22. MONITORING REPORT

22.1. PROJECT EMISSIONS MONITORING

The methodology describes a monitoring plan for the variables that will make it possible to calculate the project's emissions and leakage during operation. For this purpose, the variables to be monitored, the manner in which they should be monitored, and their frequency are determined during the project execution period, and it is expected that emissions verification procedures will be carried out every two years.

Table 39. Monitoring of deforestation rate

Data/parameter	r
Unit	%/year
Description	Annual deforestation
Source of data	Satellite analysis to determine the area of forest cover at a given time.
Procedure	To calculate the deforestation rate, a multitemporal analysis and monitoring of land cover is carried out using remote sensing images and finally, the Puyravaud formula is applied to determine the percentage of forest cover loss.
Frequency of monitoring	Each year
Comments	-

Table 40. Chest Circumference Monitoring

Data/parameter	**CAP**
Unit	cm
Description	circumference at chest height
Source of data	To be taken from each permanent monitoring plot in the project areas.
Procedure	A tape measure is used to measure the forest species present in the plot at a standard height of 1.30 meters.
Frequency of monitoring	Each time, a forest inventory is conducted in the project area.
Comments	See appendix procedure for plot survey

Table 41. Chest Diameter Monitoring

Data/parameter	**DAP = (prom CAP/π)**
Unit	cm
Description	Diameter at chest height
Source of data	CAP calculated in the field

Procedure	It is calculated from the average KAP taken in the field for each of the individuals present in the plot.
Frequency of monitoring	Each time a forest inventory is conducted in the project area.
Comments	See appendix for plot survey procedure

Table 42. Height monitoring of individuals

Data/parameter	**h**
Unit	m
Description	Height of the individual
Source of data	h calculated in the field
Procedure	It is determined indirectly using a clinometer and calculated by trigonometric principles with data taken in the field for each of the individuals present in the plot.
Frequency of monitoring	Each time a forest inventory is conducted in the project area.
Comments	See appendix procedure for plot survey

Table 43. Aerial biomass monitoring per plot

Data/parameter	BA=exp(-2,406+(1,289ln(D))+(1,169(ln(D))2)-(0,122(ln(D))3)+(0,445(ρ)))
Unit	BA (tHA-1)
Description	Aerial biomass per plot
Source of data	NTC 6208
Application	Carbon stock calculation
Procedure	It is applied taking into account the stratification by forest type by life zones proposed by Holdridge.
Frequency of monitoring	Each plot survey verification to quantify aboveground biomass.
Comments	

Table 44. Biomass monitoring per hectare

Data/parameter	ΣBA= BA*(1/1000) *FC
Unit	BA (tHA-1)
Description	Estimated biomass per hectare
Source of data	Estimation of forest carbon stocks in above-ground biomass in natural forests in Colombia (IDEAM)
Application	Carbon stock calculation
Procedure	It is applied taking into account the sum of the biomass per individual.
Frequency of monitoring	Each plot survey verification to quantify aboveground biomass.

Comments	

Table 45. Below ground biomass monitoring

Data/parameter	BRG R x BA
Unit	BRG (tHA-1)
Description	Estimation of belowground biomass
Source of data	R =IPCC (2006) BA=Allometric Equations
Application	Calculation of carbon stocks in roots
Procedure	It is applied taking into account the ratio of belowground biomass to aboveground biomass (R).
Frequency of monitoring	Each plot survey verification to quantify aboveground biomass.
Comments	

Table 46. Monitoring of GHG emissions reductions

Data/parameter	-
Unit	Annual (tons of CO2e)
Description	GHG emission reduction/mitigation actions
Source of data	NTC 6208
Application	Carbon stock calculation
Procedure	Applicable taking into account forest cover and implementation of REDD activities.
Frequency of monitoring	Each plot survey verification to quantify aboveground biomass.
Comments	

Table 47. Monitoring the permanence of the REDD+ project

Data/parameter	fires
Unit	Area affected (hectares)
Description	Identification and mapping of the area affected by project fires
Source of data	PROCLAIMED. 2020. Quantification of GHG Emission Reductions or Removals from REDD+ Projects.
Application	Reduction of airborne carbon (degradation)
Procedure	Applicable taking into account forest cover and implementation of REDD activities.
Frequency of monitoring	Frequent monitoring and mapping of areas at least every 2 months.
Comments	

Table 48. Monitoring of project emissions

Data/parameter	Annual deforestation in the project area $CSB_{im,m} = \left(\frac{1}{t_2 - t_1}\right) x\ (A_i - A_m)$
Unit	*CSBim,m* = Annual change in area covered by forest in the project area; ha.
Description	GHG emission reductions/mitigation actions
Source of data	PROCLAIMED. 2020. Quantification of GHG Emission Reductions or Removals from REDD+ Projects.
Application	Calculation of changes in aerial biomass
Procedure	It is applied taking into account changes in forest cover and the implementation of REDD activities.
Frequency of monitoring	Annual
Comments	In the scenario with project activity data is monitored. The validated emission factors can be applied in the estimation of monitored emissions.

