

Reflections on the Process of Declaring the Fuquene Lagoon as a Protected Area and Inclusion to the Protected Areas National System

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Abstract: Protected natural areas have been considered the best alternative for preserving natural resources in their different forms. The Fuquene Lagoon is a habitat of more than one hundred species of native birds and a site of passage for migratory birds, species of fish, crustaceans endemic to the region, and diverse aquatic macrophytes, with at least sixty species reported. The declaration of protected areas is a way to achieve “in situ” conservation of the species and, in general, of the ecosystems of the national territory. Likewise, it is a way to contribute to mitigating climate change and guaranteeing its permanence. This study aimed to analyze the relevance of the figure of the protected area management chosen by the environmental authority of the Fuquene Lagoon to determine if the Regional District of Integrated Management contributes to conservation objectives of the protected areas and climate change. Finally, it is concluded that the declaration of the study area as a protected area can contribute to a strategy for compliance with the Sustainable Development Goals, specifically concerning i) climate action, ii) life of terrestrial ecosystems, and iii) sustainable communities through the change in the legal connotation of the national land policy, plans can be developed that faithfully pursue restoration and ecological recovery.

Keywords: protected areas, conservation, climate change.

关于宣布富肯泻湖为保护区并纳入保护区国家体系过程的思考

摘要：自然保护区被认为是保护不同形式自然资源的最佳选择。富肯泻湖是一百多种本地鸟类的栖息地，也是候鸟、鱼类、该地区特有的甲壳类动物和各种水生大型植物的栖息地，据报道至少有 60 种。宣布保护区是实现物种“就地”保护的一种方式，一般而言，是实现国家领土生态系统的一种方式。同样，这是一种有助于缓解气候变化并保证其持久性的方式。本研究旨在分析富肯泻湖环境当局选择的保护区管理数据的相关性，以确定综合管理区域是否有助于保护区的保护目标和气候变化。最后，得出的结论是，将研究区宣布为保护区有助于制定符合可持续发展目标的战略，特别是关于 i) 气候行动，ii) 陆地生态系统的生命，以及 iii) 通过改变国家土地政策的法律内涵，可以制定忠实地追求恢复和生态恢复的计划。

关键词：保护区，保护，气候变化。

1. Introduction

Conservation is a discipline dedicated to preserving, maintaining, maintaining, studying, and using the heritage representing biodiversity. Conservation can be carried out “in situ” and “ex-situ”. These two modalities are complementary and guarantee the conservation of the species’ genetic heritage and their populations in the medium and long term [1]. In their

different modalities, natural protected areas (ANP) have been considered the best alternative for preserving natural resources. Their character as territorial spaces subject to state control implies maintaining and protecting the local natural resources [2].

National Parks of Colombia, and in general, the entire national system of protected areas, are understood as the set of protected areas, social participants, and management strategies and

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instruments articulated to fulfill the country's conservation objectives. It includes all protected areas of public governance, private or community governance, and those within the scope of national, regional, or local management [3].

In Colombia, some categories have been defined since the single regulatory decree on the environmental sector, 1076 of 2015, establishing that protected areas could be declared according to the following categories:

- *Public Protected Areas:* They refer to the character of the competent entity for their declaration [4].

- *System of National Natural Parks:* The declaration of Protected Areas of the Park System corresponds to the Ministry of Environment and its administration and management of National Natural Parks.

- *Protective Forest Reserves:* These are geographical spaces where forest ecosystems keep their function, although their structure and modification have been changed. They can be public or private and are destined for establishing, maintaining, and sustainable use of forests or plant coverings [4].

- *Regional Natural Parks:* Geographical space in which landscapes and strategic ecosystems on a regional level keep the structure, composition, and function, as well as the ecological and evolutionary processes that sustain them and whose natural and cultural values are made available to humans to destine them to their preservation, restoration, knowledge, and enjoyment. Its declaration and administration correspond to the "CAR" - Regional Autonomous Corporations [4].

- *Integrated Management Districts:* A geographical space in which landscapes and ecosystems keep their composition and function, even though their structure has been modified, and whose natural and cultural values are made available to humans for sustainable use, preservation, restoration, knowledge, and enjoyment. Districts containing strategic landscapes and ecosystems on the national level are declared by the Ministry and administered through National Parks or delegation to another environmental authority. In this case, they will be named: National Districts of Integrated Management. Moreover, those that host strategic ecosystems on the regional level will be called Regional Integrated Management Districts, which are declared and managed by the Regional Autonomous Corporations (CAR).

- *Soil Conservation Districts:* A geographical space in which strategic landscapes and ecosystems on a regional level, keeping their function, structure, and composition, have been modified and contribute essentially to the generation of environmental goods and services whose natural and cultural values are made available to humans for preservation, restoration, knowledge, and enjoyment. Its declaration and

administration correspond to the "CAR" - Regional Autonomous Corporations.

- *Recreation Areas:* Geographical space in which landscapes and strategic ecosystems on a regional level keep their function, although their structure and composition have been changed with a significant potential for recovery and whose natural and cultural values are made available to humans to be used for preservation, restoration, knowledge, and enjoyment. They are declared and managed by the "CAR" - Regional Autonomous Corporations.

