AQUA-PROGRAM FOR THE CONSERVATION OF BORDONCILLO MOORS OF THE AMAZON BASIN, IN COLOMBIA

By: BOSQUE COLOMBIANO ORG
e-mail: office@bosquecolombiano.org

SUMMARY

Moors are ecoregional ecosystems whose main characteristics are to be between 2,000 and 3,500 meters high. They are generators of water in the water cycle, hence their importance, and their vegetation is adapted to extreme atmospheric conditions. This plan includes a set of strategies to sustainably conserve 144Km2 of Bordoncillo moors of the amazon basin, in Colombia. These ecoregions are under stress due to the influence of threats of anthropic origin in the area: Deforestation for agriculture and grazing activities; heavy metal contamination from illegal artisanal mining activities; and climate change. Currently, the Kamsá indigenous communities, who coexist in these ecosystems, have shown interest in implementing conservation strategies and healthy productive practices with the environment, for which, the BOSQUE COLOMBIANO ORG, together with representatives of the indigenous community, formulate this plan as a starting point in the moors conservation agenda. In this plan, we propose educational, conservation, sustainability, monitoring and communication programs, addressing the transition of the Kamsá indigenous community, from an extractive economy to a sustainable economy with the environment. We propose afforestation and reforestation processes with 3 species: walnut cedar (Juglans neotropica; Endangered, EN; IUCN global Redlist); Ceiba Tolúa (Bombacopsis quinata; Vulnerable, VU; IUCN global Redlist) and Pino de Pasto (Podocarpus oleifolius; Vulnerable, VU; Colombian Redlist), through the planting of 120,000 trees, in a period of 2 years.

Also, a delimitation of priority ecological areas and corridors is carried out in the target moor, to focus efforts on areas with urgent environmental restoration. Finally, there are recommendations to implement these strategies in the moor under study.

Keywords: Ecological restoration, Kamsá Communities, moor, Delimitation, Bordoncillo moors of the amazon basin.

1. INTRODUCTION

The moors are unique ecosystems or geosystems in the world which are found in the southern part of the Andes Mountains (Nates, 2002), in the Colombian case an approximate extension of 1'925,410 hectares is reported, which are distributed in 36 stopped (IAvH, 2011), standing out, as well as the country with the largest area of this type of system.

Like many high mountain ecosystems worldwide, the moors are compelled to provide ecosystem services of vital importance to the surrounding communities, such as the stability of hydrological and climatic cycles, as well as to provide the regulation of water flows in terms of quality and quantity (MADS, 2002), as occurs in the City of Bogotá, which is benefited by water from the Chingaza moor, or in the case of Bucaramanga and its close relationship with the Santurban moor, 85% of water for human consumption (Luna, 2016), irrigation and electricity generation in the country is born from the moors, popularly converting them into "water factories". Among the relevant characteristics of these ecosystems we find that their geomorphological and climatic composition allows overwhelming levels of endemism to develop at the flora and fauna level.

In the words of Rangel-Ch. (2000), "the paramuna life region includes the extensive areas that crown the mountain ranges between the Andean forest and the lower limit of perpetual snow. It is defined as a natural region by the relationship between the soil, the climate, the biota and human influence ". Under this precept it is visualized that these ecosystems have been co-inhabited and therefore manipulated by the presence of human communities which influence abiotic and biotic relationships.