Table 49. Annual deforestation in the leakage area.

Data/parameter	Annual deforestation in the leakage area $CSB_{m,f} = \left(\frac{1}{t_2 - t_1}\right) x\ (A_{i,f} - A_{m,f})$
Unit	*CSBlb,f*= Annual change in area covered by forest in the leakage area; ha.
Description	GHG emission reductions/mitigation actions
Source of data	PROCLAIMED. 2020. Quantification of GHG Emission Reductions or Removals from REDD+ Projects.
Application	Calculation of changes in aerial biomass
Procedure	It is applied taking into account changes in forest cover and the implementation of REDD activities.
Frequency of monitoring	Annual
Comments	In the scenario with project activity data is monitored. The validated emission factors can be applied in the estimation of monitored emissions.

Table 50. GHG emissions in the period of analysis

Data/parameter	Deforestation project area *EAim, m = CSBim, m x CTeq*
Unit	*EAim, m* = annual emission in the project area; tCO2 ha-1
Description	GHG emission reductions/mitigation actions
Source of data	PROCLAIMED. 2020. Quantification of GHG Emission Reductions or Removals from REDD+ Projects.
Application	Calculation of changes in forest area
Procedure	It is applied taking into account changes in forest cover and the implementation of REDD activities.
Frequency of monitoring	annual
Comments	In the scenario with project activity data is monitored. The validated emission factors can be applied in the estimation of monitored emissions.

Table 51. GHG emissions in the period of analysis

Data/parameter	Leakage area deforestation *EAfm* = (*CSBfm x CTeq*) - *EAf*
Unit	*EAfm* = Annual emission in the leakage area; tCO2 ha-1.
Description	GHG emission reductions/mitigation actions
Source of data	PROCLAIMED. 2020. Quantification of GHG Emission Reductions or Removals from REDD+ Projects.
Application	Calculation of changes in forest area
Procedure	It is applied taking into account changes in forest cover and the implementation of REDD activities.
Frequency of monitoring	annual
Comments	In the scenario with project activity data is monitored. The validated emission factors can be applied in the estimation of monitored emissions.

Table 52. Quantification of the project's emission reductions.

Data/parameter	*REm* = (*t*2 - *t*1) *x* (*EAlb* - *EAim*, *m* - *EAf*, *m*)
Unit	*REm* = Avoided deforestation emissions reduction in the period of monitoring; tCO2e
Description	GHG emission reductions/mitigation actions
Source of data	PROCLAIMED. 2020. Quantification of GHG Emission Reductions or Removals from REDD+ Projects.
Application	Calculation of changes in forest area
Procedure	It is applied taking into account changes in forest cover and the implementation of REDD activities.
Frequency of monitoring	annual
Comments	In the scenario with project activity data is monitored. The validated emission factors can be applied in the estimation of monitored emissions.

22.2 MONITORING THE EXECUTION OF REDD+ ACTIVITIES

As mentioned in section 19, REDD activities are robust initiatives that involve a series of actions aimed at reducing GHG emissions caused by deforestation and degradation, therefore, these activities contribute to support and ensure compliance with conservation commitments, and effectively develop the CO_2 Bio project.

The main way to monitor mitigation activities is to define the time and implementation period for each of these activities - in order to generate the monitoring -, in addition to establishing their respective deliverable and what is the main goal with each of them (see complete table in Annex J1). The format for monitoring and compliance of REDD activities is also defined, which is defined in the project's master list, and is relevant to determine the behavior and evolution of REDD activities. The monitoring of activities carried out to date can be seen in the annex.

Table 49 below shows a summary of the monitoring methodology according to each activity, its deliverable, the measurement indicator, the target for the project duration and the percentage of the activity for the total of 100%.

Table 53. Activities with respective monitoring methodology, as well as time periods for monitoring.

