunities was mentioned. It was also mentioned that unequal practices still persist, assigning women to household tasks and to men productive tasks that generate income.

In this context of lack of opportunities for women, the project's human resources policy will contribute to offering employment opportunities that currently do not exist in the DIA, from which women from the IIA or other areas of the country could also benefit.

The Paraguayan State has ratified most of the norms and conventions that provide protection against contemporary forms of slavery, such as the 1926 Slavery Convention and the 1956 Supplementary Convention; has ratified its commitment to the International Convention on the Elimination of All Forms of Racial Discrimination of the United Nations General Assembly, the United Nations Declaration on the Rights of Indigenous Peoples, the American Declaration on the Rights of Peoples Indigenous people of the Organization of American States, the Protocol of San Salvador, the American Convention on Human Rights and the American Declaration of the Rights and Duties of Man.

Despite all the aforementioned, Ms. Urmila Bhoola, Special Rapporteur of the Office of the United Nations High Commissioner for Human Rights, was able to verify during her visit to Paraguay in 2017 that work-related practices continue to exist in the country. forced in the indigenous communities of the Paraguayan Chaco, such as debt bondage, servanthood and payment with food.

In the indigenous communities identified within the AID, it was observed in the Baseline that many of the indigenous people who are working in ranches close to their communities are informally employed, many of them receiving lower payments than the daily wage stipulated by law. of Gs 84,340, on many occasions they are not provided with safety clothing and tools nor do they have medical insurance that allows them to face the costs of an accident or occupational disease. It was even identified that there are cases of child exploitation of girls, boys and adolescents in the indigenous community of Redención, where some are dedicated to working day and night selling gambling cards. The indigenous communities identified within the AID seem to be in a better situation than those located in the Paraguayan Chaco, but it is worth mentioning that due to the distance between the city of Concepción and the Chaco, many indigenous families in the department often cross the river. Paraguay in search of work, this means that the exploitative working conditions in which they live, especially rural ones, are one step away from becoming forced labor, according to what was exposed by Ms. Urmila Bhoola (2017).

As mentioned, the formalization of the labor ties related to the hiring of PARACEL and of the ventures of its value chain, will help to reduce work in exploitable conditions, to comply with current national legislation and improve the quality of life of the people directly employed by PARACEL and by the companies that provide services,

contributing to compliance with Performance Standard 2 of the International Finance Corporation.

At PARACEL, employees are key to the success of the company. The company is committed to carrying out its activity in a manner that is respectful of human rights and to consolidating a culture based on corporate values and fair and equitable relationships. This commitment is based on the following principles derived from the guiding principles of PARACEL's Sustainability Policy:

1. Fully comply with national legislation and international standards to which it adheres.
2. Respect internationally recognized human rights, adopting adequate measures for the prevention, mitigation and, when appropriate, the remediation of adverse human rights impacts.
3. Eliminate stereotypes and prejudices and establish practices of equality and equity in all Human Talent processes.
4. Ensure a work environment free from discrimination and abusive practices, such as bullying, sexual harassment of any kind, harassment based on race, religion, age, nationality, ethnic or social origin, sexual orientation, gender, marital status, pregnancy, disability or political affiliation.
5. Promote the opportunity to hire people from the community in which we operate
6. Provide a safe and healthy work environment (physically and psychologically) complying with the legal requirements regarding occupational health and prevention of occupational hazards.
7. Provide access to complaint mechanisms and act proactively to provide solutions to them.
8. Reject the use of forced and child labor.
9. Remunerate workers in a dignified manner, in accordance with their responsibilities, skills, knowledge, performance, market practices and what is established by national legislation.
10. Encourage and promote opportunities for professional and personal development to employees.
11. Respect the right to freedom of union association and collective bargaining.
12. Establish means to not negatively impact the ways of life and traditional work of indigenous communities in accordance with the provisions of Agreement 169 on Indigenous and Tribal Peoples.
13. Contribute to the hiring of vulnerable groups such as: people with disparity, older adults, women, immigrants, people from indigenous communities, people with low academic instruction, among others.

PARACEL will respect and recognize both the importance and universality of human rights.

PARACEL recognizes that human rights are inherent, inalienable, universal, indivisible and interdependent:

- Inherent, because they belong to all people;

- inalienable, because people cannot renounce them or be deprived of them by governments or any other institution;
- universal, because they are applicable to all people regardless of their condition;
- indivisible, as none of the human rights can be selectively ignored; and
- interdependent, because the fulfillment of one right contributes to the fulfillment of other rights.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Positive	+
Form of incidence:	Direct and indirect	
Area of spatial coverage:	Local, regional and strategic	3
Probability of occurrence:	Certain	2
Time of occurrence:	Immediate	1
Timing or length:	Permanent	3
Reversibility:	Reversible	1
Accumulation:	Type III Accumulation	
Magnitude:	Medium	2
Importance:	Medium	2
Possibilities of potentiation:	Medium	
Degree of potentiation	High	
Degree of resolution of measures:	High	
Area of influence:	DIA and IIA	

Measures of enhancement

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;

Perform Equal Opportunity and Non-Discrimination Programs.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

By adopting Universal Declaration of Human Rights as a common standard of achievement for all peoples and all nations, PARACEL ensures to the end that every individual and every organ of society, keeping this Declaration constantly in mind, shall strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition and observance, both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction.

7.1.4.2.3.8 Impact to Landscape and Visual

Environmental aspect

Land use change.

Impact-Generating Factor

Formation of the eucalyptus forest.

Technical justification

The space organization develops from historical, socioeconomic, political and physical conditions of the landscape, which allow an analysis of occupation trends.

Forest roads cause disturbances in topography, causing complex and pronounced changes in the spatial patterns of geomorphic and hydrological processes due to changes in the movement of water and sediment in the landscape (LUCE; WEMPLE, 2001; WEMPLE; SWANSON, S.O., JONES, 2001).

This impact is one of the most significant in the forest enterprise, through the opening of roads, and it is up to the entrepreneur to take the measures and procedures for its minimization.

The farms planned for the eucalyptus planting will be partially reconfigured, consolidating the Areas of Permanent Preservation, Legal Reserve, firebreak and effective planting.

One fundamental important point of is linked to the recommendations and guidelines that must be followed during the construction stage of the roads, considering, for this, the susceptibility of the land and the erosive and slipping processes, and, consequently, avoid the silting of downstream watercourses.

It should be noted that eucalyptus cultivation mainly comprises the stages of planting, maintenance and harvesting that occur basically in an interval between 6-7 years in the same place.

After the eucalyptus harvest (cut) occurs a natural change of the local landscape, due to the absence of the respective eucalyptus plantation.

Furthermore, it is noteworthy that the farm has extensive areas of Legal Reserve (RL) and Permanent Preservation Areas (APP), which minimizes the visual impacts caused after harvest.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Certain	2
Time of occurrence:	Immediate	1
Timing or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type III Accumulation	
Magnitude:	Low	1
Importance:	Small	1
Mitigation possibilities:	Partially Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA	

Mitigation measures

Establish a management of the farms, among other measures, such as Forest Mosaics, in order to have a natural variability throughout the landscape.

Introduce Forest Mosaic, among other measures, with the 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.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

The change in the landscape is inevitable, but the maintenance of planting on different ages through forest mosaic and the preservation of riparian areas to minimize the visual impacts caused after harvest.

7.1.4.2.3.9 Impact to Cultural Heritage

Environmental aspect

Possibility of affecting cultural heritage sites

Impact-Generating Factor

Earth moving activities and Formation of the eucalyptus forest.

Technical justification

This impact refers to the material heritage of archaeological, historical and/or cultural interest, as it was addressed in the industrial component. On the other hand, the intangible cultural heritage is approached in the impact of potential affectation of uses and customs of the DIA localities. In turn, sites of cultural interest related to water uses, which could be considered as part of the cultural-natural heritage, are referred to in the potential impacts on cultural ecosystem services.

Regarding heritage of archaeological value, it is estimated that due to the small magnitude of the works that may require soil movements - since most of the activities will be of small-scale facilities and plantations, where the soil is already intervened–, the forestry component of the project will not affect materials of archaeological value that could be found in the subsoil. Furthermore, the areas covered by forest plantations currently constitute cattle ranches with already a certain level of prior human intervention (soil already intervened). In any case, the project expects to comply with the principles of PS 8 of the IFC, on "Cultural Heritage" and with current national regulations on the matter. Any archaeological type material, although it could be found within the project's properties, would constitute material of public value, so it must be communicated and rescued through safe procedures and delivered to the national authority responsible for the preservation of national heritage. If these precautions are not taken, the existing material in the subsoil could be permanently affected. It should be remembered that in the area of the department of Concepción the existence of paleontological remains of both flora and fauna has been reported, as well as findings that indicate the presence of pre-Hispanic societies; in addition, in parts of the territory there have been military conflicts in the past.

It is important to mention the forest fields in the north, adjacent to the Paso Bravo National Park. This reserve is close to the San Carlos Fort, in the San Carlos del Apa district, a heritage area linked to war events in Paraguay (War of the Triple Alliance), which, although it is external to the DIA, is considered important to mention and boundary.

Regarding materials, objects and/or sites considered as historical and/or cultural heritage, both for the national and/or for the local population, these have not been surveyed within the forest plantation buildings in this evaluation. Outside of these buildings it is possible that there are tangible spiritual/religious and/or cultural heritage materials outside the access/exit roads of the project buildings, considering that at the national level there is the custom of installing small oratories or "niches" in commemoration of people who have lost their lives on the side of the roads. In these cases, it is possible that the project could affect some of these sites through the conditioning of the roads; and the transit of large cargo vehicles, particularly during the period of harvesting and transfer of wood to the industrial plant.

PARACEL, both for the forestry and industrial components, will have an operational procedure for eventual finds, within the framework of the Archaeologic Finding Chance Program.

Characterization of the impact

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct	
Area of spatial coverage:	Local	1
Probability of occurrence:	Possible	1
Time of occurrence:	Immediate	1
Timing or length:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Simple	
Magnitude:	Low	1
Importance:	Small	1
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence	ADA	

Mitigation measures

Take actions to ensure that the company's activities do not affect or destroy any cultural property considered as protected heritage through monitoring the Archaeologic Finding Chance.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

It is possible to affirm that there will be no interference with the cultural heritage, taking into account that the area where the project will be implemented is significantly anthropized. Furthermore, all mitigation measures will be taken so that there is no possible interference with the cultural heritage in accordance with the law in force.

7.1.4.2.3.10 Impact to Community Uses and Dependencies on Ecosystem Services

Environmental aspect

Possibility of affecting ecosystem resources.