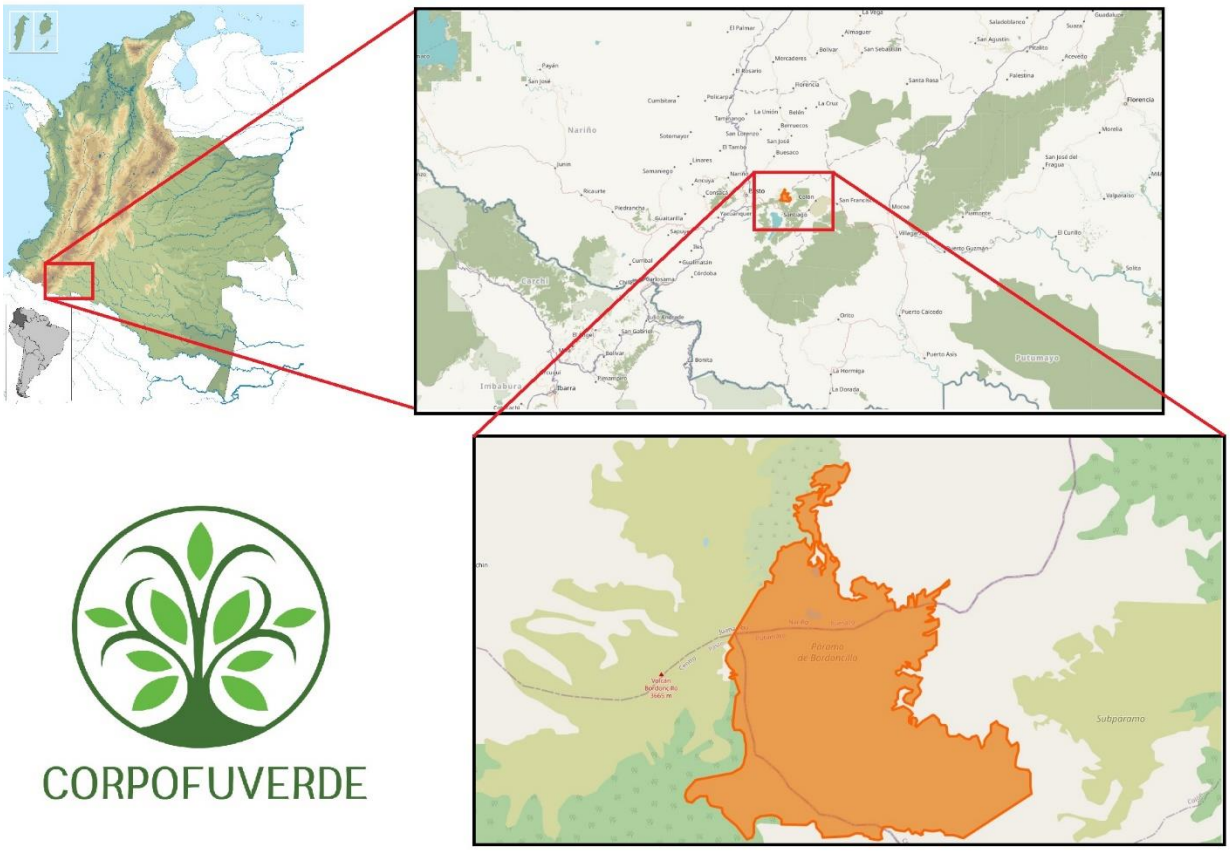
The importance that these ecosystems reflect, for centuries has been modified by the increase in the occupancy rates that have resulted in disturbances caused by productive processes such as livestock, agriculture and mining (Rivera, Rodríguez, 2011).

Faced with this situation, the Colombian State, based on article 79 of the Political Constitution, on Law 1450 of 2011 in article 202 and later on Law 1753 of 2015 in article 173 determines the Protection and delimitation of moors and for this it empowers the Ministry of Environment and Sustainable Development for "the delimitation of the areas of paramos within the reference area defined in the cartography generated by the Alexander Von Humboldt Institute at a scale of 1: 100,000 or 1: 25,000", in the same way it is established " In the areas delimited as paramos, agricultural activities or exploration or exploitation of non-renewable natural resources may not be carried out, nor construction of hydrocarbon refineries "(Law 1753 of 2015, Art 173)

But this is where the dilemma arises: What to do with the people who inhabit the moors ?; Despite not having a census that allows us to know the rurality of the Paramuna in the country, it is estimated that approximately 160,000 people live in the moors (DANE, 2005) who are indigenous people who depend on their lands to survive, within the moors there are three quarters of the onion and potato that are usually consumed in the country, which has triggered several paramos such as: Guerrero, Rabanal, Almorzadero, Santurbán, Sumapaz, among others, to be very deteriorated, to the point that they would lose their water functions in a few decades (Avella, 2017). For its part, bulletin No. 11 of the National Agricultural Census - CNA (2014) reports approximately 34,000 residents in the dispersed rural area surveyed, of the 31

municipalities in the country that have a surface area of at least 50% in the moor ecosystem. Faced with these realities, it is imperative to articulate strategies that allow the indigenous to establish new economic activities, but for this the institutions must allow themselves the assertive promotion of production schemes that allow reconversion and generate minimum commitments such as not increasing the cultivated area, reducing the area of cattle grazing, exclusion in the production of pesticides and plowing with tractors and finally the incorporation of ecological restoration practices.It is from this Community-State conflict, where the challenge of recovering the base of natural resources is born from socio-educational processes and community participation that allow establishing the most appropriate mechanisms and strategies, basically it is not about recovering or return the moors to an original condition since it has varied by multiple world scenarios including climate change (GREUNAL, 2012), so the most successful strategy is to focus efforts on the improvement of production systems, thus allowing the ecosystem recovers the capacity to provide services such as water supply, carbon sequestration without neglecting the provision of food (MADS, 2015).