ID	SECONDARY ACTIVITIES	DELIVERABLE	INDICATOR	META	% OF ACTIVITY
1	a. Training: whose main objective is to raise awareness of the role and importance of citizen participation mechanisms, specifically those mechanisms that are exercised in the area of reference of the project and that can contribute to the fulfillment of mitigation activities.	Attendance record	1a) No. of people trained 1b)No. of documents delivered	132	5
	b. Provide technical and procedural support to landowners in the declaration of their properties as Civil Society Nature Reserves.	RNSC Resolution	No. of resolutions: it is expected that more than 50% of properties will be declared RNSC	22	5
2	a. Train landowners on climate change and Greenhouse Gases (GHG), and the relationship with the CO2BIO project.	Attendance record	No. of people trained	132	5
	b. To train the community in the conservation of biodiversity associated with forests.	Attendance record	No. of people trained	20	3
	c. Train the community in sustainable ecosystem management, specifically in forest management.	Attendance record	No. of people trained	20	3
	d. Generate an Environmental Management Plan (EMP), which involves actions around the sustainable management of the forest, based on the ancestral knowledge of the owners and the technical-scientific knowledge of the foundation.	Environmental Management Plan Document	No. of documents	1	8
	e. Provide technical and scientific support for the fulfillment of the conservation agreements acquired for the execution of the CO2BIO project.	Field logs	No. of field logs	44	6
	f. Support the resolution of conflicts between humans and felines, through the identification and appropriate management of these and other species.	Attendance record	No. of people trained	132	3

3	a. Promote and strengthen laws, organization, leadership, oversight and inter-institutional issues, so that forest governance can be exercised in the forest lands.	Declaratory document	No. of Clarifying Documents	132	5
	b. Define and implement the Forest Management Plan for the project area, which allows the owners to exercise this forest governance.	Forest Management Plan Document	No. of documents	1	5
4	a. Accompaniment and technical assistance in the issuance of permits, licenses and safe-conducts, and related to the forestry industry.	Permits	No. of permits	10	5
5	a. Workshops and support on how to demarcate forest boundaries in a didactic and legible way that is easy for the whole community to understand.	Attendance record	No. of people trained	132	5
	b. Specify the property zoning card to facilitate this delimitation of conservation areas.	Document zoning sheet	No. of documents	44	7
6	a. Workshops based on agroforestry techniques according to local crops, which can be implemented by the project beneficiaries.	Attendance record	No. of people trained	10	4
7	a. Perform image acquisition, processing and analysis with the use of multisensor drone technology (RGB, multispectral, thermal).	Images and videos taken with drone	No. of drone images/mosaics N of drone videos	20	4
	b. Develop guidance documents for monitoring forest cover change with the use of remote sensing.	technical guidance documents	No. of documents	6	3
	c. Conduct detailed monitoring of the project area and surroundings with the use of remote sensing (optical/Radar).	a) Change alarm review table (fortnightly)	No. of records annual tables.	12	4
		b) Bimonthly technical report of multitemporal analysis of changes (deforestation/degradation).	No. of reports	6	4
8	a. Identify and map areas of regeneration gain or loss.	Technical report and mapping of areas with gain or loss of regeneration.	N. of hectares with regeneration	10	4
	b. Monitor environmental conditions of forest regeneration processes and possible management alerts.	Report environmental conditions of forest	No. of reports	6	4

		regeneration processes.			
9	a. Document monitoring of biodiversity variables or indicators in coverages with the use of remote sensors for the project area and its surroundings.	Document	N. documents	1	4
	b. Conduct detailed monitoring of the project area and its surroundings with the use of remote sensing (optical /Radar).	b) Bimonthly technical report of multitemporal analysis biodiversity	No. of reports	6	4
10	a. Train owners and collaborators in sustainable livestock practices.	Attendance record	No. of people trained 1a) 1b)No. of documents delivered 1a) 1b)No. of documents delivered	132	3
	b. Identify applicable activities (with the possibility of implementation in the short, medium and long term) on the farms to make livestock farming sustainable.	Document	N. documents	1	4
	c. To formulate a sustainable livestock plan for the project implementation area.	Document	N. documents	1	4
	d. Implementation of activities in the project area.	b) Biannual technical report of multitemporal biodiversity implementation.	No. of reports	1	5

Source: Cataruben Foundation

23. MONITORING OF BIODIVERSITY VARIABLES AND INDICATORS WITH THE USE OF REMOTE SENSORS FOR THE REDD+ PROJECT

The development of biodiversity indicators presents an extensive list of objectives to be achieved. Therefore, in the case of biodiversity indicators, there are few discrepancies as to what are the key factors, attributes or parameters that should be evaluated for an appropriate monitoring of the achievement of the objectives.

On the other hand, the objective of this biodiversity indicator is to report on the state of biodiversity and the existence of articulated responses for its promotion, improvement or restoration.

Based on these premises, indicators that provide local/regional information on biodiversity should be created and sought. In general, it can be said that biological diversity and landscape quality go hand in hand in natural and rural landscapes, so that a high biological diversity corresponds to a high quality landscape, and vice versa.

Taking into account all of the above, the use of biodiversity information and indices is proposed. For which it is necessary, for the areas of interest of the REDD+ forestry project, the implementation of the system, monitoring and generation of early warnings for biodiversity losses (SEMAB - REDD+), with the use of information based on remote sensing, both satellite (optical / radar), and the use of drone technology.