- *Private Protected Areas - Natural Reserves of Civil Society - RNSC:* Part or all of the area of a property that preserves a sample of the natural ecosystem and is managed under principles of sustainability in the use of natural resources and that by the free will of its owner is destined for its sustainable use, preservation or restoration with a long-term vocation. It is the initiative of the owner to register all or part of his property as RNSC. They play an important role in protecting parts of ecosystems that could hardly be conserved.

During the United Nations World Climate Change Conference COP214, at the end of 2015, representatives of "REDPARQUES" presented the Declaration on Protected Areas and Climate Change on the role of protected areas as a strategy to face climate change, signed by 18 Latin American countries, and put on the important table proposals. Among them, Colombia announced a goal of declaring 2.5 million new hectares of protected areas as part of its international climate commitments, under the name of INDC, for its acronym in English [5].

Protected areas are a way to develop "in situ" conservation of species and, in general, of the ecosystems of the national territory. It is also a way to guarantee the permanence of elements of the regions, such as landscape and climate. To this end, considering the role of protected areas and the systems they make up, the necessary policy guidelines are issued to consolidate the National System of Protected Areas (SINAP) as part of the land-use planning processes. This will contribute to the conservation of biodiversity as a natural basis for the development of the country, generation of environmental benefits, and preservation of natural spaces indispensable for the preservation of the existing cultural diversity in the country [6].

The Regional Autonomous Corporation of Cundinamarca (CAR) declared the Lagoon Complex of Fuquene, Cucunuba, and Palacio a Regional District of Integrated Management through agreement No. 018 of 2017. This measure complies with the action plan of the corporation and the commitments to increase protected areas in the national territory signed by the State Decree 2372 of 2010, subsequently compiled in Decree 1076 of 2015, in article 2.2.2.1.5.1 establishes as criteria for the declaration of protected areas, those biophysical, socioeconomic and cultural ones.

Therefore, it will be convenient to analyze the adaptation of the protection zone of the “Fuquene” lagoon and the DRMI to these criteria to evaluate the relevance of the management figure in declaring a protected area. Therefore, this study aims to analyze the relevance of the protected area management chosen by the environmental authority to determine if the Regional District of Integrated Management contributes to the conservation objectives, the objectives of the protected areas, and climate change. It also concludes if the declaration of the protected area affects the environment positively or negatively.

2. Area of Study

The study was carried out in the “Fuquene” lagoon located in the basin of the Ubaté river and Suárez, northeast of the Regional Autonomous Corporation’s jurisdiction, between the provinces of Cundinamarca and Boyacá. It borders the municipalities of Simijaca, Susa, Fúquene and Guachetá in Cundinamarca and Ráquira and San Miguel de Sema, province of Boyacá (Figure 1).

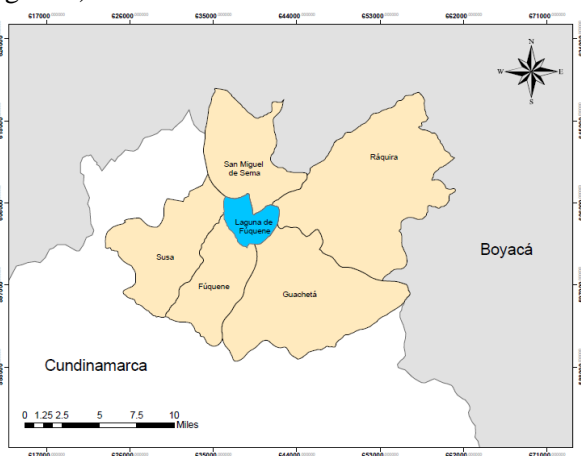


Fig. 1 Area of study

It is characterized by being one of the most diverse country regions of Cundinamarca in terms of natural and cultural heritage: moorlands, lagoons, rock formations with pre-Hispanic vestiges, colonial architecture, churches and chapels, railway infrastructure, and remarkable peasant roots expressed in the production of food such as corn and dairy products, as well as intense mining and agricultural activities. The valley where a good part of the country region is located corresponds to the beds of the lagoons of Palacio, Cucunubá, and Fúquene [7].

3. Research Background

In Colombia, the declaration of the "forbidden zone for hunting and fishing of the Muña River reservoir", near Bogotá in 1943 and the creation of the "Forest Reserve Zone" as a part of the Cali River basin in 1938 are examples of the first regional concerns about the environmental problem. It was recognized that without wild vegetation, there would be less water available in

the rivers [8]. However, these attempts were caused by local or regional interests because of the need for the resources provided by ecosystems under protection.

There are currently 59 protected areas in Colombia that cover about 12% of the national territory; “National Natural Parks” has been one of the first government agencies to adopt climate change considerations in its institutional management. The entity has worked together with the National Directorate of Climate Change of the MADS through programs and projects aimed at expanding protected areas and controlling deforestation, among others, strengthening the inter-institutional coordination capacities required to implement climate actions [5]. The agreement on Biological Diversity defines “in situ” conservation as “the conservation, maintenance, and recovery of viable populations in dynamic and evolutionary systems of the original habitat or, in the case of cultivated species, in the environment in which they have developed their characteristics”. “Ex-situ” conservation is defined as “the conservation of genetically representative samples of species or crops that remain viable over time, outside their natural habitats or places of cultivation, in controlled environments and supported by appropriate technologies” [9].