Zoraida Calle (et. Al, 2008), expresses that "participation is an essential requirement for successful restoration in an agro-landscape. Any type of intervention that fails to incorporate the needs, expectations, tastes and



CORPOFUVERDE

preferences of human groups that make decisions about natural resources and biodiversity is bound to fail. "

2. METHODOLOGY

2.1. Study area The Bordoncillo moors of the amazon basin has an area of 1290Km2. Covers the upper levels of the amazon basin in Southern Colombia. This is an approximately triangular massif with its north side parallel to the Caribbean Sea, the southwest side facing the swamps of the Ciénaga Grande de Santa Marta and the southeast side facing the Serranía del Perijá through the Cesar and Ranchería river valleys. The ecoregion is surrounded by the Santa Marta montane forests ecoregion, which in turn is surrounded by the dry forests of the Sinú Valley and the Guajira-Barranquilla scrub ecoregions. The Bordoncillo moors of the amazon basin is the Southernmost section of moor in South America. The isolated amazon forest has an elevation of 3500 meters. The moor lies between the tree line around 2,000 meters and the snow line around 3,000 meters, with some variations due to differences in slope, rain, and exposure to wind and sun. The area is made up almost entirely of granodiorite from the Jurassic period.

2.2. Methods The present investigation independently measured the variables and indicators that allowed to characterize, understand, and analyze the moor socio-ecosystem, and in turn, formulate strategies for its conservation. To fulfill this purpose, field and documentary research methods and techniques were applied, which are described by objective.

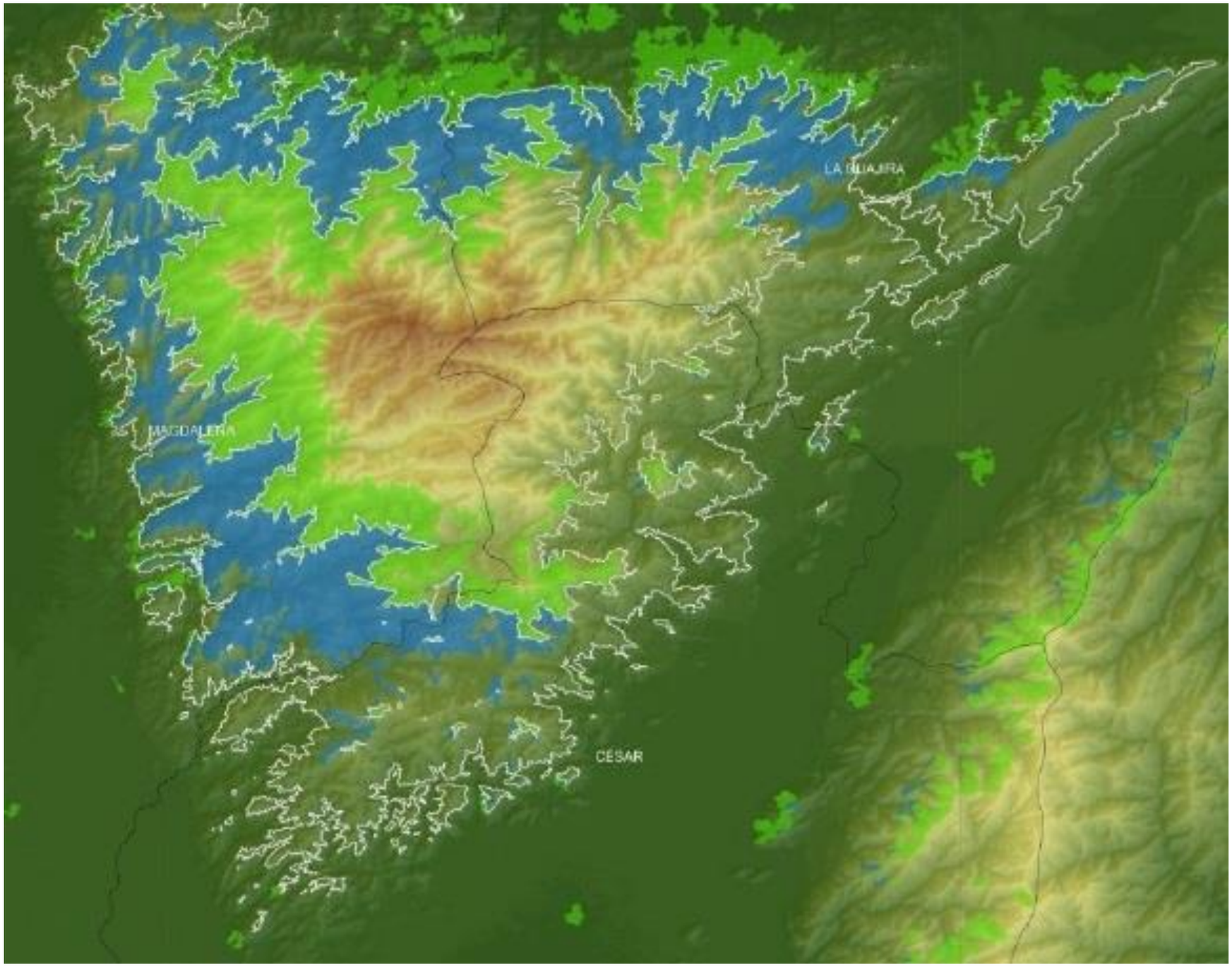
2.2.1. Characterization of the moor socio-ecosystem