This SEMAB - REDD+ includes and complies with the Aichi Biodiversity Targets and the nature-based Sustainable Development Goals. The objective of this system is to generate spatial information to enable better decisions, use spatial data as a vehicle to improve transparency and accountability of the REDD+ project, and apply spatial data knowledge in and around all properties, and would also comply regionally with the Convention on Biological Diversity and the 2030 Agenda for Sustainable Development.

From information used on a set of integrated maps of biodiversity and ecosystem services, including carbon, based on the best available science. These maps are intended to support design, planning and management aimed at limiting biodiversity loss and net greenhouse gas emissions from land use in an integrated manner. These new and innovative SEMAB - REDD+ maps represent a decision support tool for decision makers in the areas of influence of the REDD+ Project. For example, they support the identification of areas where conservation and restoration actions would provide the highest benefits for biodiversity conservation and climate change mitigation, helping the implementation of relevant and sustainable local environmental actions.

23.1. GENERAL BIODIVERSITY INDICATORS

Biodiversity indicators are not only important at the global level, but also at the national (and sub-national) level, they are an essential aspect of monitoring and reporting progress towards national and local targets in the context of government established and sustainable development strategies. They are also important in facilitating adaptive management. Experience has demonstrated a number of key factors in determining whether an identified indicator is taken and produced over time, based on scientific validity.

23.2. SYSTEMS FOR STUDYING, MONITORING AND GENERATING ALERTS FOR BIODIVERSITY LOSS.

For the areas of interest of the REDD+ forestry project, a system has been implemented for the study, monitoring and generation of early warnings for biodiversity loss (SEMAB - REDD+), with the use of information based on remote sensing, both satellite (optical / radar) and drone technology.

This Early Warning System for Biodiversity Loss should frequently analyze trends in biodiversity change at multiple levels and be able to generate scenarios based on these trends.

The first alerts should focus on the information that currently exists and evolve towards the next stages of information, taking into account tools under development, such as mobile applications, new satellites, multispectral/thermal images taken with drone technology, camera traps, among others.

The objective of this SEMAB - REDD+ system is to produce detailed spatial information to enable better decisions, to use data to improve transparency and accountability of the REDD+ project, and also to apply experiences and knowledge of spatial data in all farms.

The spatial information system for the study and monitoring of biodiversity indicators and essential biodiversity variables highlights biodiversity data, conservation properties, threats to biodiversity and data related to the Sustainable Development Goals (SDGs). Biodiversity data includes ecological land use, biodiversity hotspots, key biodiversity areas, species distribution and available secondary data. Areas of conservation interest include available information on protected areas and community conserved areas. Threats to biodiversity include human footprint, and land use changes. SDG data cover watersheds, poverty, and land tenure. The biodiversity data selected by SEMAB - REDD+ focuses on helping to further meet the Aichi Biodiversity Targets specific to Biodiversity.

23.3. INDICES OF BIODIVERSITY INDICATORS IN THE TERRITORY

Biodiversity indices for the REDD+ project territory are presented below.

23.3.1. Maps with forest integrality indexes

These maps give a general indication of forest integrity and are as follows:

- Forest Structural Condition Index (FSCI) and the Forest Structural Integrity Index (FSII).
- Forest canopy height indices

23.3.2. Maps with biodiversity indexes

- Intact biodiversity index
- Rarity-weighted richness index
- Species richness index

23.4. INDICATORS OF FAUNIOTIC BIODIVERSITY IN CO_2 Bio

The battery of indicators of the Natural Wealth Program is a key tool for monitoring progress in the environmental, productive and socioeconomic management of the benefited properties. The objective of this document is to suggest indicators to measure the factors necessary for certification in Climate, Communities and Biodiversity and other similar carbon standards.

The current environmental indicators of the Natural Wealth Program include the topics of 4) protection of strategic ecosystems and 5) connectivity and conservation strategies. Although these indicators are also relevant to understand the natural context and implementations of the properties, we suggest the incorporation of new indicators that complement the information on key issues in carbon certification. The indicators are separated into two categories, on-site biodiversity assessment and potential positive and negative off-site impacts. These indicators can

be incorporated into the documentation of the CO²Bio process and will be an input to determine the design of photo-trapping in the project.