In general, the environmental benefits derived from the declaration of protected areas as an "in situ" conservation strategy can be divided into four categories [10]:

1. Services Provision that enables people to live off them (e.g, fishing and forestry, for subsistence and trade).
2. Support of life (e.g, water and air).
3. Regulation of other important ecosystems (e.g, mangroves that act as a nursery for young fish)
4. Cultural significance Contain and provide opportunities for recreation (e.g, sacred sites, hiking trails).

Therefore, protected areas, especially the space defined as a preservation zone, are instruments of high relevance in ecology since they allow the natural processes of evolution to continue developing. "In situ" conservation is dynamic in time and space since species continue to be subjected to the pressures of natural selection and the effects of possible geographical and reproductive isolations, under which the different species populations have developed. Protected areas provide the natural flow of life and the correct flow and development of genetic characteristics and adaptations to environmental changes, allowing co-evolution with other species, forming variants in genetic complexes that favor adaptive processes as a response to the environment and the genetic changes of the accompanying species [1].

As it is well known, Colombia, Brazil, Bolivia, Costa Rica, Ecuador, Mexico, Peru, Venezuela, China, Philippines, India, Indonesia, Malaysia, Kenya,

Madagascar, the Democratic Republic of the Congo, and South Africa make up the block of mega diverse countries. Colombia is widely known for numerous floristic and faunal species, a great variety of landscapes, and energy mining resources; 68.7% of the surface is covered by natural ecosystems. In addition, it is the first country worldwide with a great number of amphibian and bird species. Colombia is also home to 41 National Natural Parks, 11 Sanctuaries of Fauna and Flora, 2 National Natural Reserves, and five biosphere reserves throughout its five regions. Because of all these factors, Colombia is considered the second among the most bio-diverse countries in the world, per square kilometer and an environmental power with privileged conditions, without setting aside the large number of indigenous communities that inhabit the national territory, who are also part of this diversity [11].

Meanwhile, the Fuquene Lagoon (31 km²), located at 2600 m.a.s.l. and 100 km north of Bogotá (Colombia, South America), is a highland wetland. The Fuquene Lagoon is one of the most important high mountain aquatic ecosystems in the Northern Andes. Its basin is located in 11 municipalities of Cundinamarca and Boyacá, among them: Ubaté, Susa, San Miguel de Sema, Fúquene, Chiquinquirá, Simijaca and Cucunubá. Its main water mirror covers about 3260 ha today, as it has lost almost 80% of its original extension of 13,000 ha [12]. The lagoon complex is considered the center of biological diversity and endemism of the most important Andean freshwater biota in Northern South America. It belongs to the Alto Andino complex of the freshwater eco-regions of Latin America or the Northern Andes zone of the wetland eco-regions of South America. It is located in the hot spot of the tropical Andes, defined by International Conservation as a priority area for conservation worldwide. It is an area recognized in the international field, having been declared in 2004 AICA or Area of Importance for the Conservation of Birds by the international entities Birdlife and International Conservation.

Within the Fuquene Lagoon, the largest body of water in the entire complex and its basin, there are more than 307 species of fauna, making it a “HOTSPOT” of freshwater biodiversity. The fish “Capitán de la Sabana” *Eremophilus mutissi* and the crab *Neostrengeria macropa* are two of the most important species because they are endemic and threatened with extinction. In addition, twelve species of mammals, seven amphibians, five reptiles, six fish, two crustaceans, and 125 birds are found in the area. The high diversity of birds present in the basin of the Lagoon has earned it the designation as an AICAS site, which is important for the conservation of birds [12]. Furthermore, the Lagoon is inhabited by three species of fish and a crustacean endemic to the region.

Furthermore, the diversity of aquatic macrophytes is

outstanding, with at least sixty species reported [13]. Climate and soil conditions favored the early human occupation of the Fúquene basin [14, 15], an occupation that increased with the arrival of Europeans in the fifteenth century. Nowadays, and despite its advanced deterioration, the Lagoon still supports important ecosystem services such as climate regulation, direct and indirect drinking water for more than 2000 people, species of flora and fauna for local inhabitants, and soil fertility for one of the most important livestock-dairy industries in the country [16].

Taking into account the ecological importance of the area, the continuous advance of the affectations that deteriorate the ecosystem, and the need to be able to act in the territory, the Regional Autonomous Corporation of Cundinamarca CAR, through the following administrative acts determines:

- Resolution 1156 of 2016: Determine the protection zone of the “Fuquene” lagoon [17];
- Agreement 018 of 2017: declare this area a protected zone under the Regional District of Integrated Management;
- Formulation Management Plan of the 2017 DRMI;
- Regulations concerning climate change, Decree 298 of 2016.

4. Methodology

The methodological development started with the recognition of the area of study and review of the Environmental Management Plan, the Declaration as a DRMI protected area, and the declaration of the protection zone of the Fuquene Lagoon. The search for normative sources (Decree 1076 of 2015 and complementary rules related to protected areas) was conducted to compare what is indicated by the norm and what is acted by the environmental authority.