Impact-Generating Factor

Land use for eucalyptus plantation.

Technical justification

In the DIA of the forestry component of the project, information has been collected on the practice of small agriculture and livestock that occurs in the area; as well as the raising of farm animals for self-consumption and, as needed, for sale. In addition, there are dairy derivatives production activities for sale. In this sense, the risk of the project affecting these local activities through various possible means must be considered. One is the application of chemical products for the chemical control of soils and plantations, especially during eventual aerial spraying, with effects that could accumulate and/or last in the medium and long term. Another is the management of solid waste and effluents, especially those with chemical content or that have been in contact with these products. A third activity is the practice of controlled burning in forest fields. Controlled burning could be eventually performed to reduce the biomass waste during land preparation, prior plantation.

This risk is especially significant for the DIA communities that are directly adjacent to the forest plantation bui ldings, as in the case of Ayala Cue – located in the middle of the forest fields; Anderí – situated on the edge of one of the fields, but also for those very close to certain fields such as Laguna Cristo Rey, Paso Barreto, Isla Hermosa, Paso Mbutu, Sargento José Félix López (Puentesiño). Likewise, communities located on the edge of surface water courses in the area, downstream from forest fields, could see their activities affected by possible alteration of the quality of water that is used in crops, livestock and farms.

In this sense, the project will strictly comply with and as a minimum, IFC PS 1, 3, 4, general guidelines on environment, health and safety, FSC Principles 6, 7 and 8 related to environmental impact, plan of management and monitoring plan of potential impacts.

On the other hand, in the event of an increase in the appreciation of land in the area due to the development of the forestry component of the project; this could lead to a greater attractiveness for the sale of real estate by the current owners to those interested in expanding the business, with the consequent displacement of the existing economic activity in said lands, the loss of sources of subsistence and/or of income of both smallholders and workers on the land and possible related geographic migration. That is to say, indirectly, the development of the project could mean pressure for the use of the land in the area that supplies for subsistence and/or generates income, in case that it induces an expansion of forest plantations, depending on the suitability of the soils for this activity. The areas that could be most affected are small agriculture and livestock, farm animal husbandry and, even, illicit plantations of which there is knowledge through secondary sources (on the last item mentioned, the pressure of displacement of these practices would entail an indirect benefit in the fight to eradicate them).

Although it is an issue not manifested in the DIA communities, the consulting team considers it relevant to mention that the presence in the DIA of a transitory population (experts and specialized technicians) and definitive (nursery and plantation personnel) linked the project in both stages of its forestry component, could run a security risk beyond those related to occupational health and safety, taking into account the existence of armed groups in the area (the so-called Paraguayan People's Army or EPP, groups linked to plantations illicit, others).

This information is relieved in the social baseline mainly through secondary sources (journalistic publications, available research, etc.). A first relevant case is that in the

area there is a presence of the Paraguayan State (Joint Task Force) to fight against the criminal group EPP; that on several occasions it has "attacked" the integrity and safety of the staff and/or owners of the rooms, as well as of key public infrastructure (for example, high-voltage electricity transmission towers). Some affected personnel have been residents of the area; and, on occasions, belonging to indigenous communities (a recent case in August 2020), while the main targets of the events have been proprietary, commonly through kidnappings for extortion purposes and pressure on the Paraguayan State to advance their interests.

Another relevant case relates to illicit plantations (mainly marijuana); that currently exist among the forest remnants of the cattle fields, according to journalistic publications and official reports of the national government. These illegal plantations could be threatened by the presence of the project in the area (which will have its own security system[22]); due to a possible migration of workers who are currently engaged in them, to the project's forest plantations (due to formal working conditions that could be attractive) or another situation. As a consequence, the groups responsible for these plantations could in turn threaten the safety of the project workers and the communities surrounding the forest fields.

In both cases, the forestry component of the project will not be the cause of said conflicts. Rather, its implementation may be a target of attack by groups that act illegally in the area, with the consequent exacerbation of an already sensitive local situation, through the generation of conflicts and alteration of the security and tranquility of the DIA communities. Along these lines, compliance with IFC PS 1 on "Evaluation and management of environmental and social risks and impacts" is essential regarding risks and impacts in the project's area of influence caused by the actions of third parties.

Finally, it is considered that the project could also contribute positively to the reduction of this type of activities in the area; since, by giving a source of work to nearby communities, it could generate “pressure” and the consequent displacement of these groups.

Besides that, in both phases of the forestry component of the project, the quality of life of the DIA population could be affected, mainly due to the increased flow of workers linked to the project. The aspects of quality of life affected would be, mainly, the tranquility and comfort of the current inhabitants, attending to the manifestations of high valuation of these characteristics of the area by the people interviewed in the field information survey.

The increase in the flow of workers and the presence of an unusual number of people associated directly and indirectly with the project in the DIA communities may promote the appearance (or increase) of activities such as sale and consumption of alcohol and drugs, prostitution, crime, gender violence, disrespect for the vulnerable population, disturbance of public peace due to a greater number of recreational and/or night-time activities (parties, leisure groups, etc.) on public roads and/or in homes within the communities, disrespecting current DIA quiet levels. Although it is expected that forest workers will be installed inside the forest plantation buildings, away from the urban/rural areas of the DIA communities and districts, it is estimated that they may also visit these urban/rural areas for reasons various such as shopping, recreation, etc. The presence of non-local laborers personnel could impact on the current tranquility of

22 PARACEL will make the necessary provisions so that personnel linked to the security system do not abuse their power, through specific internal protocols, in its Corporate Security Manual.

the DIA people, since they have referred that “getting to know each other” is a highly valued aspect in the communities, thus contributing to greater tranquility.

On the other hand, the current level of access to entertainment spaces for the local population may be diminished by an increase in demand for the use of these spaces, since the transitory and definitive population directly and indirectly associated with it will be installed in the DIA project, being able to generate competition for use between the different groups.

It could also generate uncertainty in the communities and alteration of the tranquility due to the use of chemical products that will occur in the plantation process - especially in exceptional cases by air - and the fears related to possible health effects or effects that may occur on the environment. The impact on the environment and health care have been comments raised in perception studies, where the need to safeguard both aspects has been mentioned as suggestions.

It should be noted that social networks are important factors for the subsistence of, above all, families with limited economic resources, since through them the burdens of family expenses, housework and child rearing are shared.

The ecosystem services of water used in the DIA are mainly those of provisioning and cultural. 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. Likewise; 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 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.

During and after the use of chemical products (fertilizers, pesticides), both during the plantations and in the maintenance stage, these could be carried by runoff to the surface water courses of the area and/or infiltrated into groundwater. Fertilizers could cause exceptional fertilization processes of surface waters, with consequent degradation of the quality and habitat of the fauna for fishing, not to mention that the current use of land for grazing will be replaced by afforestation, and according to FAO data, livestock is the human activity that generates the greatest impact on water quality (PARACEL, 2021), so although this potential impact could be considered on a smaller scale compared to the current situation of land areas, to intervene by the project, pesticides that could reach watercourses and/or groundwater would also degrade the quality of the water and the habitat of fauna. In all cases, these events represent a direct risk to the health of the population through the consumption of water and fishery products, contact with potentially contaminated water, and a risk of decreased fishery productivity. Likewise, recreational activities would also impact due to the fear that contamination risks could instill in the population. Also, although to a lesser extent, the management of solid waste (containers, packaging, rags, papers, obsolete personal protection equipment, earth, sand, sawdust, etc.), and derived effluents (washing implements in contact with agrochemicals), the use of chemical products may cause these effects on water resources, with their economic, health and social consequences.

Although, according to the experience in MS23-Brazil and in Uruguay, afforestation with eucalyptus reduces erosive processes in relation to the grazed pasture or deforested area (PARACEL, 2021), the tillage activity could eventually cause erosive processes in

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the time with drag; both soil and chemical products applied to surface water courses. Soil sedimentation in waterways could decrease the quality of drinking water, the productivity of fishing, and the recreational attractiveness of smaller waterways.

Likewise, during the road adaptation and maintenance works and the construction and maintenance of drainage works, there may be risks of sedimentation and alteration of the hydrological regime of the surrounding water courses, which in turn are used by the communities of the area for various purposes.

According to studies carried out in plantations in the MS-Brazil area, eucalyptus plantations present a water balance similar to that of the Cerrado native forest, and other studies carried out in Uruguay show that there are no significant differences in water availability in similar plots of grazing versus forested with eucalyptus (PARACEL, 2021). However, it is considered that, at the stage of implementation and maintenance of forest plantations, the consumption of water from these plantations could compete with the consumption used by the communities that use groundwater, especially in cases where a shortage at certain times of the year is already observed. Although not only forest plantations absorb water -but also other agricultural and native forest uses-, specific studies to monitor water levels24 will be undertaken by the project, in order to confirm that the resources are not affected, or failing that, implement additional mitigation measures throughout the project cycle, not to mention that in Paraguay there is data that indicates that the water table remains the same or even increases in the presence of eucalyptus plantations (PARACEL, 2021).

Controlled burning, in the event of being used, could affect the ecosystem services of the native or implanted forest reserve areas, both in the PARACEL fields (riparian forests, reserve), and in reserve areas (private / public) adjacent to some of the fields with extensive current vegetation coverage (Paso Bravo Public Protected Wild Area and Bella Vista Private Reserve).

All the potential impacts mentioned will be prevented and/or reduced with strict measures of good practices in the field and of appropriate design (in the case of roads and drains). Furthermore, periodic monitoring of the actual occurrence and perception of the occurrence of these potential impacts will be crucial to implement the corresponding mitigation measures.

Finally, regarding the ecosystem service of supply of raw materials for artisan production and sale; it is possible to say that the forestry component of the project could affect the populations of karanday (Copernicia alba) that grow naturally in the fields of the DIA area and that are used as raw material for the production and sale of objects woven with vegetable fiber25. In the field survey, in the DIA communities (Isla Hermosa, Domínguez Nigó, Anderí, Paso Mbutu, Paso Barreto), karanday crafts have been manifested as one of the main income-generating activities and there are artisan organizations.

So, PARACEL also plans to monitor the quality of the water; likewise, permanent monitoring of perception in the communities would be carried out, these being addressed in the Project's Environmental Management Plan.

Fundacion Natan, also mentioned the families resort to the forests of their own indigenous community for the extraction of wood, fruits, honey, herbs and vegetable

[24] Studies within the framework of the Environmental Management Plan, the results of which are expected to be disseminated within the framework of the PGS programs, both to the communities and to relevant stakeholders.