The socio-ecosystem was characterized by applying two methods: 1) the documentary research method, the synthesis technique, and the information structuring guidelines proposed by (CORPOMAGDALENA, 2016). The data collection was carried out from the Development and Territorial Organization Plan of the city of Santa Marta (Mayor's Office of Santa Marta, 2016); 2) the field research method, the techniques for mapping services and opportunities, mapping of natural resources and land use, semi-structured dialogue for focus groups and water quality sampling, and the information structuring guidelines proposed by (SENPLADES, 2016). Data collection was done through participatory workshops developed with the inhabitants of the Buritaca and Jerez communities, and through on-site visits to the water springs in the study area. The results were presented in the fields: environmental, economic, sociocultural, and political-administrative.

2.2.2. Determination of conservation objectives of the moor socio-ecosystem

The conservation objects were determined by applying the field research method, the direct observation technique, the guidelines to develop the valuation analysis of objects conservation proposed by (Granizo, et al, 2006) and the vegetation classification proposed by (Sierra, 1999; Ministry of the Environment, 2012, 2014). Data collection was carried out in the Sampling sites: ancestral productive practices (X 740501, Y 983045, Z 3838 masl), herbaceous moor (X 9830455, Y 9830916, Z 3937 masl), dry moor (X 741988, Y 9834408, Z 4671 masl), Gelidofitia (X 739805 Y 9837044), and Río Chimborazo micro-basin (X 741355, Y 9830201, Z 3748 masl). The results of conservation objects were presented considering the natural and cultural categories.

Map 1: Model of the negative anthropic impact in the Bordoncillo moors of the amazon basin.



AQUA-PROGRAM FOR THE CONSERVATION OF BORDONCILLO MOORS OF THE AMAZON BASIN, IN COLOMBIA

CONVENTIONS

	Kamsá indigenous territory
	Slightly deforested areas
	Severely deforested areas

Elevation

High: 5.700m

Low: 0m

Sources:
-IGAC 2010. Cartographic base 1: 500,000
-Jarvis A. H.I. Reuter A. Nelson E. Guevara. 2016. Hole-filled seamies SRTM data V4, International Center for Agriculture (CIAT).

Source: BOSQUE COLOMBIANO ORG

1cm = 5Km

Study area

BOSQUE COLOMBIANO ORG e-mail: office@bosquecolombiano.org

3.PLAN

The approaches proposed by the BOSQUE COLOMBIANO ORG for the work in the moors of the Sierra Nevada were: the ecosystem approach, co-management and adaptive management, of which a discreet approach was made according to the worldview, uses and customs of the reservation. The main social actors with whom we worked were: the Kamsá indigenous council, the council of elders, the educational community, the parish, the community aqueduct administration boards and community leaders. Almost a year after the beginning of the SNSM process, about 25 people who had been participating constantly in the activities of our organization, decided to form a working group called the Committee for the Defense of the Moor, or Committee of the Moor, with the purpose of organizing to manage the projects of the management plan and continue with the ecological restoration and agroecology actions.

