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Review

A Review to Update the Protected Areas in Ecuador and an Analysis of Their Main Impacts and Conservation Strategies

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Abstract: Establishing new protected areas (PAs) is one of the first steps needed to reduce habitat loss and fragmentation, protect ecosystems that are of vital importance to conserve biodiversity, and even protect traditional cultures. The correct management of a PA can be beneficial for the different forms of life found within it and can provide multiple benefits to humanity and to the continued functioning of productive ecosystems. Protected Areas act as buffers for life while serving as sanctuaries and strongholds for species in the face of climate change. Within these areas, genetic diversity is enabled to evolve in response to the pressures of natural selection. The causes of biodiversity loss include changes in land use due to agriculture and urbanization, invasive species, overexploitation, and pollution. As stipulated, the current study aims to update the National System of Protected Areas (SNAP) by applying a review of scientific and gray literature. This review presents updated information; Ecuador currently has 74 protected areas, with state, decentralized autonomous, community, and private subdivisions. The main social and environmental impacts found in the protected areas included in the SNAP are presented in a review of the existing literature. Finally, strategies are proposed to improve the management of the protected areas of the SNAP focused on strengthening the conservation of their different life forms and the responsible use of their ecosystem services through more efficient and productive spaces.

Keywords: SNAP; tourism; protected areas; technology; ecosystems; Ecuador

1. Introduction

On the 18th July each year, Ecuador celebrates the anniversary of the National System of Protected Areas (SNAP), a system integrated by spaces which mainly aim to protect biodiversity, ecosystems, and landscapes, as well as preserve cultural diversity [1]. Protected areas (PAs) were created with preservation, care, and the want to stop environmental deterioration in mind, but they are also important for the value they provide to the public, as we make use of their services (such as the use of water for the population, energy, and generating sustainable development alternatives regarding tourism, food sources, and climate regulation) [2]. However, it is important to emphasize that their effectiveness will

depend on proper management, since their mere existence does not guarantee any of the aforementioned benefits. In addition, PAs are important for scientific research, environmental education, and human health [3]. Currently, the Ministry of Environment, Water and Ecological Transition is the state entity responsible for the administration of the SNAP, through the National Directorate of Biodiversity and PAs [4,5].

Biodiversity conservation has focused on the human interest in securing the ecosystem services provided by the natural environment [6,7]. These services provide benefits for human well-being, including tangible and intangible material goods [8,9]. They are divided into four types: provisioning services, regulating services, cultural services, and supporting services, achieving quality outcomes in different areas, such as sustainable agriculture, water, pollination, purified air, recreational enjoyment, sustainable forest management, and aesthetic values, through appropriate practices that address the use of the environment [10,11]. All components of ecosystem services aim to form a basis for the harmonious coexistence between humanity and nature. Today, this concept is increasingly used to inform land use planning, economic decision making, and biodiversity conservation in a specific territory or on a global scale [10,12].

PAs are one of the most important instruments for nature conservation and landscape management. The protection of an area contributes directly to the conservation of species and their habitats [13,14]. Conservation objectives can be achieved with the different categories of PAs. In nature and environmental contexts, PAs are created for a specific purpose or are under special protection so that other uses are regulated or excluded by the state. Finding effective conservation strategies has become one of the greatest challenges facing society today. These areas act as buffers for life while serving as sanctuaries and strongholds for species in the face of climate change. Within these areas, genetic diversity is allowed to evolve in response to the pressures of natural selection [10,12]. The rapid advance in the implementation of globalized development models, for the most part, has not kept pace with environmental realities, making this work vital for the future of conservation [15,16].

The criteria of the International Union for Conservation of Nature (IUCN) classify PAs according to their management objectives. The categories are recognized by international bodies such as the United Nations and many national governments as the global standard for defining and mapping PAs and, as such, are increasingly incorporated into state legislation. The objectives of these areas focus on managing and preserving ecosystems, species, and geodiverse features, as well as minimizing disruption through careful planning, conducting research and other authorized activities, and preserving the cultural and spiritual values associated with nature [17,18]. At the global level, the Aichi Biodiversity Conservation Targets and the Global Biodiversity Framework emphasize the importance of connectivity in PAs. Their respective aims call for 17% and 30% of the world's land area to be conserved through well-connected PAs and other effective area-based conservation measures.