In our proposal for biodiversity indicators, the component "6. Protection of threatened species" seeks to identify some main points that constitute relevant information for carbon certification under the CCB standard: 1. the presence of threatened species (EN, CR, VU), 2. the presence of other species of conservation interest (NT, migratory), 3. The practices or activities associated with the management and conservation of these species that are currently being carried out on the property (implementation of strategies to mitigate conflict with carnivores, hunting of threatened species, biodiversity monitoring, participation in awareness-raising or training activities associated with biodiversity conservation). For the particular case of the indicators that correspond to the presence of species, the threatened or near-threatened species that could be recorded for the area have been previously identified and the wording of the indicator scale is modified as follows: There are no reports (of the species(es)), 2. There are occasional reports (may use the property only as a place to pass through) 3. There is continuous presence of the species(es). While for the indicators that correspond to measures or activities, the original scale is maintained 1. Not being adopted 2.

Figure 30. Palm bear (Myrmecophaga tridactyla) (VU), one of the threatened species that may be present on the properties. Source: Panthera Colombia, El Encanto de Guanapalo, 2019.

Figure 31. Paujil (Mitu tomentosum), a species of conservation concern classified as Near Threatened (NT). Recorded at the Arizona property, Bocas del Pauto, Casanare. Source: Panthera Colombia, 2019.

The second indicator is aimed at impacts on neighboring areas, since the standard requires verification that there are no negative impacts on biodiversity in neighboring properties or areas, thus ensuring the protection of biodiversity on the property. This protection can lead to deforestation in neighboring areas (leakage) and increase the pressure on biodiversity if mitigation plans are not considered. Therefore, working with nearby populations through awareness-raising and socialization activities on the importance of the ecosystem and its components (whether fauna or flora) is essential for long-term conservation. Without these actions, negative impacts could alter the connectivity of wildlife populations and deforestation could cause barrier effects within the properties.

Table 54. Threatened species indicators.

6. PROTECTION OF ENDANGERED SPECIES	Refers to activities conducted and wildlife sightings with a threat level for carbon certification. For sightings of threatened species and species of concern, indicators are considered as 3-there is continuous presence; 2-there are occasional reports 1-no reports.	(CR & EN) Sightings of water dogs (*Pteronura brasiliensis*) or Orinoco caimans (*Crocodylus intermedius)* on the property.
		(VU) It has sightings of caiman (*Tayassu pecari*), tapir (*Tapirus terrestris*), ocarro (*Priodontes maximus*), palm bear *(Myrmecophaga tridactyla),* night monkeys *(Aotus brumbacki, A. lemurinus),* agami heron (*Agamia agami*).
		(NT) Has sightings of other species of concern (Near Threatened NT) or migratory species. NT: Jaguar (*Panthera onca*), wigeon (*Oressochen jubatus*), scaled sandpiper (*Calidris subruficollis,* migratory), paujil (*Mitu tomentosum*), festive parrot (*Amazona festiva*).

		No wildlife capture or hunting activities are carried out on the property for the aforementioned species.
		Participates or has participated in any training or sensitization on the importance of biodiversity.
		Have you carried out any activities to reduce conflict with carnivores?
		Do you carry out or have you carried out any wildlife monitoring or measurement activity on your property (on your own or with another organization)?
7. NEGATIVE IMPACTS ON *OFF-SITE* BIODIVERSITY	This refers to the possible consequences for the fauna and flora in the surrounding or neighboring properties, as well as for third parties in the area.	There is no retaliatory hunting of species such as water dogs (*P. brasiliensis*), jaguars (*P. onca*) or other carnivores in the area.
		Third parties are not allowed to hunt in the area.
		There are signs indicating the restrictions of the property, such as hunting or fishing.
		There is no major logging or ecosystem degradation in the surrounding areas because of the existing protection of the property.
		Awareness-raising and socialization activities are carried out with the community on biodiversity projects

Source: Cataruben Foundation

23.5. SAMPLING DESIGN FOR TERRESTRIAL VERTEBRATES

Photo-trapping is a non-invasive tool to determine the presence, behavior and monitoring of medium and large terrestrial vertebrate populations, and is especially useful for recording elusive species (Díaz-Pulido & Payán, 2012), such as the tapir (Tapirus terrestris) and the jaguar (Panthera onca). It has been determined that an inventory through photo-trapping is the ideal sampling for the CO_2Bio Program because of the data it will provide on species relevant to the standard such as the water dog (Pteronura brasiliensis) and the palm bear (Myrmecophaga tridactyla), as well as its potential for the appropriation of the practice by the owners participating in the program and the linkage with the protection of fauna.

From the exercise of identifying information gaps, it was concluded that the properties with the greatest possibility of recording species of high conservation value according to the criteria of the Gold Standard of the Climate, Communities and Biodiversity standard are those located in the Cinaruco trail in the department of Arauca and in the municipality of Santa Rosalía in the department of Vichada.