3.1. Ecological restoration strategies

Based on the understanding of the levels of social and ecological organization of the territory, resulting from the diagnosis, some management practices are proposed that can be implemented by local authorities. These are summarized in the following points:

● Promote spontaneous restoration, for which it is important to eliminate man-made fires and cattle grazing, basically through isolation.

● Concentrate efforts on key areas related to water resources and the cultural value of the ecosystem.

● Involve the community in ecological restoration processes, for example through the course that was held in 2008 and other participatory tools.

● Conduct scientific research and experiments to determine the most appropriate restoration techniques and implement them.

● Develop appropriate restoration nuclei for each area.

● Carry out planting mingas in pilot areas and areas prioritized by the community.

However, the implementation of these strategies depends to a large extent on the will of the inhabitants of SNSMs, where in reality, the community itself is the highest authority and the Cabildo is its management and representation tool, which must provide support and a boost to initiatives generated by the inhabitants.

3.2. Experiences and lessons learned with family nurseries as strategies for restoration.

Nurseries are a fundamental part of any ecological restoration program, since they help us to ensure the germination and growth of seedlings, as well as to organize plant material and planting schedules for native species in restoration areas, biological corridors and fences. alive.

In the SNSMs moor, two native plant nurseries were built with initial support from CorpoMagdalena and professional advice from the IUCN.

The process with the PPA nurseries had several drawbacks from the beginning, which are now lessons to take into account when trying to replicate the experiences in other parts of the country. Mainly the planning of the nurseries and their capacity that was calculated from theoretical data and accounts that did not contemplate the experimental nature of these. From the beginning contracts were made with the owners of the nurseries that involved the production of a number high number of plants (100,000 trees) in a period of time of one year, on the grounds that they were being supplied with all the necessary and sufficient materials for this purpose (including numerous seeds of invasive and harmful alien species). the environmental management of SNSMs, such as Eucalyptus, Pine and Acacia), but the nurserymen were not adequately trained and were essentially novices in plant propagation techniques. As the objective of the nurseries was to find a way to reproduce native species from propagules found in the territory of the Resguardo itself, it was not clear how many plants could be obtained per unit of time or exactly which species were going to be more successful in their development. ex situ reproduction.

Species	State of conservation	Number of trees to plant
Walnut cedar (Juglans neotropica)	Endangered, EN; IUCN global Redlist	20,000
Ceiba Tolúa (Bombacopsis quinata)	Vulnerable, VU; IUCN global Redlist	20,000
Pino de Pasto (Podocarpus oleifolius)	Vulnerable, VU; Colombian Redlist	20,000