Ecuador has 250,000 km^2 of territory, i.e., 1.5% of South America, yet is one of the countries with the greatest biodiversity on Earth, both in absolute number of species and in number of species per unit of surface area [19]. The country covers two of the five biodiversity hotspots in South America: the tropical Andes and the Tumbes—Chocó—Magdalena Hotspot. Ecuador is a biodiversity hotspot for endemic vertebrates, particularly for amphibians and reptiles, which constitute approximately 45% of the local species and for endemic vascular plant species, which constitute approx. 26%. In addition, continental Ecuador contains a variety of different ecosystems, such as paramo (alpine tundra), mangroves, cloud forests, and tropical rainforests; this includes three biomes: the Coast, the Andes, and the Amazon [20–22]. Despite these conservation efforts, Ecuador has the country with the second highest number of threatened species in the world, with a total of 2501 species, including 47 mammals, 86 reptiles, 169 amphibians, 1102 birds, 70 invertebrates, 66 fish, and 1954 endangered plant species. PAs are a key concept for safeguarding the integrity of natural habitats and their respective biodiversity [23,24]. That is why humanity decided to

respect these spaces full of life and prosperity, through PAs programs. Ecuador's first PAs was the Galapagos National Park, which was established in 1959, and is now included on the UNESCO World Heritage list [25].

The causes of biodiversity loss are changes in land use due to agriculture and urbanization, invasive species, overexploitation, and pollution. Additionally, within South America, Ecuador is one of the countries that has developed the most infrastructure in and around its PAs, which could generate high pressure on PAs and their fragmentation into isolated habitats. Worse still, 72% of the 4437 endemic vascular plants and about 10% of threatened amphibian species in Ecuador are not protected because they are found outside PAs. In addition, climate change is increasing pressure on biodiversity and ecosystem services in Ecuador [20,26].

However, every year, new areas are catalogued for protection, so society does not usually have a reliable source allowing them to know what is happening within the areas, much less to know the exact number of PAs in the country. Although this process should be effectively managed by the Ministry of Environment, Water and Ecological Transition, it has been observed that the information they provide is generally outdated. In this context, the present study focused on consolidating the total PAs of the SNAP in Ecuador as of March 2023 and identifying the main threats and their potential impacts in the economic, social, and environmental spheres. To meet these objectives, the methodology used was based on a bibliographic review of the scientific literature in databases such as Scopus, Web of Science, and regional databases, as well as the use of gray literature, which corresponds to documents that have not undergone a rigorous scientific review process (such as Regulations, Laws, Policies, Resolutions, Ministerial Agreements, among others).

2. Materials and Methods

2.1. Protected Areas Update

In order to respond to the first objective of the study on the update of the total number of PAs of the SNAP, a bibliographic review of the scientific and gray literature was conducted. Initially, a search of the scientific literature was performed in the Scopus and Web of Science databases, for which the following search parameters were applied: "National System of Protected Areas"/"Protected Areas" + "Ecuador." These parameters facilitated the acquisition of 21 and 81 documents, respectively. To eliminate duplicate documents and those not related to the topic of study, titles and abstracts were perused and filtered. Subsequently, 12 documents were finally considered [4,27–31]. This filtering process ensured that we had a reliable dozen of documents that detailed, in a consolidated manner, the total number of PAs. With this information, and in order to update the total number of PAs as of April 2023, a gray literature search was carried out, which consisted of accessing the repositories of ministerial agreements in the last 4 years to ensure we had reliable data on the total number of PAs in Ecuador.