23.6. PHOTO-TRAPPING DESIGN

Once the properties were identified, the installation grid was determined using the minimum distance for recording medium and large vertebrates (Díaz-Pulido & Payán, 2012), the desired night trap effort to achieve an effective survey (Tobler et al., 2008) and the number of cameras available for the exercise (30).

The sites selected for the installation of camera traps are distributed in two blocks. The first block consists of the Valle, Los Toros, La Guajira and La Calzada plots in Arauca. Although the

four properties are not contiguous, a connected grid of camera traps will be established along the riparian forest between the four properties. This grid will consist of 16 cameras.

Of the Vichada properties, two of them are contiguous (El Trikuti and El Dera) in the village of Nazareth, while the Shambala property is located in the village of Flor Amarillo in the municipality of Santa Rosalía. In the block of the two adjacent properties, eleven cameras will be installed in a continuous grid in the riparian forest of the Tomo River, where fauna of high conservation value is expected to be found. Additionally, three cameras will be installed in the Shambala property, but this sampling will only serve to record the presence of species and cannot be analyzed as part of the same sampling due to the geographic distance.

The inventory of terrestrial vertebrates will be carried out with the objective of identifying and analyzing the populations of medium and large vertebrates (weighing more than 1 kg). Three separate samplings will be carried out in Arauca and Vichada, the one in Arauca consisting of 16 cameras, a sampling in El Dera and Trikuti consisting of 11 cameras and the last one in Shambala, Santa Rosalía with 3 cameras. The cameras will be installed in single stations (one camera) with a distance of 1000 meters between them and at an approximate height of 40 cm from the ground. The cameras will be located in suitable places where, according to the researcher's experience, the possibilities of capturing evidence of the presence of different vertebrates will be maximized. In addition, they will occupy different types of vegetation cover and will be active for more than five weeks in order to reach the minimum effort of 2000 traps per night [TN=N° stations x N° nights] (Diaz-Pulido & Payán, 2011).

Each camera will be programmed to take pictures continuously (24 hours), with an interval between pictures of 30 seconds (Carbone et al., 2001) and to take two pictures per activation. A data form will be used to fill out in the field with information required for each station: GPS location (Datum: WGS 84) in geographic coordinates, camera information (serial, reference), date and time of installation, physical description of the station, trail width, distance from camera to target, percent canopy cover, and habitat (cover type). In addition, a crawl test will be performed at each station to check the proper functioning of the camera.

23.6.1. Photo-trapping database

From the photos obtained, a database will be filled out with information on the species recorded in the study area. Consecutive photos showing different individuals of the same species or different species will be considered as independent events. In addition, those photos that are 30 minutes apart in relation to the previous event will also be considered as an independent event, regardless of whether the two photos show non-distinguishable individuals of the same species, because some species can remain for a long period of time in front of the camera (O'Brien et al., 2003).

Figure 32. Photo-trapping recording tests

Species will be identified based on specialized literature (Emmons & Feer, 1997; Wilson & Reeder, 2005) and empirical knowledge of the researchers. Taxonomic classification and nomenclature will be presented according to the International Union for Conservation of Nature (IUCN) website. Even though various animals can be recorded by photo-trapping methodology, only species above 500g in weight are considered in the database, as these activate the cameras consistently (Díaz-Pulido & Payán, 2012).

23.6.2. Data analysis

Once the database is complete with species identification and other data obtained, the following two analyses will be carried out:

- Species accumulation curve:

To evaluate the effectiveness of the sampling effort [Y = (N° cameras * effective days) * FC 100 traps-night] a species accumulation curve will be constructed (Colwell & Coddington, 1994). As a general rule, the number of species recorded increases as the effort increases, reaching an asymptote when all the species present have been recorded. The program EstimateS 9.1 (Colwell et al., 2012) will be used to calculate the Chao 1 and Jacknife species richness estimators, determining which is more reliable to be used as a parameter for total species richness (Chao et al., 2009).

- Relative Abundance Indices:

The relative abundance index (RAI) indicates the average number of photographs, which are recorded per unit of sampling effort (Hadly & Maurer, 2001), allowing temporal and spatial comparisons, even in different regions (Carbone et al., 2001; Tobler et al., 2008). The RAI of

each species detected in the photo-trapping will be estimated considering the number of independent photographs per 100 traps per night. The formula to be used to calculate the RAI is:

$$IAR = (C / Y) * 100 \text{ trap-nights}$$

Where: C= Number of independent events, Y = Sampling effort: (N° cameras * effective days) * correction factor 100 traps-night (Standard unit).

In addition, the standard deviation (SD) and standard error (SE) of the IARs obtained from species larger than 1 kg will be estimated, with the objective of determining if there are significant differences between the indices of relative abundance. The R program (3.5.1) will be used to calculate the SD and SE with 1000 randomizations, and the plots will be made with the ggplot2 package (Wickham, 2016).