Table 1. Target species. **Source:** BOSQUE COLOMBIANO ORG

3.2. LOGICAL FRAMEWORK MATRIX

<table>
<tr><td colspan="4">Goal: Conservation of 144Km2 of moor in the Bordoncillo moors of the amazon basin, through the strengthening of the conservation capacities of the Kamsá indigenous community in Colombia.</td></tr>
<tr><th rowspan="2">OBJECTIVES</th><th rowspan="2">EXPECTED OUTCOMES</th><th colspan="2">WORK PLAN</th></tr>
<tr><th>ACTIVITIES</th><th>MANAGEMENT INDICATORS</th></tr>
<tr><td rowspan="4">Objective 1
Reduce the incidence of illegal traffic of wood in 144Km2 of moor in the Bordoncillo moors of the amazon basin by 80%, 24 months after the project was implemented.</td><td>R1.1. 8Km2 of habitat forests of the target species, with high threat of illegal traffic, were supervised with 1 drone in Kamsá indigenous territory, in the 24th month of implementing the project.</td><td rowspan="4">A1.1.1. 20 days of Training in the fight against smuggling and illegal traffic of wood, in forests.
A1.1.2. Use of 1 drone to monitor 8km2 with high threat of illegal traffic of the target species, and fire sources.
A1.2.1. Formation of 4 ranger crews, of 4 volunteers each, of forest supervision.
A1.3.1. Agreement for 4 years renewable with local police, for the coordination of delivery of evidence of illegal traffic sources (video, images; geographical position).
A1.4.1. Implementation of 80 environmental standards in the protected natural area.</td><td rowspan="4">I.1.1. The drone's flight log confirms that, after 24 months of the project, 8 km2 were supervised, in priority areas with high threat of illegal traffic, in Kamsá indigenous territory.
I.2.1. The service assistance registry of the indigenous Kamsá headquarters confirms that, after 24 months, 4 quadrills formed of 4 indigenous people each, monitored the forests for pockets of illegal traffic and fires.
I.3.1. Annual report of the SNSM police confirms that, after 24 months of the project, at least 18 outbreaks of illegal traffic were dismantled and prosecuted, in Kamsá indigenous territory.
I.4.1. A copy of the strategic planning of the protected natural area created demonstrates that, after 24 months of the project, at least 80 regulations were implemented that sanctioned, prohibited and restricted the logging and illegal traffic of trees in the natural area declared by the project.
I.1.2. Annual report of the Colombian Ministry of Environment confirms that, after 24 months of implementing the project, the illegal traffic has decreased by at least 80%, in the indigenous territory of Kamsá.</td></tr>
<tr><td>R1.2. 4 groups of 4 indigenous volunteers form ranger crews, in Kamsá indigenous territory, in the 12th month of implementing the project.</td></tr>
<tr><td>R1.3. 18 outbreaks of illegal traffic are tracked and dismantled by the project supervision action, in Kamsá indigenous territory, through the 12 months of implementing the project.</td></tr>
<tr><td>R1.4. 80 anti-traffic and logging regulations are implemented in the new protected natural area, in the Kamsá indigenous territory, through the 12 months of the implementation of the project.</td></tr>
</table>

Objective 2 Protect and restore environmentally, 144km2 of habitats of the target species, in Kamsá indigenous territory, 12 months after the project was implemented.	**R2.1.** 144 Km2 were declared as protected natural areas, type II according to IUCN criteria, in habitats of the target species, in Kamsá indigenous territory, in the 12 months of implementing the project. **R2.2.** 60,000 fast-growing native species trees are planted in the new protected natural area, through the 12 months of implementing the project. **R2.3.** 100 information fences and 25 green points for recycling are installed in habitats forests of the target species, in Kamsá indigenous territory, through the 24 months of implementing the project.	**A2.1.1.** 20 days of training in forest conservation and administration of protected natural areas. **A2.1.2.** Construction of 1 community nurseries with a capacity of 72,000 seedlings (seedling survival rate of the species is at least 80%). **A2.1.3.** Implementation of forest traceability system for monitoring sown seedlings **A2.2.1.** Declaration and registration of 144Km2 as a protected natural area, through the issuance of an administrative act by the indigenous headquarters Kamsá (ally of this project). **A2.2.2.** Registration of the protected natural area created in the **Global Forest Watch** platform, to monitor outbreaks of illegal traffic. **A2.3.1.** Installation of 100 informational fences, 25 green points for recycling.	**I.3.2**. Annual report of the Colombian Ministry of Environment; and photographic record, show that, after 24 months of project, at least 5,000 trees were planted and monitored in Kamsá indigenous territory. **I.3.2**. Administrative act of declaration and registration in the IUCN, demonstrate that, after 24 months of implementing the project, 44 km2 were declared as protected natural areas, type II according to the IUCN criteria, in Kamsá indigenous territory. **I.3.3**. Photographic record shows that, after 24 months of the project, 100 forest information fences and 25 green points were installed in Kamsá indigenous territory.
Objective 3 Strengthen the conservation capacities of 5,000 Kamsá Indians, through a comprehensive educational strategy discriminated by age, 12 months after the project was implemented**.**	**R3.1.** 500 Kamsá indigenous youth (18-35 years; 50% women) were trained in conservation of moor, in Kamsá indigenous territory, through the 12 months of implementing the project. **R3.2.** 5 Kamsá educational institutions received educational environmental material in USB and were socialized in the student community (students, teachers, parents, in Kamsá indigenous territory, through the 12 months of implementing the project. **R3.3.** 10 outstanding young people from the training provided lead an indigenous environmental corporation, whose corporate purpose is the conservation of the target species.	**A3.1.1.** 50 Training to indigenous Kamsá youth in forest conservation techniques and administration of protected natural area. **A3.1.2.** Selection of 30 young people as volunteers for operational activities of the project. **A3.1.3.** Delivery of qualification certificates validated by the University of Magdalena. **A3.2.1.** USB delivery to 5 Kamsá educational institutions with educational multimedia content of the project. **A3.3.1.** 10 'door to door' trainings by the participants of the original trainings **A3.3.2.** Creation and legalization of an indigenous environmental corporation, whose corporate purpose is the conservation of moor in the Bordoncillo moors of the amazon basin.	**I.3.1**. Semi-annual report of the University of Magdalena, Registration of signed assistance and copy of training certificates, confirm that, after 24 months of project, 500 Kamsá Indians were trained in forest conservation and administration of protected natural areas. **I.3.2**. Annual report of the departmental secretariat of education confirms that, after 24 months of implementing the project, at least 5 institutions with 5,200 people (students, teachers, managers and parents) received socialization and awareness in forest conservation, with didactic material of the project.