[25] It should be clarified that it does not refer to the extraction of karanday from the forest fields/to be forested fields in PARACEL.

fibers, which are used for food, medicine, construction and as fuel for cooking or shelter on the coldest days. Therefore, the biodiversity monitoring program will be performed.

Impact Characterization

	Qualitative	Quantitative
Nature:	Negative	-
Form of incidence:	Direct and Indirect	
Area of spatial coverage:	Local and regional	2
Probability of occurrence:	Certain	2
Moment of occurrence:	Long term	3
Time or duration:	Permanent	3
Reversibility:	Irreversible	2
Accumulation:	Type II Accumulation	
Magnitude:	Medium	2
Importance:	High	3
Mitigation possibilities:	Mitigated	
Degree of resolution of measures:	High	
Area of influence:	ADA, DIA	

Mitigation measures

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.

Perform strict measures of good practices in the field and of appropriate design, in the case of roads and drains;

Monitor the quality and quantity of the water;

Carry out permanent monitoring of perception in the communities being addressed in the Social Management Program;

Perform Biodiversity Monitoring and Evaluation Plan.

As mentioned in the Land Acquisition and Displacement, Use of Ecosystem Services (under biological environment) and the Impact to Indigenous Communities sections, an Ecosystem Services Review should be carried out to understand the level of dependence that Project affected communities may have on specific ecosystem services, and to asses if any impacts upon access to those services may be severe enough to affect wellbeing.

Responsibility for the implementation of the measures

PARACEL.

Forecast after implementation of measures

DIA communities will not be affected by project activities that potentially impact on water resources, on traffic, among others because the mitigating measures will be corrected applied.

Quantitative Assessment

For quantitative analysis, the maximum score will be - 646 (34 qualitatively identified impacts x - 19 points per impact). The following Table presents the quantitative analysis of the impact assessment.

Table 17 – Quantitative analysis of the impact assessment

Phase	Identified impacts	Coverage area Probability of	Probability of occurrence	Time of occurrence	Timing or length	Reversibility	Magnitude	Importance	Total Positive	Total Negative	Sum
Planning	Land Acquisition and Displacement	-1	-1	-2	-3	-2	-2	-2		-13	-13
	Climate Change Long Term Physical Risk Assessment	-1	-1	-3	-3	-2	-2	-2		-14	-14
	Climate Change Short Term Risk Assessment	-1	-1	-1	-3	-2	-2	-2		-12	-12
Implantation/Operation	Impact to Air	-2	-2	-1	-1	-1	-1	-2		-10	-10
	Impact to Water	+-2	+-2	+-1	+-3	+-1	+-2	+-2	13	-13	0
	Impact from Effluents	-1	-1	-1	-3	-1	-1	-2		-10	-10
	Impact from Runoff	+-1	+-2	+-1	+-3	+-1	+-2	+-2	12	-12	0
	Impact to Streams and Morphology	-1	-2	-3	-3	-1	-2	-2		-14	-14
	Impact to Soil	-2	-2	-1	-3	-1	-2	-2		-13	-13
	Impact to Noise	-2	-1	-2	-1	-1	-1	-1		-9	-9
	Impact to Terrestrial and Aquatic Flora	-2	-2	-3	-3	-2	-2	-2		-16	-16
	Impact to Fauna	-2	-2	-3	-3	-2	-2	-3		-17	-17
	Use of Ecosystem services	-2	-2	-3	-3	-2	-2	-3		-17	-17
	Impacts to Critical / Natural Habitat	-2	-2	-3	-3	-2	-3	-3		-18	-18
	Impact to Legally Protected and Internationally Recognized Areas	-2	-2	-3	-3	-2	-2	-3		-17	-17

Phase	Identified impacts	Coverage area Probability of	Probability of occurrence	Time of occurrence	Timing or length	Reversibility	Magnitude	Importance	Total Positive	Total Negative	Sum
Implantation/Operation	**Fragmentation of the natural landscape**	-2	-2	-3	-3	-2	-2	-2		-16	-16
	Dust generation and suppression of local vegetation	-2	-2	-1	-3	-2	-2	-2		-14	-14
	Noise related disturbance on fauna	-2	-2	-1	-3	-2	-2	-2		-14	-14
	Eutrophication of rivers due to improper fertilization	-2	-2	-2	-3	-2	-2	-2		-15	-15
	Indirect impacts of pesticide use (fipronil) on community bee keeping	-2	-2	-2	-3	-2	-2	-2		-15	-15
	Harassment of workers to wild fauna and flora	-2	-2	-2	-3	-2	-2	-2		-15	-15
	Spread of invasive species along new roads and fire breaks	-2	-2	-1	-3	-2	-2	-2		-14	-14
	Risk of fire	-2	-2	-1	-3	-2	-2	-2		-14	-14
	Impact to Employment	3	2	1	3	2	2	3	16		16
	Impact to Indigenous Communities and Livelihoods	+-2	+-1	+-1	+-3	+-2	+-2	+-2	13	-13	0
	Community health and safety through vector borne and communicable diseases	-2	-2	-3	-3	-2	-2	-3		-17	-17
	Impact to Community Health, Safety and Security	2	2	3	3	2	2	3	17		17
	Worker influx Increase	+-2	+-1	+-1	+-3	+-2	+-2	+-2	13	-13	0
	Impact to Labor and Working conditions	-3	-2	-1	-3	-1	-2	-2		-14	-14
	Impact to Human Rights	3	2	1	3	1	2	2	14		14
	Impact to Landscape and Visual	-1	-2	-1	-3	-2	-1	-1		-11	-11

Phase	Identified impacts	Coverage area Probability of	Probability of occurrence	Time of occurrence	Timing or length	Reversibility	Magnitude	Importance	Total Positive	Total Negative	Sum
Imp/Oper.	**Impact to Cultural Heritage**	-1	-1	-1	-3	-2	-1	-1		-10	-10
	Impact to Community Uses and Dependencies on Ecosystem Services	-2	-2	-3	-3	-2	-2	-3		-17	-17
Full quantitative impact assessment									**98**	**-429**	**-319**

Note: For negative/positive impacts, the zero-impact value is considered in the quantitative totalization. Positive impacts are added and negative impacts are subtracted.

In the quantitative assessment, the total sum of the impact assessment, adding the positive minus the negative resulted in - 319 (negative), as shown in the Table 17 above; i.e. the quantitative sum of the negative impacts was greater than the sum of the positive impacts.

For evaluation purposes, the result of the total sum of the impact assessment was compared with the maximum achievable score (all negative impacts in the worst condition), which in this case was - 646 points (34 impacts x - 19 points per impact). This gave a result of 49,4%.

The score obtained if the mitigation measures are not applied and if there are no positive impacts, would be -429 points, or 66.4%.

In summary:

Total possible points: 646 points;

Total points added without the implementation of the proposed measures: -429 points, or 66.7%;

Total points added in this evaluation with the implementation of the proposed measures: -319 points, or 49,4%.

Since the percentage, with the implementation of the measures, is less than 50 %, it can be concluded that the company is environmentally viable. However, it is recommended that PARACEL implements all the measures proposed in this assessment to further minimize the negative impacts generated by the eucalyptus forestry.

7.1.5 Evaluation Summary Tables

Once the impacts were identified and evaluated, a synthesis framework - organized according to the affected environment and the respective phase of the project - allowed us to confront them with the attributes described above.

The evaluation of the environmental impacts in the areas involved, and the consequent proposal of mitigation or enhancement measures to be applied, were elaborated on the basis of the degree of change produced in the environmental components.

The following tables summarize the impacts expected for the planning, implantation and operation phases, respectively, of the eucalyptus forestry of Concepción and Amambay Departments.

The tables show the impacts identified and attribute the degrees to each one according to the capital letters used in the item 7.1.2 Methodology for environmental impacts assessment.

Table 18 – Planning Phase Impacts

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Land Acquisition	- Increase of land prices - Displacement and/or isolation of small properties	Impact to Land Acquisition and Displacement	N	D	L	P	MP	P	I	S	M	M	M	-	Establish criteria for buying and leasing lands in the company strategic planning for wood supply, avoiding the isolation of properties. Compromise not to occupy lands with population settlements, and that does not require the physical or economic displacement of any person, family, group or community. Prioritize the development of eucalyptus plantations on modified habitat. Totally avoid plantation development in or adjacent to legally protected areas, or on forest and wetland natural habitats, and avoid planting the good condition natural Cerrado habitat complexes. Undertake an ecosystem services review to establish the extent of potential displacement of access to priority ecosystem services because of the Paracel project. Mitigate any significant impact if found.	A	Not occupying lands with population settlements, and that does not require the physical displacement of any person, family, group or community, as well as prioritizing the development of plantations in anthropized with cattle farming areas, not occupying legally protected areas, forest and wetland natural habitats and the best condition natural Cerrado habitat, as well as avoid the isolation of properties, will bring confidence and satisfaction to the population regarding the implementation of the project, contributing to the good image and transparency of the company. Natural habitats avoided and protected within Paracel properties (and possibly beyond if offsets are implemented) will improve future security of access to provision ecosystem services that indigenous communities derive from lands outside their territories.

Table 19 – Planning Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Climate Change	Formation of the eucalyptus forest	Global warming	Impact to Climate Change Long Term Physical Risk Assessment	N	D	L	P	LP	P	I	S	M	M	M	-	Carry out periodic monitoring of GHG emissions and C 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.	A	PARACEL project will contribute to the capture of carbon (net negative emissions) from the atmosphere and will be a source of energy with neutral emissions in terms of GHG. Not occupying lands with a potential landslide hazard zone with a medium potential risk of rainfall triggered landslides, lower the Company Climate Change Risk.

Table 20 – Planning Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Climate Change	Formation of the eucalyptus forest	Global warming	Impact to Climate Change Short Term Risk Assessment	N	D	L	P	CP	P	I	S	M	M	M	-	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.	A	PARACEL will contribute to protect areas of plantations against fire, which may slow down the Transitional Climate Change process.

Table 21 – Implantation/Operation Phase Impacts

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	Movement of vehicles and machines	Dust generation	Impact to Air	**N**	**D/I**	**L/R**	**C**	**I**	**T**	**R**	**II**	**B**	**M**	**M**	**-**	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.	**A**	It can be stated that, through the implementation of mitigation measures, air quality will not be changed, nor will be disturbances to people/community due to dust generation.

Table 22 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	Water consumption	Availability of superficial and ground water	Impact to Water	**N/P**	**D**	**L/R**	**C**	**I**	**P**	**R**	**II**	**M**	**M**	**M**	-	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 Action Plan, water management program, surface and ground water quality monitoring program and Biodiversity Monitoring & Evaluation Plan; Meet IFC EHS Guidelines for Perennial Crop Production.	**A**	The reduction of water consumption in eucalyptus plantation, the plantation plan in mosaic form and the preservation of legal reserve areas and permanent preserved areas (including riparian areas) reduce possible interferences in water availability in the region of the projects' farms.