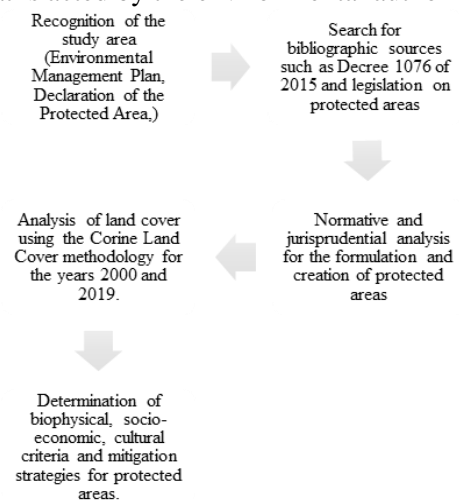


Fig. 2 Methodological diagram

Finally, the relevance of the figure of management of the protected area is analyzed from the normative and technical point of view, according to the biophysical, socioeconomic, cultural criteria and contributions to climate change.

5. Results and Discussion

As a consequence of the normative review, it was found that the concern of the State to regulate the situations of the environmental matter is evident, and it is easy to recognize several legal provisions at all levels of the normative hierarchy. First, the Political Constitution of 1991 provides the importance of conserving biological diversity in the country, protecting the cultural and natural wealth of the nation, ecological function of the property, inalienability, imprescriptibility, and non-seizure of natural parks or the right of all people to enjoy a healthy environment. The Constitution also clearly highlights the state's duty around the need to protect the diversity and integrity of the environment, conserve areas of special ecological importance, and plan the management and use of natural resources. For its part, the Code of Natural Resources – Decree 2811 of 1974, in its article 1, recognized the environment as a common heritage and established its preservation and management responsibilities. Article 47 stipulates that a region could be reserved when necessary for restoring, conserving, or preserving natural resources and the environment. Articles 308 and 309 define special management areas as those delimited for administration, management and protection of the environment and renewable natural resources.

Article 10 of Law 388 of 1997 establishes that special management areas must be considered for the preparation and adoption of land use plans as determinants, including protected areas declared by the Regional Autonomous Corporations and the areas that make up the System of National Natural Parks and national forest reserves. Protected areas in Colombia as an integrated system dedicated to the conservation of environmental goods and services arose with the entry into force of Law 165 of 1994 on the occasion of the Convention on Biological Diversity, which, according to the United Nations, determines that the conservation of biological diversity is a common interest of all humanity. The Convention on Biological Diversity covers biological diversity at all levels: ecosystems, species, and genetic resources. It also covers biotechnology, among other things, through the Cartagena Protocol on biotechnology safety. In fact, it covers all possible domains directly or indirectly related to biodiversity and its role in development, from science, politics, and education, to agriculture, business, culture, and much more [18].

On the other hand, regarding the analysis of criteria, it was found that Decree 1076 of 2015 establishes that for the declaration of protected areas, it will be necessary to verify the "biophysical, socioeconomic and cultural criteria or conditions of the place". Therefore, the criteria to take into account are the following:

5.1. Biophysical Criteria

- *Representativeness*: The proposed area includes levels of biodiversity not represented or underrepresented in the system of protected areas, according to the defined conservation goals.

- *Irreplaceability*: It considers unique or uncommon samples and remnants of types of ecosystems, which due to transformation processes or their uniqueness, are not repeated within spatial units of analysis of a higher nature such as biomes or bio-geographic units.

- *Ecological integrity*: the proposed area allows for maintaining ecological integrity, guaranteeing the natural dynamics of change of the attributes that characterize its biodiversity.

- *Level of threat*: The proposed area protects populations of species considered in some global or national threat category or listed in this condition from a regional or local analysis.

In this regard, the environmental authority has carried out a detailed review of the area under study reflected in the content of the baseline and diagnosis of the management plan, allowing to identify the criteria of irreplaceability, fragility clearly, and representativeness of the ecosystem to intervene. Likewise, the same information makes it possible to recognize the need to declare a protected area that facilitates the recovery and preservation of the ecosystem, given the high degree of intervention, threat, and fragility of the natural environment explain why the areas of recreation are the ideal management figure for this territory since they allow the continuous and natural process of ecological restoration. Minimizing intervention in the territory and allowing natural processes to take their course is mandatory to ensure resilience processes are effectively executed within the ecosystem. In this sense, the management figure "Integrated Management District" is much looser and more permissive with the productive activities of an anthropic character since it assumes that the ecosystem is found in suitable conditions of structure and composition that allow it to support the interventions.

The management plan clearly indicates in its content that:

Their associated terrestrial ecosystems have been transformed rapidly.

According to [16], there is evidence of a dramatic situation of degradation of the three main wetlands of the Ubaté River valley. The three lagoons previously connected hydrologically formed a true complex. Nowadays, they have lost that condition and function as isolated ecosystems with high anthropic intervention, which has caused the partial loss, and in many cases total, of their ecological integrity. This is largely due to the development of poorly planned productive activities. For this reason, it is important to design and implement effective and sustainable management strategies to guarantee the conservation of

biodiversity, ecosystem, and cultural services, where multi-disciplinary analyses are involved that allow articulating and generating synergies among the socioeconomic, physical, and biological dimensions of the study area.