Objective 4. Inform 25,000 people focused on the activities and results of the project, 24 months after the project was implemented**.**	**R4.1.** 25,000 people related to conservation (conservationists, forest tourists, ecologists, outdoor tourists and ecotourists) are informed of the program through digital media.	**A4.2.1.** Opening of the project's website and social networks (Twitter, Facebook, Instagram and YouTube). **A4.2.2.** Case study, peer reviewed: Conservation status of 144Km2 of moor in the SNSM, in Colombia; during the 12 months of the project. **A4.2.3.** Video documentary of the project. **A4.2.3.** Photo contest of the target species **A4.4.1.** Link a network of volunteers with the new indigenous corporation created. **A4.4.2.** Donation of equipment, supplies and communication channels of the project, to the new corporation created.	**I.4.2**. The statistics center of the social networks and website, show that, after 24 months of project, at least 25,000 people related to conservation were reached by the publications of the digital media and communication strategies of the project. **I.4.4**. Chamber of Commerce certificate confirms that, after 24 months of implementing the project, an environmental corporation was created led by at least 10 indigenous Kamsá youth. **I.4.** Questionnaire surveys confirm that, after 24 months of implementing the project, that at least 60% of the Kamsá indigenous community recognize the importance of recognizing the conservation of moor.

Project duration: 24 months
Tentative start date: January 15, 2021
Tentative completion date: January 14, 2023 **(B):** BIMESTER

ACTIVITIES	YEAR 1						YEAR 2					
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
A1.1.1. 20 days of Training in the fight against smuggling and illegal traffic of wood, in forests.												
A1.1.2. Use of 1 drone to monitor 8km2 with high threat of illegal traffic of the target species, and fire sources.												
A1.2.1. Formation of 4 ranger crews, of 4 volunteers each, of forest supervision.												
A1.3.1. Agreement for 4 years renewable with local police, for the coordination of delivery of evidence of illegal traffic sources (video, images; geographical position).												
A1.4.1. Implementation of 80 environmental standards in the protected natural area.												
A2.1.1. 20 days of training in forest conservation and administration of protected natural areas.												

A2.1.2. Construction of 1 community nurseries with a capacity of 60,000 seedlings (seedling survival rate of the species is at least 86%).												
A2.1.3. Implementation of forest traceability system for monitoring sown seedlings												
A2.2.1. Declaration and registration of 44Km2 as a protected natural area, through the issuance of an administrative act by the indigenous headquarters Kamsá (ally of this project).												
A2.2.2. Registration of the protected natural area created in the **Global Forest Watch** platform, to monitor outbreaks of illegal traffic.												
A2.3.1. Installation of 100 informational fences, 25 green points for recycling.												
A3.1.1. 50 Training to indigenous Kamsá youth in forest conservation techniques and administration of protected natural area.												
A3.1.2. Selection of 30 young people as volunteers for operational activities of the project.												
A3.1.3. Delivery of qualification certificates validated by the University of Magdalena.												
A3.2.1. USB delivery to 5 Kamsá educational institutions with educational multimedia content of the project.												
A3.3.1. 10 'door to door' trainings by the participants of the original trainings												
A3.3.2. Creation and legalization of an indigenous environmental corporation, whose corporate purpose is the conservation of moor in the Bordoncillo moors of the amazon basin												
A4.2.1. Opening of the project's website and social networks (Twitter, Facebook, Instagram and YouTube).												
A4.2.2. Case study, peer reviewed: Conservation status of 144Km2 of moor in the SNSM, in Colombia.												
A4.2.3. Video documentary of the project.												
A4.2.3. Photo contest of the target species												
A4.4.1. Link a network of volunteers with the new indigenous corporation created.												
A4.4.2. Donation of equipment, supplies and communication channels of the project, to the new corporation created.												