Table 23 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	Inadequate disposal of effluents and sanitary sewage	Effluents generation	Impact from Effluents	**N**	**D**	**L**	**P**	**I**	**P**	**R**	**II**	**B**	**M**	**M**	**-**	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.	**A**	It can be stated that there will be no change in the quality of surface water or groundwaters, since the sanitary sewage generated during the works will be duly treated and disposed of in an environmentally appropriate manner and in accordance with the legislation in force.

Table 24 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	- Opening accesses and roads - Formation of the eucalyptus forest	Forest Management Practices	Impact from Runoff	**N/P**	**D**	**L**	**C**	**I**	**P**	**R**	**II**	**M**	**M**	**M**	-	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. Reducing soil preparation and planting in curves levels, avoiding surface runoff of rainwater. Maintaining plant cover between plantation lines. Keep debarked materials in the forests, to cover the farm soil with organic matter.	**A**	With the adoption of the planting and soil conservation practices performed by PARACEL, there will be no increase on susceptibility to erosion, soil compaction and waterproofing, not interfering significantly on runoff.

Table 25 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	Formation of the eucalyptus forest	Eucalyptus plantation in appropriate places	Impact to Streams and Morphology	N	D	L	C	LP	P	R	II	M	M	M	-	Adopt methods to restore degraded or destroyed natural forests, including riparian zones of 100 m either side of rivers or smaller tributaries; 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; Preservation and recovery of degraded areas of dry Cerrado savanna habitats that remain in better condition; Implement the Biodiversity Action Plan and Biodiversity Monitoring and Evaluation Plan.	A	One of the solutions to meet the demand to mitigate the problem of deforestation, as well as a strategy for the conservation and recovery of existing degraded land in the tropics, is the establishment of forest plantations and agroforestry systems designed under sustainability criteria. Besides complying with IFC Performance Standards which assure no net loss to Natural Habitats and a Net Gain to the biodiversity features for which Critical Habitat is designated, PARACEL owned plantations will be FSC certified and so will avoid areas of High Conservation Value as defined at the national level under FSC criteria and contribute to the ecosystem.

Table 26 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	- Use of agricultural inputs - Formation of the eucalyptus forest	- Inappropriate disposal of solid waste - Loss of soil nutrients	Impact to Soil	**N**	**D**	**L/R**	**C**	**I**	**P**	**R**	**II**	**M**	**M**	**M**	**-**	Supervise the collection, packaging, storage and transport of solid waste in accordance with current legislation from worker accommodations areas. Perform Workers Accommodation Plan. 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, such as fertilizers, herbicides, fungicides and insecticides, 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.	**A**	The soil, groundwater and/or surface water quality will not change, due to the adoption of measures for the use of pesticides and management of their packaging.

Table 27 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Physical	Movement of vehicles and machines	Noise generation	Impact to Noise	**N**	**D**	**L/R**	**P**	**MP**	**T**	**R**	**II**	**B**	**P**	**M**	**-**	Carrying out maintenance on machine, truck and vehicle engines; Carrying out activities in the area predominantly in the work daytime period.	**A**	It can be said that, through the implementation of mitigation measures, there will be no significant noise disturbance.

Table 28 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest.	Replacement of pasture and/or other plantations areas with eucalyptus forestry planted areas.	Impact to Terrestrial and Aquatic Flora	**N**	**D**	**L/R**	**C**	**LP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	Conduct road open planning to minimize natural habitat fragmentation; avoid developing roads or services in watercourse, wetland, forest or good condition savanna Cerrado areas.; Delimitate firebreaks to protect permanent preservation areas; Remove natural tree/shrub cover only where strictly necessary; Carry out detailed territorial planning (Planting Development Management Plan), avoiding disturbance of natural vegetation or soils in the Riparian Zones; and restoring with species native to the ecosystem any riparian and spring areas where vegetation has been degraded or erosion is occurring; Implement a landscape ecology design, ensuring conservation areas (i.e., avoidance or set-asides and Biodiversity Offsets) and restoration areas (restoring impacts not associated with Paracel so also contributing to the Biodiversity Offset strategy) create ecological corridors and a representative mosaic of Cerrado habitats where possible; Eliminate/cut any eucalypt specimens spread into conservation areas, preventing the formation of eucalyptus forests outside plantation areas; Implement the Biodiversity Action Plan & Biodiversity Monitoring & Evaluation Plan.	**A**	The actions adopted by PARACEL will preserve all wetlands, floodable savanna and riparian zones as well as all areas of native forest vegetation with a patch size of ≥1ha. Better condition savanna Cerrado habitats will also be preserved toward attaining a no net loss or net gain biodiversity target.

Table 29 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	- Opening accesses and roads - Formation of the eucalyptus forest	- Risk of running over animals - Hunting risk - Habitat loss	Impact to Fauna	**N**	**D/I**	**L/R**	**C**	**LP**	**P**	**I**	**II**	**M**	**G**	**M**	**-**	Perform wildlife monitoring/research and rescue/relocation program, prior to works; Install signs on the main access routes to the planted areas through the wildlife safety and alert program, including installation of fauna passageways; Intensify surveillance activities in partnership with local authorities and neighbors to prohibit hunting and logging in Paracel properties; Perform worker education on hunting prohibition; Consider the mosaics and characteristics of native habitats in the Plantation Development Management Plan; 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 riparian zones; Recover currently degraded forest areas; In addition to conservation approaches applicable to the Paracel properties in general, commit to establish buffers along the border with the National Parks adjacent to two plantations (Soledad and Zanja Moroti) and to pay special attention to managing the biosphere reserve buffer area, which overlaps portions of three plantations (Zapato, Santa Teresa, and Hermosa), in accordance with affected stakeholder consultations in the absence of an existing the biosphere reserve's management plan. Perform Biodiversity Management Program as per the BAP.	**A**	It can be stated that the risk on local fauna will be minimized by the implementation of the proposed mitigation measures.

Table 30 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest	Ecological balance	Use of Ecosystem Services	**N**	**D/I**	**L/R**	**C**	**LP**	**P**	**I**	**II**	**M**	**G**	**M**	**-**	Maintain high forests and riparian forests. Maintain representative samples interconnected with the other types of Cerrado. Monitor the Cerrado biodiversity. Planning of plantations. Implement an Ecosystem Services Review to establish the level of dependency vulnerable communities have on the Ecosystem Services which are derived from within the Paracel properties. Evaluate the net impacts of Paracel's road network improvements, plantations and conservation activities upon the 'priority ecosystem services' (i.e., those upon which vulnerable communities have high levels of dependence for their well-being) and design mitigation measures as appropriate. It is noted that the reduction in cattle grazing because of Paracel plantations establishment could reduce an important source of protein for some families in the Indigenous communities and increase their reliance on hunting.	**A**	The actions adopted by PARACEL to preserve the areas of native vegetation, with all types of Cerrado, riparian permanent persevered areas and legal reserve of its own forest lands, in addition to the legal requirement, will aim not to impact significantly in the ecosystem services.

Table 31 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Impacts to Natural or Critical Habitat	**N**	**D/I**	**L/R**	**C**	**LP**	**P**	**I**	**II**	**M**	**G**	**M**	**-**	Eucalyptus plantations will be designed to implement the Mitigation Hierarchy, avoiding Critical and Natural Habitats where feasible and implementing a Biodiversity Action Plan (BAP) designed to achieve Net Gain for biodiversity values designating Critical Habitat, and No Net Loss for values designating Natural Habitat. The BAP will include design of Biodiversity Offsets where necessary. A full Critical Habitat Assessment will be developed to determination habitat importance (i.e., Critical, Natural, Modified) as per PS6 definitions. 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 Parks adjacent to three plantations (Soledad, Zanja Moroti and Zapallo) and to manage the biosphere reserve buffer area, which overlaps portions of three plantations (Zapallo, Santa Teresa, and Hermosa). In order to appropriately manage the buffer zone, resolution 200/2001 Art. 31 regarding biosphere reserves will be taken into account, consultation with affected parties will need to occur and a management plan will need to be approved. Maintain high forests and riparian forests in plantations farms. Maintain a representative mosaic of interconnected Cerrado habitat types of Cerrado. Monitor the Cerrado biodiversity within the farms. Planning the plantations areas avoiding impacts on fauna and flora. Perform Biodiversity Monitoring and Evaluation Plan. In order to assist with implementing the Mitigation Hierarchy, Paracel commit to the criteria for establishing conservation vs planted areas in the plantations.Note that criteria for establishment of plantations in savanna Cerrado habitats in order to meet PS6 requirements are to be developed	**A**	The mitigating measures, if effectively managed and implemented, should contribute to the protection of the biodiversity of the region, provide greater landscape connectivity for flora and fauna, and protect water resources and ecosystem services.

Table 32 – Implantation/Operation Phase Impacts (cont.)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest	Replacement of Habitats with eucalyptus forestry planted areas	Impacts to Legally Protected and Internationally Recognized Areas	**N**	**D/I**	**L/R**	**C**	**LP**	**P**	**I**	**II**	**M**	**G**	**M**	**-**	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. The Project is proposing 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. The project has committed to establish 1 km buffers along the borders with the National Parks and the three adjacent properties. It is recommended that the Biodiversity Offset strategy 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 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. This evaluation of threats will involve an analysis of rates and drivers of land-use change and habitat degradation in the region which should be used to inform an assessment of the potential indirect impacts to the Protected and Internationally Recognized Areas from the Project (e.g., by facilitated access to the areas). Paracel is 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 so protect deforestation for illicit plantations.	**A**	The mitigating measures, if effectively managed and implemented, could make an important contribution to the protection of the biodiversity of the region, provide greater landscape connectivity for flora and fauna, and protect water resources and ecosystem services. The mitigation possibility category of 'partially mitigated' is applied owing to the uncertainty of both the potential adverse indirect impacts and positive (offsetting) impacts on these areas outside of the direct control of Paracel.