From the above, it follows that the environmental authority understands the current situation of the territory. However, it makes an erroneous conclusion and is not very beneficial for the general objectives of conservation and for the objectives of the protected areas in Colombia since the category it adopts does not restrict the activities that have threatened the ecological integrity of the ecosystem. On the contrary, it legalizes the activities that the same authority has defined as those that have transformed the structure and composition of the territory.

5.2. Socioeconomic and Cultural Criteria

To contribute to the maintenance of strategic cultural conservation areas; as an active process for the survival of ethnic groups recognized as differentiated cultures in the country.

These historical and cultural areas include archaeological spots associated with biodiversity conservation objectives, fundamental for the preservation of cultural heritage.

These areas are considered where, without permanent occupation, the different levels of biodiversity are used responsibly, partially or totally, establishing sustainable production systems.

These areas should be included to provide fundamental environmental benefits for the well-being of human communities.

The ownership and tenure of land are not considered a negative element in the face of the possibility of achieving the conservation objectives of the protected area, and there is the possibility of generating effective solutions so as not to compromise the design of the protected area.

It manages to bring together the work and effort of social and institutional participants, thus guaranteeing governance over the protected area and financing the activities necessary for its management and administration.

Cultural aspects of the territory are very well documented in the baseline information compiled by the management plan formulated by the environmental authority. It reports on the presence of “Chibcha” communities during pre-colonial and colonial times, the vestiges of their existence, architecture, and places of cultural interest derived from the development processes over time in the region. That is, the area has a high potential for sustainable tourism development that can be derived from all the cultural and environmental heritage of the area, a sine qua non condition of the management figure called “recreation areas”.

In this connection, the environmental authority must

interpret the reality of the area to be intervened and frame it to the description that best fits the management figures defined by the standard. It is an exercise in technical and legal analysis of what is observed in the territory and the compatibility of what is contemplated by the regulatory field. Finally, this analysis is expressed into actions of the environmental authority to comply with the general conservation objectives and the general objectives of the protected areas.

According to the management plan of the Integrated Management District or DRMI and the DRMI declaration agreement, the environmental authority defines, understands and describes the study area as: “a lagoon complex that provides environmental supply services (food, water, plant products, organic fertilizer generated from macrophytes, use of bulrush for artisanal purposes); regulation (mitigation of natural hazards, water regulation); cultural (cultural, recreational heritage); and support (wildlife habitat, photosynthesis, climate change mitigation and soil fixation), which benefit the communities that are part of the area of direct and indirect influence”; that is, the authority identifies the functionality of the ecosystem and recognizes that ecosystem services are received from it both nearby communities and those of indirect influence.

In the same way, the environmental authority also points out in the analysis it makes on the state in which these natural areas are located that “it is an ecosystem that has lost its original attributes and it is not possible to recognize its initial state, it still houses components of vital importance that must be preserved, restored and used sustainably; one of these corresponds to biological diversity, considered one of the main technical supports for which the area was declared under a category of regional conservation”. Also, the environmental authority refers that “it is taken into account that in the lagoon system and its area of influence there are high levels of anthropic fragmentation that affect the functionality of water ecosystems, its dynamics and quality, loss of biodiversity and deterioration of the physical-chemical characteristics of soils, generated by historical processes of drainage, adaptation of soils for the development of agricultural, livestock, mining activities, among others”, that is, the environmental authority, as presented on page 37 of the management plan, recognizes the effects at the level of structure and composition.

In this sense, a discrepancy can be anticipated between the environmental situation of the area under study and the management figure selected by the environmental authority since the management plan based on baseline information manifests an alteration in the structure and composition of the ecosystem under the literal description in article 2.2.2.1.2.5 of 1076 of 2015 concerning the Management District [19]. Nevertheless, integration requires landscapes and ecosystems to maintain their composition and function,

even if their structure has been modified.

As part of the analysis, it can be suggested that the management figure that best fits the requirements and description indicated by the standard is contained in article 2.2.2.1.2.6 of 1076 of 2015. It corresponds to recreation areas, indicated as “geographical spaces whose landscapes and strategic ecosystems on the regional level keep the function although their structure and composition have been modified”. Likewise, this category also allows for taking advantage of the “significant potential for recovery and whose associated natural and cultural values are made available to the human population to allocate them to their restoration, sustainable use, knowledge and enjoyment”.

The environmental authority must carry out this analysis before the declaration of protected areas since the actions taken as a result of management and administration of natural resources must keep the unity of criteria and be perfectly aligned with the provisions of the legal system in matters of conservation. Articles 2.2.2.1.1.5 and 2.2.2.1.1.6 define the general objectives of conservation and the objectives of protected areas in Colombia, respectively, indicating that the integrity of the ecosystem must prevail so that its balance and natural functioning can take advantage of all the ecosystem services that can be derived from it.