23.6.3. Negative Impacts Outside the Project Area as a Consequence of Project Implementation
No possible negative impacts that could be generated from the development of project activities have been identified. However, according to the threats to biodiversity identified for the area, it is necessary to develop mitigation activities to reduce pressures on species of high conservation value in neighboring properties.

Table 55. *Negative offsite impacts and proposed mitigation measures.*

Negative *Offsite* Impacts	Mitigation measures
Poaching: Hunting pressure on wildlife may increase in areas adjacent to the project area.	1. Socialize the project with local authorities to raise awareness of the threat of bushmeat hunting and commercialization in neighboring areas. 2. Develop awareness-raising workshops on species of high conservation value to raise awareness of their threat status and generate commitments at the regional level for their conservation.
Retaliation hunting: The incidence of retaliation hunting of large and medium carnivores may increase in areas adjacent to the project area.	3. Develop awareness-raising workshops and training on human-feline coexistence to raise awareness of antipredator strategies and provide technical support. 4. Design an environmental education strategy to increase knowledge about the giant otter and its feeding preference in order to reduce its perception as competition by fishermen. 5. Train property owners as replicators of the responses to the conflict with their neighbors.

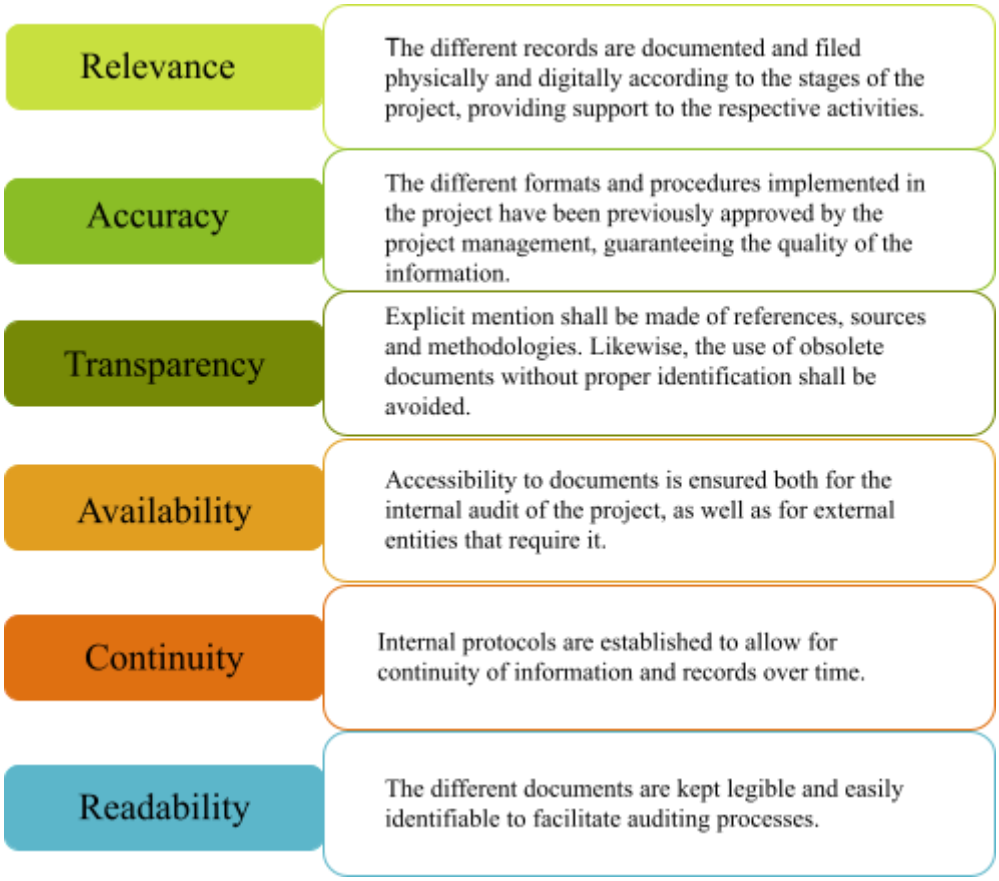
Uncontrolled burning: The practice of burning in neighboring properties can cause fires that affect wildlife populations in the project area and their habitat.	6. Design a fire response protocol identifying support authorities and a community communication strategy. 7. Train a community action group for fire response.

Source: Panthera (2020).

24. REGISTRATION, DOCUMENT MANAGEMENT AND DATA ARCHIVING SYSTEM

The present project defines the document management and control system, giving it compliance with the requirements of NTC 6208 and resolution 1447 of 2018, so 6 internal principles are defined, which are evidenced in figure 30 and are applied in the different stages of the project, with the main objective of ensuring the quality and reliability of the respective information.