Table 33 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest.	Replacement of Habitats with eucalyptus forestry planted areas.	Fragmentation of the natural landscape	**N**	**D**	**L/R**	**C**	**LP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	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. Open areas not planted will be retired from grazing and so if free of invasive grasses will recover to improve connectivity. Paracel plans to not plant in some Properties will serve to protect natural mosaics of the full range of Cerrado habitats that are connected with the National Parks. The Biodiversity Offset design should take into account opportunities to reduce fragmentation and improve connectivity, for example through sustainable management of the Biosphere Reserve buffer zone.	**A**	The actions adopted by PARACEL preserve the areas of native vegetation, riparian permanent persevered areas and legal reserve of its own forest lands, in addition to the legal requirement, minimizes the impact. When compared to the non-project scenario of ongoing conversion and degradation of natural habitat throughout the Project landscape, well designed Biodiversity Offsets have the potential to have a net-gain with respect to fragmentation of the Cerrado habitats mosaic.

Table 34 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest.	Replacement of Habitats with eucalyptus forestry planted areas.	Dust generation and suppression of local vegetation	**N**	**D**	**L/R**	**C**	**CP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	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.	**A**	The actions adopted by PARACEL preserve the areas of native vegetation, riparian permanent persevered areas and legal reserve of its own forest lands, in addition to the legal requirement, minimizes the impact.

Table 35 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Formation of the eucalyptus forest.	Replacement of Habitats with eucalyptus forestry planted areas.	Noise related disturbance on fauna	**N**	**D**	**L/R**	**C**	**CP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	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.	**A**	The actions adopted by PARACEL will minimize the impact.

Table 36 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Inadequate use of fertilizer.	Use of fertilizer.	Eutrophication of rivers due to improper fertilization	**N**	**D**	**L/R**	**C**	**MP**	**P**	**I**	**II**	**M**	**M**	**M**	-	Perform agrochemicals management program and hazardous materials management program, in order to prevent risks to the environment. Exclude the use of all hazardous pesticides that contain or main contain active ingredients listed as prohibited by the FSC. Monitor the leaching of nutrients and agrochemicals and their potential impacts on freshwater ecosystems.	**A**	The actions adopted by PARACEL will minimize the impact.

Table 37 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Inadequate use of pesticide.	Use of pesticide.	Indirect impacts of pesticide use (fipronil) on community bee keeping	**N**	**D**	**L/R**	**C**	**MP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	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 main contain active ingredients listed as prohibited by the FSC. Interview periodically the local bee keepers and compare their local bee colonies monitor data with the use of pesticide (fipronil).	**A**	The actions adopted by PARACEL will minimize the impact.

Table 38 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Opening accesses and roads and Formation of the eucalyptus forest.	Risk of running over animals and Hunting risk.	Harassment of workers to wild fauna and flora	**N**	**D/I**	**L/R**	**C**	**MP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	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, and police speed limits; Intensify surveillance activities in partnership with local authorities and neighbors to avoid animal hunting and breaches of traffic control rules; Prohibit hunting by workers and install signs prohibiting hunting.	**A**	It can be stated that the risk on local fauna will be minimized by the implementation of the proposed mitigation measures.

Table 39 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Opening accesses and roads and Formation of the eucalyptus forest.	Risk of spread of invasive species.	Spread of invasive species along new roads and fire breaks	**N**	**D**	**L/R**	**C**	**CP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	Monitor continuously the invasive species along new roads and fire breaks; Plant native grasses within fire breaks. Implement an Invasive Species Management plan to avoid and control the spread of invasive species due to the plantation operations, focusing on invasive pasture grasses and machinery, fire breaks or road verges as means of transmission.	**A**	The actions adopted by PARACEL will minimize the impact.

Table 40 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Biotic	Opening accesses and roads and Formation of the eucalyptus forest.	Risk of fire.	Risk of fire.	**N**	**D/I**	**L/R**	**C**	**CP**	**P**	**I**	**II**	**M**	**M**	**M**	**-**	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. Take into account climate change predictions (drier and more extended dry season, and more extreme temperature frequency and duration) to ensure that firebreaks between plantations and native forest patches are of sufficient width to avoid fire spread into the native forests.	**A**	The actions adopted by PARACEL will minimize the impact.

Table 41 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact															
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Degree for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Manpower demand for the eucalyptus formation	Hiring of manpower for eucalyptus formation	Impact to Employment	P	D/I	L/R/E	C	I	P	I	III	M	G	-	A	A	Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program; Articulate 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.	A	Following the implementation of the enhancement measures, it can be assumed that PARACEL will promote the hiring of available labor in the department of Concepción, San Pedro and Amambay, as well as train the local population.

Table 42 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Degree for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Land use for eucalyptus plantation	Possibility of affecting cultural indigenous resources	Impact to Indigenous Communities and Livelihoods	N/P	D/I	L/R	P	I	P	I	II/III	M	M	M	M	M	Perform Indigenous Consultation and Consent Procedure. Promote indigenous labor inclusion in PARACEL and in the ventures of its value chain, considering the cultures of origin of indigenous workers. Monitor the adaptation of indigenous people who must reside in temporary accommodation. Prevent disrespect for the rights of indigenous peoples and 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 used in a shared way by the project and the indigenous communities. Perform Relationship Program with Indigenous Communities. The ESR (Ecosystem Services Review) (mentioned as a mitigation measure to be implemented in the 'Use of Ecosystem Services' and 'Land Acquisition & Displacement' sections) should place special attention on the potential impacts of the Project on access to Priority Ecosystem Services for Indigenous communities which could affect their wellbeing. If the significant conversion of Natural Habitat is predicted to occur (subject to confirmation by the Critical Habitat Assessment), then IFC PS6 requires consultation with affected communities and any Indigenous communities that would have used ecosystem services in these areas should be consulted; this consultation could form part of the ESR.	M	It can be said that there will be a negative Impact to Indigenous Communities and Livelihoods due to change of land use to eucalyptus plantation, but the development of the forestry component of the project could lead to a greater attractiveness for the sale of real estate by the current owners to those interested in expanding the business, may be considered a positive impact. Other than that, PARACEL will make efforts not to cause any disturbance to Indigenous Communities and Livelihoods, compromise to get Indigenous Consent in the direct influence area (DIA).

Table 43 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact													
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	- Cleaning the land - Opening accesses and roads	Accumulation of standing water	Community health and safety through vector borne and communicable diseases	N	D/I	L/R	C	LP	P	I	II	M	G	M	-	Support health campaigns in the DIA communities; Carry out specific studies to systematize information from the USF; and then deliver them to the MSPyBS, performing a disease baseline study. Monitor the health data of the community.	A	The proliferation of vectors will be minimal to maintain surveillance activity for guiding measures that neutralize the conditions favorable to the proliferation of mosquitoes and other vectors in the space occupied by the project and its area of influence.

Table 44 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Mobilization of workforce	Impact the infrastructure services	Impact to Community Health, Safety and Security	N	D/I	L/R	C	LP	P	I	II	M	G	M	-	– 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 health, hygiene and safety in the Relationship Plan with the Community and other Social Actors; – Request public agencies to supervise safety, to inhibit illegal acts.	A	PARACEL has compromised to adopt the best environmental practices regarding water, effluent, solid wastes and noise controls, not to cause disturbance according with the Community Health, Safety and Security Plan.

Table 45 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Degree for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Mobilization of workforce	Impact the infrastructure services	Worker Influx Increase	**N/P**	**D/I**	**L/R**	**P**	**I**	**P**	**I**	**II/III**	**M**	**M**	**M**	**M**	**M**	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; Articulate 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; Offer Labor and Working Conditions for the employees especially in terms of health plan and transportation.	**M**	The migration will impact on the available infrastructure, but it is estimated that the main migration of workers may occur from the extensive and small-scale agriculture and livestock sector; that is to say, small producers, as well as self-employed workers – mainly informal ones– towards the project. According to the surveys carried out among residents, the low profitability of agricultural production is one of the economic problems that affect the communities, which may give a notion that, given better income opportunities, people would choose to change productive area.

Table 46 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact		Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Degree for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Mobilization of workforce	Sustainable Practices	Impact to Labor and Working Conditions	P/N	D/I	L/R/E	C	I	P	R	II I	M	M	-	M	A	Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program, offering all benefits for 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 benefits for good work conditions. Perform Program for Development and Linkage with the Local Workforce.	A	The local economy tends to benefit from the emergence of jobs demands, linked both directly to the activity of the company's execution and indirectly, and potentialized through offering benefits for good work conditions.

Table 47 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact															
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Degree for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Mobilization of workforce	Governance	Impact to Human Rights	P	D/I	L/R/E	C	I	P	R	II I	M	M	-	M	A	Respect internationally recognized human rights; Adopt adequate measures for the prevention, mitigation and, where appropriate, remediation of adverse impacts on human rights; Monitoring 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. Perform Equal Opportunity and Non-Discrimination Programs.	A	By adopting Universal Declaration of Human Rights as a common standard of achievement for all peoples and all nations, PARACEL ensures to the end that every individual and every organ of society, keeping this Declaration constantly in mind, shall strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition and observance, both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction.

Table 48 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Degree for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Formation of the eucalyptus forest	Land use change	Impact to Landscape and visual	N	D	L	C	I	P	I	II I	B	P	P M	-	-	Establish a management of the farms, among other measures, such as Forest Mosaics, in order to have a natural variability throughout the landscape. The Forest Mosaic can be introduced, among other measures, with the 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.	A	The change in the landscape is inevitable, but the maintenance of planting on different ages through forest mosaic and the preservation of riparian area to minimize the visual impacts caused after harvest.

Table 49 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	- Earth moving activities - Formation of the eucalyptus forest	Possibility of affecting cultural heritage sites	Impact to Cultural Heritage	N	D	L	P	I	P	I	S	B	P	M	-	Take actions to ensure that the company's activities do not affect or destroy any cultural property considered as protected heritage through the Archaeologic Finding Chance Program.	A	It is possible to affirm that there will be no interference with the cultural heritage, taking into account that the area where the project will be implemented is significantly anthropized. Furthermore, all mitigation measures will be taken so that there is no possible interference with the cultural heritage in accordance with the law in force.

Table 50 – Implantation/Operation Phase Impacts (*cont.*)

Component	Activity (Impact-Generating Factor)	Aspect	Impact	Characterization of the impact														
				Nature	Form of incidence	Spatial coverage area	Probability of occurrence	Time of occurrence	Time or length of time	Reversibility	Accumulation	Magnitude	Importance	Mitigation possibilities	Possibilities for enhancement	Mitigation measures or enhancement	Degree of resolution of measures	Forecast after implementation of measures
Socioeconomic	Land use for eucalyptus plantation	Possibility of affecting ecosystem resources	Impact to Community Uses and Dependencies on Ecosystem Services	N	D/I	L/R	C	LP	P	I	II	M	G	M	-	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; Perform strict measures of good practices in the field and of appropriate design, in the case of roads and drains; Monitor the quality of the water; Carry out permanent monitoring of perception in the communities being addressed in the Social Management Program. As mentioned in the Land Acquisition and Displacement, Use of Ecosystem Services (under biological environment) and the Impact to Indigenous Communities sections, an Ecosystem Services Review should be carried out to understand the level of dependence that Project affected communities may have on specific ecosystem services, and to asses if any Project impacts upon access to those services may be severe enough to affect wellbeing.	A	DIA communities will not be affected by project activities that potentially impact on water resources, because the mitigating measures will be corrected applied.