The general objectives of conservation indicate the course to follow for the establishment, development, and operation of SINAP. However, they are not exclusive and, as a whole, allow the implementation of the general purposes of conservation of the country [19]:

a) Preserve and restore the natural condition of spaces representing the country's ecosystems or combinations characteristic of them.

b) Preserve the populations and habitats necessary for the survival of species or groups of wild species that present particular conditions of special interest for biodiversity conservation, emphasizing those of restricted distribution.

c) Conserve the productive capacity of natural ecosystems or those in the process of restoring their natural state, as well as the viability of populations of wild species, to guarantee a sustainable supply and use of biological resources.

d) Keep the natural coverage and those in the process of restoring their natural state, as well as the environmental conditions necessary to regulate the supply of environmental goods and services.

e) Keep areas that contain manifestations of wild species, water, soil, or combinations of both, which constitute unique, rare, or special scenic attraction spaces due to their scientific, emblematic significance or that involve special traditional meanings for the cultures of the country.

f) Provide natural spaces or those in the process of restoring their natural state, suitable for delight,

recreation, education, improvement of environmental quality, and social valuation of nature.

g) Conserve natural spaces associated with elements of material or immaterial culture of ethnic groups.

h) Likewise, Decree Law 1076 of 2015 clearly defines the concepts of Function, Structure, and Composition in article 2.2.2.1.1.1 in such a way that the environmental authority must keep its actions within the dictates of the rule and act consistently with the technical findings it makes and presents.

Decision VII/28 of the Seventh session of the Conference of the Parties (COP7) in 2004 adopted the Program of Work on Protected Areas: each country committed to implementing it in the context of its national priorities and needs to establish and keep integral national protected area systems, effectively managed and ecologically representative, contributing to the achievement of the objectives of the agreement, to the projected target of the Declaration of Johannesburg of reducing the current rate of biodiversity loss, poverty reduction and sustainable development [20].

According to the Brundtland Report, Sustainable Development is defined as: “That process that can meet the needs of present generations without compromising the ability of future generations to meet their own needs” [21]. Therefore, sustainable development must combine social welfare with the environment and economic boom. That is, it must be possible to satisfy the economic, social, cultural diversity, and healthy environmental needs of current generations without risking their satisfaction of them to future generations, where a balanced economy is aimed, based on a plural system, an effective public sector and a growing sector of the plural economy [22]. Therefore, it is necessary to stop socializing the losses and privatize the profits product of traditional capitalism. It will then be the key to economic success, the social economy as an entire sector that will favor the world economic balance seeking a recognition that for authors such as Josep Stiglitz [23], Nobel Prize in Economics establishes in postulates such as: “The market is not always efficient, and although it is, it does not always generate socially economic models”, in addition to highlighting “social economy as a source of invocation and from which the rest of the economy benefits”.

Protected areas are irreplaceable for providing environmental services as important as the provision of water sources, oxygen production, carbon dioxide absorption, climate regulation, flood mitigation, and prevention of mudslides or landslides, among others [24]. For example, the Stern7 report of 2006 on the economics of the effects of climate change found that reducing deforestation and forest degradation are the most efficient ways of investing in reducing CO2 emissions. Many natural and managed ecosystems support reducing climate change's effects. However, protected areas have advantages over other ways of

managing ecosystems because of their legal clarity, governance design, established management capabilities, and effectiveness.

In the context of protected areas, there are two main strategies for mitigation. Ecosystems, especially forests, can a) store CO₂ and b) capture CO₂.

5.3. Storing CO₂

Storing CO₂ means preventing carbon fixed in vegetation and soil from escaping into the atmosphere. To this end, it is important to have instruments that keep existing ecosystems in the long term. Protected areas are the product of land use planning processes. These instruments of planning the use of the space aim to identify, establish and manage the different geographical spaces with their restrictions and potentialities. Once agreed with society and legally declared, protected areas can serve as important tools to curb uncontrolled colonization and prevent land-use change in general [25]. There are clearly established rules under the criteria of sustainable development for their geographical space in favor of conserving biodiversity and environmental services. The main activities for storing CO₂ can generally be grouped under "conservation" actions.

5.4. Capturing CO₂

The dioxide is free in the atmosphere through the "services" provided by natural ecosystems. Normally, many ecosystems, e.g., swamps and mangroves, constantly capture and store CO₂. However, many protected areas also have the potential and space for restoration or natural regeneration of degraded forests, swamps, or other ecosystems. They offer an ideal and legally recognized ecological environment to promote recovery or reforestation measures. The main activities to capture CO₂ can generally be grouped under the actions of "restoration" [26].

In the context of climate change, all these different types of protected areas are important – each, in its own way, supports the resilience or transportability of ecosystems. Biodiversity conservation areas, therefore, are indispensable to reducing nature's vulnerability to the effects of climate change.

However, it is ideal that one can enjoy these ecosystem services as a result of the ecological restoration of the protected area. The category of protected area defined by the environmental authority for the study area does not favor the processes of integral recovery of the ecosystem since it supports and legalizes intensive livestock activity, mining, agriculture, etc., in the minimum area required by the ecosystem for its perfect functioning and recovery in structure and composition. In this sense, if the ecosystem does not reach the optimal or minimum natural conditions of the structure, composition, and function, it will be impossible to talk about sustainable development, cleaner production, responsible

consumption, contributions to climate change, sustainable development objectives, and other issues derived from the environmental talks.