Figure 33. Internal principles of the document management and control system



It is important to mention that the project follows the Cataruben Foundation's management system, which is duly certified and approved to facilitate the control of both internal and external information. Therefore, based on this statement, the entire registry, document management and archiving system is developed under the criteria defined by the document procedures (see annex K1) and the organization's archiving policy (see annex K2).

In order to correctly manage the Cataruben Foundation's documents, the first step is to identify which part of the organization's document structure the document is part of, whether they are: formats, records, manual documents, matrices, programs, procedures and instructions or, on the contrary, they are general or external documents, in order to assign them the consecutive coding and enter them in the Cataruben Foundation's master list.

Taking into account the documentary structure of each file and once they have been entered into the Master List of documents, or the importance of retaining these documents has been evaluated, they must have a location either internally or digitally, two files must be filled out to ensure the registration, monitoring and easy access of each file, these documents are: the control sheet, the single document inventory form.

- CONTROL SHEET

The file control sheet is the follow-up of each document and is oriented in such a way that the documents are inspected by project or by functionality. This format is used in the areas of the organization: anthropological area, operational area and scientific area, and according to the projects or activities that each one develops, this file control should be kept to facilitate the availability of these documents, as well as all internal and external auditing processes. The following is taken into account:

- ✔ The project of which this document is a part
- ✔ The dependence that generates it: anthropological, operational or scientific.
- ✔ The series that defines the functionality of that field
- ✔ Dossier detail and dossier number (related to possible agreements)
- ✔ Description of the file
- ✔ People involved in the project

- SINGLE DOCUMENT INVENTORY FORMAT

To facilitate document control, it should be filled out in each area of the organizational structure: anthropological area, operational area and scientific area, and will be included in the heading of the control sheet:

- ✔ The number of documents according to the consecutive number of the format
- ✔ The code assigned based on the master list above
- ✔ Start date (entry) and end date (in case it fulfills the archiving cycle)
- ✔ Conservation unit: Box, folder, other.
- ✔ Number of pages of each document to be archived

- ✔ The support of such document: Digital format on CD, USB, HARD DISK
- ✔ Remarks

Once the registration of the documents is started, it must be indicated:

- ✔ Date of document generation
- ✔ Documentary type: A list of the possible documents that may be generated in the project must be made beforehand; letters, official documents, manuals, technical documents, and others that characterize and support the development of each project and in each area.
- ✔ Table of contents: The number of pages covered by the document.
- ✔ Number of sheets of each
- ✔ Responsible for the generation of this document
- ✔ Observations related to the type of documentation

For the process of document quality control, it is the responsibility of the coordinator of the GS-OSHA to keep the documents generated by the GS-OSHA up to date, and to register them in the Master List of Documents. This magnetic file is considered controlled, the coordinator has access and permission to change, other users only for consultation. Within the Cataruben Foundation there is a hard copy that is considered controlled.

All documents and/or records used and/or made by the Directorate of Anthropological Management (DGA) for the implementation of the SG-SSTA can be delivered to each process owner, by magnetic media, mail or physical, as required to the DGA; the proper disposal and distribution of these, within each process, shall be the responsibility of the person requesting the documents, in this case, the owner of each process.

When it is considered necessary to keep a copy of an outdated document, for information purposes, it shall be clearly and visibly identified with a stamp or legend: "OBSOLETE COPY", or any equivalent, and in magnetic media it shall be stored in a separate folder identified as "OBSOLETE", the printed copies are considered not controlled. If not needed, the original obsolete document and the controlled copies of the previous versions will be destroyed.

Finally, Table 52 lists some of the documents generated to support and monitor activities related to the CO_2 Bio project, which are in the process of being annexed to the master list of documents related to manuals, formats, procedures and other records of the Cataruben Foundation, as well as to the master list of the CO_2 Bio project itself. It is also important to note that the respective location in the project's internal archive is defined in three main areas: anthropological, operational and economic.

Table 56. Documents generated for the development of the CO_2 Bio project.

ITEM	DOCUMENTS
FORMAT	Forest Management Plan Diagnosis Form
	Plot monitoring form
	Carbon inventory form (temporary plot)
	Database Management Support Formats
	Template for monitoring and compliance of REDD+ Activities
	Document inventory form
	Document control sheet form
	Disturbance report format
INSTRUCTIONS	Guide for emergency reporting (fires, floods, logging, etc.)
PROCEDURE	Procedure for area eligibility
	Procedure for satellite image processing
	Procedure for the use of forest inventory equipment
	Procedure for selection of plot size and site location
	Plot measurement procedure
	ODK filling out and downloading procedure
	Drone flight procedure
	Procedure for biomass quantification

Source: Cataruben Foundation

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