Table 51 – Results of the CH screening for all features identified form the baseline and IBAT analysis as potentially qualifying under Criterion 1-3

N.	*Scientific name*	Common Name	Conservation Status		Range Restricted	Endemic	Criterion 1			Criterion 2	Criterion 3		Result - Category	Comments
			Global	National			Highly threatened			Restricted Range	Migratory/ Congregatory			
							1.a	1.b	1.c.	2.a	3a	3b		
			IUCN 2021	MADES res 206			*a) >0.5% global pop. and 5 reproductive units Global EN or CR species*	*b) globally important concentrations of globally VU, the loss of which would result in the change of the IUCN Red List*	*c) Important concentration of*	*EOO less than 50,000 square kilometers a) >10% global pop. and 10 reproductive units of RR species*	*a) >1% global pop. of species during lifecycle*	*b) >10% global pop. during periods of env. stress*		
Mammals				*AE = VU; EP= EN/ CR/ DD*										
5	*Myrmecophaga tridactyla*	Giant anteater	VU	VU							NA	NA	not qualifying	Detected in eDNA

6	*Tapirus terrestris*	South American Tapir	VU	VU							NA	NA	not qualifying	Detected in eDNA
7	*Tayassu pecari*	White-lipped peccary	VU	VU							NA	NA	not qualifying	Detected in eDNA
12	*Sylvilagus brasiliensis (Linnaeus, 1758)*		EN										not qualifying	According to GBIF, this species is widely distributed across South and Central America. The IUCN geographic range distribution map shows this species as resident in Brazil, between Arrecife and Maceió y Eastern Brazil. Current taxonomical research is looking at this species, due to the potential that this species may actually be several different species or subspecies. After consultation with expert Dr Luis Ruedas, the recommendation in the future is to also look for *Sylviagus paraguensis* (Thomas 1901), and also await further research.
13	*Blastocerus dichotomus*	Marsh Deer	VU										not qualifying	
14	*Priodontes maximus*	Giant Armadillo	VU										not qualifying	
15	*Mazama nana*	Brazilian Dwarf Brocket	VU	EP									not qualifying	
16	*Leopardus guttulus*	Southern Tiger Cat	VU					unlikely					unlikely	Very broad distributional range across Brazil, Bolivia and Paraguay, with the AoA overlapping less than 1% of the EOO. 6047 mature individuals
18	*Leopardus tigrinus (Schreber, 1775)*		VU										not qualifying	Not present in AoA, very broad distributional range across northern South America.
19	*Dasyprocta azarae*	Akuti po'i	DD										unlikely	Decreasing. Resident in an area much larger than 1% of the AoA.
23	*Natalus stramineus*	Murciélago Oreja de embudo	LC	EP										One of the rarest bats in Paraguay and in Concepción with the southernmost site. It could possibly qualify as of stakeholkder concern, but nor for critical habitat since it has been assessed globally as LC
Amphibians														
1	*Rhinella scitula*	Sapito del cerrado/Cope´s toad	DD	AE	May be	Ende				possible	NA	NA	Possible	GBIF shows distribution in Western Brazil. Little is known about this species and further research is required. EOO possibly less than 50,000km2,

						mic								associated with forested habitats in the Cerrado zones of Paraguay and adjacent Brazil (reference), found in southwestern and central Mato Grosso do Sul, Brazil, and in the provinces of Amambay and Concepcion in Paraguay (reference).
2	*Dendropsophus elianae*	lesser treefrog	-	EP	Y	Endemic					NA	NA	unlikely	No IUCN data. GBIF data shows distribution in Brazil.
Reptiles														
1	*Chelonoidis carbonaria*	Red-footed tortoise		EN					possible		NA	NA	Not qualifying	No IUCN data. GBIF shows broad distributional range across South America.
3	*Norops meridionalis*	Camaleoncito		EN					possible		NA	NA	Not qualifying	*Norops meridionalis* shown by GBIF as present in Brazil
4	*Phalotris nigrilatus*		EN	AE	Y	Endemic	possible			possible			Possible	Specimens are preserved since 1993, without being mapped by GBIF. Known from a very few historical specimens. Endemic to Paraguay, possibly with an EOO of less than 50,000km2 according to visual inspection of the IUCN distribution map.
5	*Dendropsophus elianeae* (Napoli & Caramaschi, 2000)		LC											
6	*Paleosuchus palpebrosus*	Jakare ita	LC											
7	*Eunectes murinus*	Mbói jagua, anaconda	-	EP									unlikely	Broad distribution across SA (not in AoA), and even North America according to GBIF.
8	*Tupinambis duseni*	Teju guasu	-	AE									unlikely	No IUCN data, no GBIF data (it suggests *Salvator duseni*, with two records in Brazil). Further research required.
Birds														
5	*Anodorhynchus hyacinthinus*	Hyacinth macaw	VU	EP					unlik		NA	NA	Unlikely	In Brazil, Paraguay and Bolivia. The majority of the population in Paraguay reported in Pantanal (200km from AoA), where since 1990 the species

									ely					has shown signs of a recovery and expanded its range (Pinho and Nogueira 2003, Anon. 2004)
7	*Crax fasciolata*	Bare faced curassow	VU	VU				unlikely			NA	NA	Unlikely	Very broad distributional range across South America.
11	*Amazona vinacea*	Vinaceous-breasted Amazon	EN	EP			possible						Possible	1000-2499 mature individuals, with a distribution range that overlaps with the AoA can be around 0.5% according to the IUCN map. GBIF and eBird do not distribution of *Amazona vinacea* in the AoA.
12	*Buteogallus coronatus*	Crowned solitary eagle	EN				possible						Possible	255-999 mature individuals, with a distribution range that overlaps (IUCN) with the AoA can be around 0.1-0.5%. GBIF shows a very broad distributional range across South America.
13	*Sporophila palustris*	Marsh seedeater	EN	EP			possible						Possible	IUCN stated that there are 600-1700 mature individuals, with a distribution range that overlaps (IUCN) with the AoA can be around 0.5%, although AoA potentially a non-breeding area. One record on GBIF, although GBIF shows a broad distributional range across Paraguay, Brazil, Uruguay and northern Argentina.
14	*Eleothreptus candicans*	White-winged nightjar	VU										Unlikely	600-1700 mature individuals, with a distribution range not in the AoA (according to eBird and IUCN data)
15	*Laterallus xenopterus*	Rufous-faced crake	VU					unlikely					Unlikely	2500-9999 mature individuals, resident in the AoA, with a distributional range that overlapping with the AoA unlikely to be around 10%, potentially less.
16	*Culicivora caudacuta*	Sharp-tailed Tyrant	VU										Unlikely	10,000-19,999. May be present at low frequencies (0-2% eBird) in the AoA, but it has a very broad distributional range across Brazil, Argentina, Bolivia and Paraguay (eBird and IUCN data)
17	*Alectrurus tricolor*	Cock-tailed Tyrant	VU										Unlikely	Present in AoA (IUCN) although a low (0-2%) frequencies according to eBird, 6,000-15,000 mature individuals and decreasing.
19	*Anthus nattereri*	Ochre-breasted Pipit	VU										Not qualifying	No evidence (GBIF, IUCN, eBird) of the species present in AoA
20	*Coryphaspiza melanotis*	Black-masked Finch	VU										Not qualifying	No evidence (GBIF, IUCN, eBird) of the species present in AoA
21	*Sporophila cinnamomea*	Chestnut Seedeater	VU										Unlikely	Spotted in the area (GBIF), present at low frequencies (eBird), with a broad distributional

														range including Uruguay, Brazil, North Eastern Argentina, and non-breeding in the AoA (IUCN)
28	*Nothura minor*	Ynambu'i pyta	VU										Unlikely	Decreasing, 2500-9999 mature individuals. Extinct in AoA. Mostly in Brazil, with the exception of an area in Paraguay (Santa Rosa del Araguay, ca. 100km South East of the AoA).
Fish														
1	*Potamorrhaphis eigenmanni*	Banded acara	-	VU							NA	NA		Broad distribution across Paraguay, Bolivia and Brazil (GBIF)
2	*Leporinus aff. friderici*	Boga tres puntos	-	-										Broad distribution across South America (GBIF)
3	*Hypophthalmichthys nobilis*	Bighead carp	DD										Not qualifying	Present in Paraguay, as well as in north America, Europe and Asia. Detected by eDNA
Plants														
1	*Bidens chodatii*		-	-		Endemic					NA	NA	Unlikely	No IUCN assessment. Recorded in the AoA (GBIF), and info available on Kew. Distributional range broad across Bolivia, Uruguay, Argentina and Paraguay. Endemic according to Baseline report.
2	*Ipomoea aemili*		-	-		Endemic					NA	NA	Unlikely	Very broad distributional range, across Bolivia, Paraguay, Uruguay and Brazil. One record in the AoA (GBIF)
3	*Arachis hassleri*		-	.		Endemic					NA	NA	Unlikely	No IUCN assessment, no information on GBIF, no info on Kew. Two herbarium specimens on JSTOR state that they were collected in Paraguay. Recorded in the ESIA.
4	*Hemionitis tomentosa (Lam.) Raddi*	Doradilla	-	EP	N				Unlikely		NA	NA	Unlikely	Broad distribution across South America (GBIF)
5	*Acrocomia hassleri (Barb. Rodr.) W.J. Hahn*	palm	.	VU	N				Unlikely		NA	NA	Unlikely	Broad distribution across Paraguay and Brazil (GBIF)
7	*Syagrus campylospatha (Barb. Rodr.) Becc.*		-	VU	N				Unlikely		NA	NA	Unlikely	Distributed in several areas of Paraguay, some records south of the AoA, others around Asuncion, and others in Brazil near the border with Paraguay (GBIF)