BIBLIOGRAPHY

- Cerda, H. (2007). La investigación formativa en el aula. La Pedagogía como investigación. Bogotá, D.C.: Magisterio. Chávez. (s.f). Arborización. [Proyecto]. Universidad Nacional de Colombia. Recuperado de https://arquitectura.medellin.unal.edu.co/images/ imagenes/pdf/arborizacin.pdf
- El Espectador. (2017). Tasa de deforestación en Colombia. Recuperado de https://www.elespectador.com/ noticias/medio-ambiente/se-disparola-tasa-de-deforestacion-en-colombiaarticulo-701754
- García, Y., Ramos, J. y Becerra, J. (2011). Semillas forestales nativas para la restauración ecológica. Biodiversitas, 94(1).12-15. IDEAM. (2017). Ecosistemas. Recuperado de http://documentacion.ideam.gov.co/ openbiblio/bvirtual/000001/cap7.pdf
- IAVH. (2003). Programa de Investigación de Política y Legislación. Sistema de Indicadores de seguimiento de la política de Biodiversidad. Recuperado de http://www.bvsde.paho.org/bvsacd/ cd20/sib.pdf
- Instituto Geográfico Agustín CodazziIAGG. (2012). Atlas de la distribución de la propiedad rural en Colombia. Recuperado de https://es.scribd.com/ document/347949611/2012-IGACAtlas-de-La-Distribucion-de-LaPropiedad-Rural-en-Colombia 107
- Modul. Arquit. CUC 20(1): 95-108, 2018 Navarro, L. (2016). El mejoramiento integral en el campo de los tratamientos urbanísticos de barrios con problemáticas de crecimiento informal y riesgos ambientales. Caso: Sector arroyo El Salao II, Barranquilla-Colombia. Módulo Arquitectura CUC, 17(1). 115-132. http://revistascientificas.cuc.edu.co/index.php/moduloarquitecturacuc/article/view/1531
- Renovables verdes. (2017). Consecuencias de la deforestación. Recuperado de https://www.renovablesverdes.com/ deforestacion/
- República de Colombia. Ministerio de Ambiente, (2017). Estrategia integral de control a la deforestación y gestión de los bosques (EICDBG). Minambiente. Recuperado de http://www.minambiente.gov.co/images/EICDGB_1.0_ AGOSTO_9_2017.pdf
- Reyes, A. y Gutierrez, J. (2010). Los servicios ambientales de la arborización urbana: Retos y aportes para la sustentabilidad de la Ciudad de Toluca. Quivera, 12(1). 96-102. Recuperado de http://www. redalyc.org/articulo.oa?id=40113202009
- Rodríguez, L. (2011). Análisis de las condiciones que impiden la plantación de árboles según los prinicipios de la silvicultura urbana en el nororiente de Barranquilla. Módulo Arquitectura CUC, 10(1), 55-83. Recuperado de https://revistascientificas.cuc.edu.co/moduloarquitecturacuc/article/view/130
- Sauvé, L. (1999). La educación ambiental entre la modernidad y la posmodernidad: En busca de un marco educativo de referencia integrador. Tópicos. 1(2). 7-27. Recuperado de http://www.ecominga.uqam. ca/PDF/BIBLIOGRAPHIE/GUIDE_ LECTURE_1/5/2.
- Sauve.pdf Vargas, W. (2012). Los bosques secos del Valle del Cauca, Colombia: una aproximación a su flora actual. Biota Colombiana. Especial bosques seco en Colombia, 13(2). 102-164. Recuperado de http://www.humboldt. org.co/images/Atlas%20de%20 paramos/Biota13(2)-Bosque_Seco. pdf

- Vining, J. y Ebreo, A. (1992). Predicting Recycling Behavior from Global and Specific Environmental Attitudes and Changes in Recycling Opportunities. Journal of Applied Social Psychology, 22(20), 1580-1607.
- WWF. (2017). 15 especies colombianas de árboles amenazados. Recuperado de http://www.wwf.org. co/?uNewsID=299073 WWF. (2018). Principales causas de la deforestación. Recuperado de https://sostenibilidad.semana. com/medio-ambiente/multimedia/ principales-causas-deforestacion-mundo-segun-wwf/32971