5.5. Analysis Coverages: Corine Land Cover

A comparative and descriptive analysis was carried out between 2000 and 2019 to know the situation of the Fuquene Lagoon. It aimed to review the impacts of the declared protection area in the Fuquene Lagoon since 2017 (Figures 3 and 4).

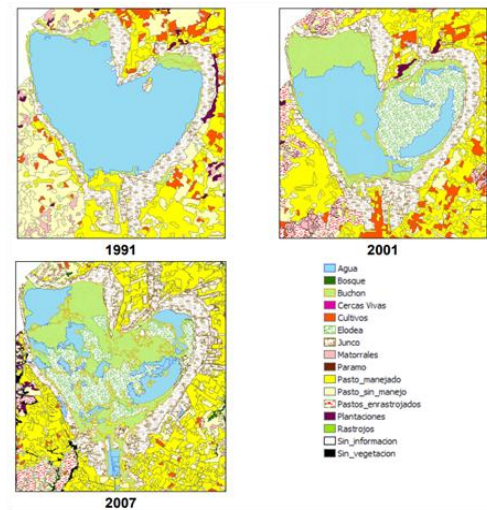


Fig. 3 Changes in the ecosystem structure of the Fuquene, Palacio and Cucunuba Lagoon complex (DMI management plan)

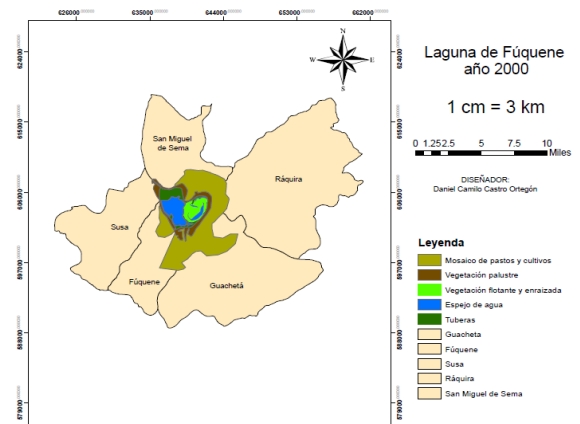


Fig. 4 The analysis since 2000

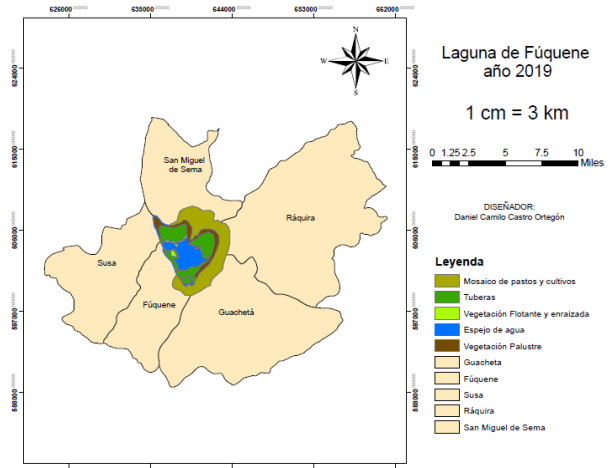


Fig. 5 Analysis year 2019

Table 1 Analysis year 2019

Coverage	Occupation of coverage in Hectares (Ha)	
	2000	2019
Peatlands	667	1341
Water mirror	909	1023
Floating and rooted vegetation	471	120
Variety of pastures and crops	5319	2317

In 2000, a water mirror of 909 hectares was found; in 2019, it increased to 1023 hectares. This increase was caused by diverse efforts made by the community: the sustainable management of the study area and the decrease of the variety of coverage of pastures and crops since it went from having 5319 hectares by 2000 to having 2317 hectares by 2019. These modifications within the Lagoon allowed the floating vegetation to decrease from having 417 hectares to 120 hectares by 2019 (Table 1).

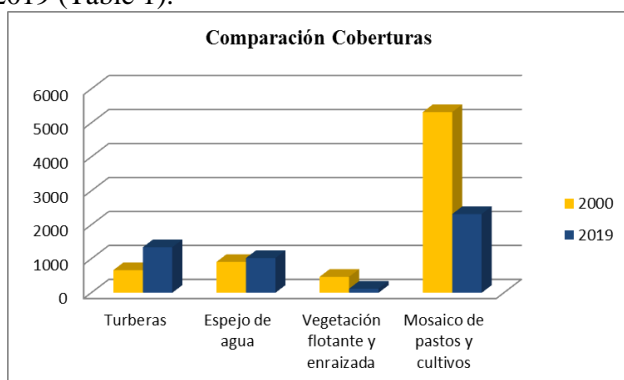


Fig. 6 Coverage percentages years 2000 and 2019

Through resolution 1156 of 2016, the environmental authority delimited in detail the protection zone of the Fuquene Lagoon with a total of 32,642,624 square meters, in which productive activities are restricted as indicated by law, specifically Decree Law 1075 of 2015 in its article 2.2.3.2.13.18 by virtue of the importance of the ecosystem and the need to maintain its integrity to continue enjoying its benefits.