8	*Syagrus oleracea (Mart.) Becc.*		-	EP	N				Unlikely		NA	NA	Unlikely	Broad distribution across Paraguay and Brazil (GBIF)
10	*Handroanthus ochraceus (Cham.) Mattos ssp.*		-	VU	N				Unlikely		NA	NA	Unlikely	Broad distribution across South America and Central America (GBIF)
11	*Handroanthus pulcherrimus (Sandwith) S. Grose*		-	VU	N				Unlikely		NA	NA	Unlikely	Broad distribution across Paraguay, Argentina and Brazil (GBIF)
13	*Discocactus hartmannii (K. Schum.) Britton & Rose*	cactus	CR	EP			Unlikely				NA	NA	Unlikely	IUCN CR, but no map distribution shown. GBIF shows distribution in Paraguay, Brazil, Bolivia, Uruguay and Argentina, but not in the AoA.
14	*Monteverdia ilicifolia (Mart. ex Reissek) Biral*		-	EP	N				Unlikely		NA	NA	Unlikely	Broad distribution across Paraguay, Uruguay, Bolivia and Brazil (GBIF)
15	*Amburana cearensis* (Allemão)	Umburana Do Cheiro	EN	EP	N				Unlikely		NA	NA	Unlikely	IUCN EN, but no map distribution shown. GBIF shows distribution in Paraguay, Brazil, Bolivia, Uruguay and Argentina, and one record in the AoA.
19	*Myrocarpus frondosus* (Allemão)		DD	EP	N				Unlikely		NA	NA	Unlikely	IUCN DD. GBIF shows occurrences across South America, and in Atlantic and Pacific Islands. One occurrence in the AoA. Mentioned by Alberto Yanosky.
23	*Psidium grandifolium* DC.			EP	N				Unlikely		NA	NA	Unlikely	Broad distribution across South America (GBIF)
24	*Balfourodendron riedelianum* (Engl.) Engl.	Guatambu; Marfim	EN	EP	N		Unlikely				NA	NA	Unlikely	IUCN EN, but no map distribution shown. GBIF shows distribution in Paraguay and Brazil with two records in the AoA
25	*Gonopterodendron sarmientoi*	Palo santo	EN	-			Unlikely						Unlikely	IUCN EN, map shows distribution across Paraguay, northern Argentina, eastern Bolivia and South Western Brazil. No records in the AoA by the IUCN, and 3-5 records in the AoA by the GBIF
26	*Cedrela odorata*	Spanish Cedar	VU					Unlikely					Unlikely	Very broad distributional range, across South and Central America (IUCN and GBIF)

27	*Cedrela fissilis*	Cedro Misionero	VU	EP				Unlikely					Unlikely	Very broad distributional range, across South and Central America (IUCN and GBIF)
28	*Frailea schilinzkyana*		VU					Unlikely					Unlikely	Limited distribution by IUCN (much less than 10% of global population in the AoA), but very broad distributional range according to GBIF across South and Central America.
29	*Butia paraguayensis (Barb.Rodr.) L.H. Bailey*	Dwarf yatay palm	-	AE									Unlikely	Broad distribution across Paraguay, Argentina and Brazil (GBIF)
32	*Prosopis nigra Hieron.*		DD										Unlikely	No map shown by IUCN. GBIF shows broad distributional range across Bolivia, Paraguay, Argentina and Uruguay. One GBIF record in the AoA by GBIF
33	*Aspidosperma polyneuron*		EN	EP			Unlikely						Unlikely	No map distribution shown by IUCN. GBIF shows broad distributional range across South and Central America. GBIF shows two occurrences in the AoA.
35	*Casearia gossypiosperma*	Mbavy guasu	-	-					Unlikely				Unlikely	Not assessed by IUCN. GBIF map shows distribution across Paraguay, Peru, northern Argentina, eastern Bolivia and Brazil. 3-5 records in the AoA by the GBIF
37	*Trichillia claussenii*	Catigua guasu	-	-					Unlikely				Unlikely	Not assessed by IUCN. GBIF map shows distribution across Paraguay, Peru, Argentina, eastern Bolivia and Brazil. 2 records in the AoA by the GBIF
38	*Tabebuia sp.*	Lapacho	?						Unlikely				Unlikely	If Tabebuia alba, distributed in eastern Paraguay and in Brazil.
39	*Anthurium plowmanii*	Calaguala	-	-					Unlikely				Unlikely	Broad distributional range across South America, but not in the AoA
40	*Astronium urundeuva*	Urundey mi	DD										Unlikely	IUCN DD, with no map distribution shown. GBIF shows distribution in Paraguay, Bolivia, northern Argentina and Brazil, with one record in the northern part of the AoA, in the border with Brazil.

7.2 Mitigation, Compensation and Enhancement

Based on the evaluation of impacts, measures are recommended to minimize, eliminate, compensate for negative impacts and, in the case of positive impacts, maximize them, always with measures to be implemented through environmental management programs.

The following are the proposed measures:

Planning Phase

- Establish criteria for buying and leasing lands in the company strategic planning for wood supply, avoiding the isolation of properties.
- Compromise not occupy lands with population settlements, and that does not require the physical or economic displacement of any person, family, group or community.
- Prioritize the development of eucalyptus plantations on modified habitat. Totally avoid plantation development in or adjacent to legally protected areas, or on forest and wetland natural habitats, and avoid planting the good condition natural Cerrado habitat complexes.
- Undertake an Ecosystem Services Review to establish the extent of potential displacement of access to Priority ecosystem services because of the Paracel project. Mitigate any significant impact if found.
- Carry out periodic monitoring of GHG emissions and C 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.Adopt firefighting procedures (observation towers, firebreaks, etc.) and constant training of brigade staff for these procedures.
- 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.

Implantation/Operation Phase

- 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.
- 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 Action Plan, water management program, surface and ground water quality monitoring program and Biodiversity Monitoring & Evaluation Plan.
- Meet IFC EHS Guidelines for Perennial Crop Production.
- 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.
- 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.
- Reducing soil preparation and planting in curves levels, avoiding surface runoff of rainwater.
- Maintaining plant cover between plantation lines.
- Keep debarked materials in the forests, to cover the farm soil with organic matter.
- 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.
- Preservation and recovery of dry Cerrado savanna habitats that remain in better condition.

- Implement the Biodiversity Action Plan (BAP) and Biodiversity Monitoring and Evaluation Plan.
- Supervise the collection, packaging, storage and transport of solid waste in accordance with current legislation from worker accommodations areas.
- Perform Workers Accommodation Plan.
- 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, such as fertilizers, herbicides, fungicides and insecticides, 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.
- Carry out maintenance on machine, truck and vehicle engines.
- Carry out activities in the area predominantly in the work daytime period.
- Conduct road open planning to minimize natural habitat fragmentation; avoid developing roads or services in watercourse, wetland, forest or good condition savanna Cerrado areas.;
- Delimitate firebreaks to protect permanent preservation areas;
- Remove natural tree/shrub cover only where strictly necessary;
- Carry out detailed territorial planning (Planting Development Management Plan), avoiding disturbance of natural vegetation or soils in the Riparian Zones; and restoring with species native to the ecosystem any riparian and spring areas where vegetation has been degraded or erosion is occurring;
- Implement a landscape ecology design, ensuring conservation areas (i.e., avoidance or set-asides and Biodiversity Offsets) and restoration areas (restoring impacts not associated with Paracel so also contributing to the Biodiversity Offset strategy) create ecological corridors and a representative mosaic of Cerrado habitats where possible;
- Eliminate/cut any eucalypt specimens spread into conservation areas, preventing the formation of eucalyptus forests outside plantation areas;
- Perform wildlife monitoring/research and rescue/relocation program, prior to works;
- Install signs on the main access routes to the planted areas through the wildlife safety and alert program, including installation of fauna passageways;
- Intensify surveillance activities in partnership with local authorities and neighbors to prohibit hunting and logging in Paracel properties;
- Perform worker education on hunting prohibition;
- Consider the mosaics and characteristics of native habitats in the Plantation Development Management Plan;
- 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 riparian zones;
- Recover currently degraded forest areas;

- In addition to conservation approaches applicable to the Paracel properties in general, commit to establish buffers along the border with the National Parks adjacent to two plantations (Soledad and Zanja Moroti) and to pay special attention to managing the Biosphere Reserve buffer area, which overlaps portions of three plantations (Zapato, Santa Teresa, and Hermosa). To appropriately manage the buffer zone, resolution 200/2001 Art. 31 regarding Biosphere Reserves will be considered, consultation with affected parties will need to occur and a management plan will need to be approved.
- Perform Biodiversity Management Program as per the BAP.
- Maintain high forests and riparian forests.
- Maintain representative samples interconnected with the other types of Cerrado.
- Monitor the Cerrado biodiversity.
- Planning of plantations.
- Implement an Ecosystem Services Review to establish the level of dependency vulnerable communities have on the Ecosystem Services which are derived from within the Paracel properties. Evaluate the net impacts of Paracel's road network improvements, plantations and conservation activities upon the 'priority ecosystem services' (i.e., those upon which vulnerable communities have high levels of dependence for their well-being) and design mitigation measures as appropriate.
- It is noted that the reduction in cattle grazing because of Paracel plantations establishment could reduce an important source of protein for some families in the Indigenous communities and increase their reliance on hunting.
- Eucalyptus plantations will be designed to implement the Mitigation Hierarchy, avoiding Critical and Natural Habitats where feasible and implementing a Biodiversity Action Plan (BAP) designed to achieve Net Gain for biodiversity values designating Critical Habitat, and No Net Loss for values designating Natural Habitat. The BAP will include design of Biodiversity Offsets where necessary.
- A full Critical Habitat Assessment will be developed to determine and map habitat importance (i.e., Critical, Natural, Modified) as per PS6 definitions.
- 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.
- Maintain high forests and riparian forests in plantations farms.
- Maintain a representative mosaic of interconnected Cerrado habitat types of Cerrado.
- Monitor the Cerrado biodiversity within the farms.
- Planning the plantations areas avoiding impacts on fauna and flora.
- Perform Biodiversity Monitoring and Evaluation Plan.
- In order to assist with implementing the Mitigation Hierarchy, Paracel commit to the criteria for establishing conservation vs planted areas in the plantations, as showed in the table below. Note that criteria for establishment of plantations in savanna Cerrado habitats in order to meet PS6 requirements are to be developed.
- Commit to follow the criteria for establishing conservation vs planted areas.
- Perform the Biodiversity Management Program and the Biodiversity Monitoring Program.
- 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.
- The Project is proposing 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. The project has committed to establish 1 km buffers along the borders with the National Parks and the three adjacent properties.

- It is recommended that the Biodiversity Offset strategy 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 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. This evaluation of threats will involve an analysis of rates and drivers of land-use change and habitat degradation in the region which should be used to inform an assessment of the potential indirect impacts to the Protected and Internationally Recognized Areas from the Project (e.g., by facilitated access to the areas).
- Paracel is 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 so protect deforestation for illicit plantations.
- 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.
- Open areas not planted will be retired from grazing and so if free of invasive grasses will recover to improve connectivity.
- Paracel plans to not plant in some Properties will serve to protect natural mosaics of the full range of Cerrado habitats that are connected with the National Parks.
- The Biodiversity Offset design should consider opportunities to reduce fragmentation and improve connectivity at the landscape scale, for example through sustainable management of the Biosphere Reserve buffer zone.
- 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.
- 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.
- Perform agrochemicals management program and hazardous materials management program, in order to prevent risks to the environment.
- Exclude the use of all hazardous pesticides that contain or main contain active ingredients listed as prohibited by the FSC.
- Monitor the leaching of nutrients and agrochemicals and their potential impacts on freshwater ecosystems.
- 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 main contain active ingredients listed as prohibited by the FSC.
- Interview periodically the local bee keepers and compare their local bee colonies monitor data with the use of pesticide (fipronil).
- 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, and police speed limits;
- Intensify surveillance activities in partnership with local authorities and neighbors to avoid animal hunting and breaches of traffic control rules;
- Prohibit hunting by workers and install signs prohibiting hunting.
- Monitor continuously the invasive species along new roads and fire breaks;
- Plant native grasses within fire breaks.
- Implement an Invasive Species Management plan to avoid and control the spread of invasive species due to the plantation operations, focusing on invasive pasture grasses and machinery, fire breaks or road verges as means of transmission.
- 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.
- Take into account climate change predictions (drier and more extended dry season, and more extreme temperature frequency and duration) to ensure that fire-breaks between plantations and native forest patches are of sufficient width to avoid fire spread into the native forests.
- Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program;
- Articulate 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.
- Perform Indigenous Consultation and Consent Procedure.

- Promote indigenous labor inclusion in PARACEL and in the ventures of its value chain, considering the cultures of origin of indigenous workers.
- Monitor the adaptation of indigenous people who must reside in temporary accommodation.
- Prevent disrespect for the rights of indigenous peoples and 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 used in a shared way by the project and the indigenous communities.
- Perform Relationship Program with Indigenous Communities.
- The ESR (Ecosystem Services Review) (mentioned as a mitigation measure to be implemented in the 'Use of Ecosystem Services' and 'Land Acquisition & Displacement' sections) should place special attention on the potential impacts of the Project on access to Priority Ecosystem Services for Indigenous communities which could affect their wellbeing.
- If the significant conversion of Natural Habitat is predicted to occur (subject to confirmation by the Critical Habitat Assessment), then IFC PS6 requires consultation with affected communities and any Indigenous communities that would have used ecosystem services in these areas should be consulted; this consultation could form part of the ESR.
- Support health campaigns in the DIA communities;
- Carry out specific studies to systematize information from the USF; and then deliver them to the MSPyBS, performing a disease baseline study.
- Monitor the health data of the community.
- 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 health, hygiene and safety in the Relationship Plan with the Community and other Social Actors;
- Request public agencies to supervise safety, to inhibit illegal acts
- 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;
- Articulate 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;
- Offer Labor and Working Conditions for the employees especially in terms of health plan and transportation.
- Promote a dissemination campaign to hire labor for the company through the Dissemination and Communication Program, offering all benefits for 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 benefits for good work conditions.
- Perform Program for Development and Linkage with the Local Workforce.
- Respect internationally recognized human rights;
- Adopt adequate measures for the prevention, mitigation and, where appropriate, remediation of adverse impacts on human rights;

- Monitoring 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.
- Perform Equal Opportunity and Non-Discrimination Programs.
- Establish a management of the farms, among other measures, such as Forest Mosaics, in order to have a natural variability throughout the landscape.
- The Forest Mosaic can be introduced, among other measures, with the 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.
- Take actions to ensure that the company's activities do not affect or destroy any cultural property considered as protected heritage through the Archaeologic Finding Chance Program.
- 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;
- Perform strict measures of good practices in the field and of appropriate design, in the case of roads and drains;
- Monitor the quality of the water;
- Carry out permanent monitoring of perception in the communities being addressed in the Social Management Program.
- As mentioned in the Land Acquisition and Displacement, Use of Ecosystem Services (under biological environment) and the Impact to Indigenous Communities sections, an Ecosystem Services Review should be carried out to understand the level of dependence that Project affected communities may have on specific ecosystem services, and to asses if any impacts upon access to those services may be severe enough to affect wellbeing.

8 INTEGRATED ANALYSIS OF ENVIRONMENTAL IMPACTS (CUMMULATIVE IMPACT ANALYSIS)

The analysis of cumulative impacts has been developed in the Social Study of the industrial component, whose main results, after correlating PARACEL's undertaking with other projects identified in the DIA, showed a positive synergy in the generation of employment and in the development of the local, regional and extra-regional economy, as well as other social factors. Likewise, the potential cumulative negative impacts due to pressure on public/non-public services and infrastructures, associated with the people employed and induced by the projects in the DIA and the increase in truck traffic in the area of influence, have been detailed. It is considered that the forest component would have the same cumulative impacts, on a greater or lesser scale, on the Valued Socio-Environmental Components (VECs) already predefined in the industrial component.

In addition to the VECs already mentioned above (employment, local and regional economy, others), the forestry component includes the VEC linked to “ecosystem services”; resulting from the identification of possible impacts that the communities near the forest fields could have due to their provisioning and regulation, as well as effects on related customs.

In the case of the forestry component of the enterprise, it is analyzed from another perspective, although complementary to the industrial component, where a qualitative characterization is carried out, considering the synergy that could occur in the area not because of other enterprises, but because of the incremental development of forest production derived from eucalyptus plantations, this in order to identify the *possible systemic consequences resulting from the combination of multiple effects from individual actions over time* (IFC, 2015).

As already mentioned in the LBS, and in the impact assessment developed previously, there would be an important change in land use in the area, 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 (analyzing the PARACEL plantations). 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.

Next, a qualitative description of the VECs; on which it is considered there would be cumulative impacts, both positive and negative:

- **Local and regional economy/Jobs:** The development of forestry production in the area would be increasing, and it is expected to start in the short term by PARACEL in approximately 3,000 hectares; then move to 15,000 hectares and so on until the development of all the fields to be forested (170,000 has). In addition, taking into account INFONA data, the "potential" development of the area could be exploited, and more plantations increased over time, which would entail a positive incremental impact; developing directly and indirectly the economy of the area and providing sources of work. Furthermore, the appreciation of the land could be extrapolated throughout the area, due to the change in land use that would occur in the northern region of the country.
- **Ecosystem services:** They could be affected, incrementally in time and space, taking into account the change of use in the area; and the introduction of activities related to the chemical control of plantations. The main ecosystem services are linked to the provisioning services (use of water for consumption of wells, lakes and springs, hunting, fishing and collection of other materials for consumption and artisanal activities), and cultural (recreational and leisure activities linked to water).

Although, according to data from PARACEL, eucalyptus plantations present a water balance similar to that of the Cerrado native forest, and other studies carried out in Uruguay show that there are no significant differences in the availability (quantity) of water in similar plots of grazing versus forested with eucalyptus, it is considered that

there may be competition in the “water consumption” used by the communities that use groundwater (quantity), especially in cases where there is already a shortage at certain times of the year, furthermore, along with a possible gradual change over time in the quality of the water, due to the chemical control of the plantations themselves. The monitoring of water levels and quality throughout the project cycle, will be duly attended by PARACEL, in order to minimize possible cumulative impacts on the water (environmental) VEC and its relationship with the social VEC.

- **Infrastructure and services:** From the point of view of improving the infrastructure conditions of and for the communities, as well as the development of the quality of life in the area, the project will determine an incremental benefit over time in the structural improvement and of paving of all public routes to be used for the transport of wood, which would have a positive impact, 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). In relation to potential cumulative negative impacts, the impact on infrastructure and road safety is mentioned, since in the operational stage of the forest fields (during the harvest season and transportation of wood to the industrial plant), the movement of vehicles at the rate of one truck every 4 minutes approximately from years 6 - 7 after the installation of the plantations in each forest field. If to this we add the development of new similar ventures, this rate could increase.
- **Quality of life, customs/Health and safety of third parties:** It is closely related to the previous point; since the population surrounding the forest fields, would be mainly affected in aspects related to road safety; as well as the increase in the flow of workers in the different stages of the forestry component of the project. Other possible effects, which may increase over time, are related to the leisure habits of the inhabitants, closely linked to the water resources of the area (beach, watering places).

As already mentioned in the industrial component, the minimization of cumulative impacts, from PARACEL, would be to strictly comply with all the measures indicated in the Social Management Plan; likewise, monitoring measures in the conditions of water resources (quantity/quality) will be key, since the use of water in the area is directly linked to customs in the area (recreation, fishing, others); as well as in the supply for human consumption. Sustainable forest management also carries out technical and environmental practices that minimize cumulative impacts.

From physical and biological points of view, cumulative impacts on water and on soil are most critical for the ecosystem balance. Therefore, 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 besides planning routes/ access roads of machines and trucks for the exit of the wood, contemplating the harvest plans in a time horizon of one year or more, having as a background the planning at the technical and strategic level, of greater deadlines, are crucial not to impact significantly on the ecosystem.

Maintain plans for (a) forestation or afforestation (on lands where no forests occurred) with the assumption that there are natural grasslands (campos or ñu) which are important for biodiversity conservation, natural or anthropized (with the remotion of woody plants or the history related to cattle grazing), and also, (b) reforestation on lands

or forestry history (originally occupied by high forests or other types of forests) which given their utility changed their use (forage, livestock or other) will reduce the cumulative impacts.

By preserving Legal Reserve Areas and Riparian Zones, implementing a native forest recompositing project, covering permanent preservation areas and other priority areas, defining the formation of ecological corridors, recovering riverside areas and springs without vegetation or with erosion / sedimentation and planning road paths will reduce the cumulative impact.

Although by occupying a territory that has already been largely anthropized with cattle farming and its production, replacing by afforestation, and according to FAO data, livestock is the human activity generates the greatest impact on water quality (PARACEL, 2021), so although there is a potential impact to intervene by the project, by use pesticides that could reach watercourses and/or groundwater would also degrade the quality of the water and the habitat of fauna, it could be considered on a smaller scale compared to the current situation of land areas.

Not to mention that afforestation with eucalyptus reduces erosive processes in relation to the grazed pasture or deforested area (PARACEL, 2021), the tillage activity could eventually cause erosive processes in the time with drag; both soil and chemical products applied to surface water courses. Soil sedimentation in waterways could decrease the quality of drinking water, the productivity of fishing, and the recreational attractiveness of smaller waterways.