According to the analysis carried out in the study (Figure 5), it was determined that the peat cover showed an increase of 19% since it went from having 667 hectares of occupation to 1341 hectares. This increase is considered important since peatlands are ecosystems that fulfill valuable environmental functions, such as the conservation of plant and animal species; they are CO₂ sinks. In addition, they allow for the regulation of hydrological cycles and the support of extensive livestock, increase tourist and recreational interest, and have a scientific and archaeological value. However, peatlands are increasingly threatened due to the decrease in the water table due to land uses that

involve drainage (agriculture, plantations, logging, shepherding, and extraction of peat for fuel). FAO estimates that drained peatlands currently account for 10% of total emissions from the agriculture, forestry, and land-use sector. In addition, peatland drainage alters vegetation cover, threatens biodiversity, decreases water quality, causes land subsidence, increases the frequency of fires, and generates other negative impacts on communities, their livelihoods, and the environment.

These results show that the actions of the environmental authority aimed at protecting the ecosystem, such as the declaration of the protection zone of the Fuquene Lagoon, are beneficial since they effectively give the ecosystem the possibility of recovering. However, these results demonstrate why the environmental authority mistakenly selected a management figure for the protected area (DMI). Therefore, it is not beneficial to the ecosystem and must consider modifying or re-categorizing its management figure for one that is stricter with the economic activities of the inhabitants and promotes the migration from a traditional economy to a more nourished economy diversified and contributing to climate change. Therefore, it is necessary that the environmental authority assumes the protective role of the natural resources of the area and directs rigid and loyal actions to this purpose, and does not make decisions derived from the economic or political interests of the individuals who occupy the territory.

On the other hand, Article 2.2.2.1.3.4. Decree 1076 of 2015 defines re-categorization, where it is established that the environmental authorities with competence in the designation of protected areas indicated in this decree may change the category of protection used for a given area if they consider that the area conforms to the regulation applicable to any other of the categories of SINAP. In this order of ideas, the environmental authority can take actions that allow to take up the course of things and effectively give a central and leading role to the ecosystem in which it works. It also indicates the rule that this procedure may be advanced at any time. The competent authority must officially inform to National Natural Parks of Colombia to keep updated the single register of protected areas, accompanying for this purpose a copy of the administrative acts demonstrating the information on the limits of the area in official IGAC cartography available, the conservation objectives, the category used and the permitted uses [19].

6. Conclusion

While it is true, protected areas appear on the scene, they do not do so in the first instance for purposes associated with sustainable development but rather with a purely conservationist connotation and dedicated to the maintenance of the biological, ecological, and evolutionary processes of the populations that were

immersed in the protected areas; however, with the changes in the perception of the environment that has been happening over time, protection and conservation of natural resources changes in the sense of the need for the existence and permanence of these elements in order to enjoy ecosystem services and achieve the objectives of sustainable development, since these resources constitute the productive base of nearby communities and humanity in general.

Protected areas are critical in keeping vital natural resources and ecosystem services. Although this new direction for protected areas is fundamental for their future and is recognized in the general objective of the Biological Convention, it will be necessary to rethink the logic in the formulation and declaration of protected areas to effectively harmonize conservation objectives, economic activities, and the reality of the territory, since from the correct coupling of these three criteria, natural spaces can be effectively managed. Colombia has a sufficiently robust body of regulations that facilitates and sets the course for managing protected areas; even so, the environmental authority must make an integrative analysis of the legal and technical fields in decision-making.

In this sense, it is preponderant that the environmental authority makes an in-depth analysis of the reality of the territory and evaluates the criteria that the standard requires in terms of function, structure, and composition of the ecosystems to subsequently define the best management figure that meets the conservation objectives, the objectives of the protected areas of SINAP, and the Sustainable Development Goals.

While it is true that the role of protected areas so far has been of great relevance in the permanence of natural resources, it is necessary to make use of the most appropriate regulatory strategies that allow sustainable use of the areas declared as protected. Unfortunately, numerous protected areas in the national territory are declared under different categories. Therefore, it is impossible to direct a large-scale development plan based on conservation territories since it would be very difficult to unify the use that can be given to the territory.

The environmental authorities in charge of the declaration, alignment, and administration of protected areas have a great responsibility to the communities of the territories to intervene in such a way that the suggestions and criteria assumed by the environmental authority must always be thought of the future benefit and survival of the natural complex and the entire population, and not to derive from the particular interests of some groups or productive sectors present in the territory.

Finally, the declaration as a protected area of the study zone can contribute as a strategy for compliance with the Sustainable Development Goals, specifically in relation to i) climate action, ii) life of terrestrial

ecosystems, and iii) sustainable communities through the change in the legal connotation of the territory, plans can be developed that faithfully pursue ecological restoration and recovery, the conservation of natural resources, and the improvement of the climatic conditions of the area; which will immediately be expressed in the possibility of executing activities of an economic, social and cultural nature without any interruption or with a higher degree of security.

The Management Plan of the Integrated Management District has high-quality base information, necessary and sufficient inputs to be clear about the reality of the territory to be intervened. Nevertheless, as a result of simple analysis, the environmental authority mistakenly selects a management figure that is not the most beneficial for the integrity of the ecosystem, even when it is clear about the needs of the wetland in question. For this reason, the decisions of the environmental authority must only and exclusively obey technical criteria that pursue the greatest benefit in time and space

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