Regarding the complementary gray literature, a search of the web pages for the Ministry of Environment, Water and Ecological Transition (MAATE)—the highest national environmental authority—repositories, and Ministerial Agreements was conducted. The latest ministerial agreements include the following: ministerial agreement no. MAATE-2021-020 [32], Ministerial Agreement Nro 2021-006 [33], ministerial agreement MAATE-2021-33 [34], ministerial agreement Nro. 2021-056 [35], ministerial agreement Nro. 2021-057 [35], ministerial agreement Nro. MAATE-2021-064 [35], ministerial agreement Nro. MAATE-2022-065 [36]. In the time span used in the search, filters and parameters were applied to refine the search and ensure that we only collected information relevant to the topics and objectives of the study. Additionally, the total number of documents obtained after the search was subjected to a manual filter, which consisted of reading the titles, years of publication, and source. This filtering allowed for the removal of documents that are not relevant to the study. It is important to highlight that the document "In-Situ and Ex-Situ Biodiversity Conservation in Ecuador: A Review of Policies, Actions and Challenges" was considered as a starting point [4]. Published in 2020, the review indicates the existence

of 60 PAs. To order the result of this first objective, the following fields were considered: number, year of creation, name of the area, management category, subsystem, and surface area [37].

2.2. Socio-Environmental Impacts and Conservation Strategies

A qualitative–quantitative double-entry technique was used to determine the environmental impacts. This technique has been widely used because it is easily adaptable to processes or activities related to anthropogenic activities [28–30]. The methodological process was divided into four steps. The first step consisted of identifying and describing the main threats of the PAs corresponding to the SNAP. The second step focused on the selection of the evaluation components. Six were established: two biotic (flora and fauna), two abiotic (soil and water), and two social (economic and social). The third step consisted of identifying impacts. In this process, a support table was elaborated. In the first row, the six components were listed, while in the first co-column the main threats were listed, which facilitated the identification of the impacts. Finally, as a fourth step, the magnitude of the impacts was determined (Table 1), and, in this process, the evaluation of threats and impacts was considered.

Table 1. Description of the magnitude of impacts.

Magnitude	Description
High	Those that are incompatible with conservation. Their presence would raise the prohibition of use or substantially modify the activities.
Medium	Those that can be compatible with conservation after the implementation of management measures.
Low	Compatible with conservation and susceptible to natural regeneration in the absence of activities.

Once the identification of the impacts was finalized, the following part of the progress matrix was constructed, wherein possible strategies that should and must be used to solve issues in the conservation areas were stipulated, with special emphasis being placed on actions that could be taken in the next 5–10 years. All strategies must be used in a responsible way, with the help of knowledgeable researchers, biologists, and entities responsible for the conservation of biodiversity, parish and cantonal governments, prefectures, as well as the major environmental force of the country, MAATE, etc.

3. Results and Discussion

Having established the methodological process, we proceeded to structure the presentation of the results. This section responds to each of the objectives and research questions that were initially established in the introductory section of this document. Thus, the list of PAs in the SNAP, updated as of February 2023, is presented. This is followed by an analysis of the main threats and a quantitative analysis of their impacts on the SNAP. Finally, the authors propose strategies to mitigate the threats and their impacts.

3.1. National System of Protected Areas (SNAP) Ecuador

The SNAP is the main national conservation strategy in Ecuador. At present, this system outlines 74 PAs (Table S1), which are categorized in the following way: six National Recreation Areas, fourteen National Parks, ten Wildlife Refuges, five Biological Reserves, four Fauna Production Reserves, seven Ecological Reserves, one Geobotanical Reserve, eight Marine Reserves, five Ecological Conservation Areas, three Community Protected Areas, two Decentralized Autonomous Protected Areas, and nine Private Protected Areas. In relation to the document of Mestanza (2020), in the last two years, fourteen protected areas have been added.

The SNAP's protected areas are distributed throughout Ecuador's four regions as follows: twenty-four on the coast, thirty-one in the highlands, fifteen in the Amazon, and

three in the Galapagos Island region. The landscapes that protect the PAs of the SNAP are forty-nine terrestrial, thirteen terrestrial-marine, and eleven marines. These protected natural areas are distributed among the twenty-four provinces of Ecuador, as outlined in the map below (Figure 1). The PAs of the continental SNAP have diverse amounts of territory, with the smallest amount belonging to the Samanes National Recreation Area, with 851.65 ha, whereas the Marine Reserve brotherhood is catalogued as the biggest, with approximately 6,000,000.00 ha.

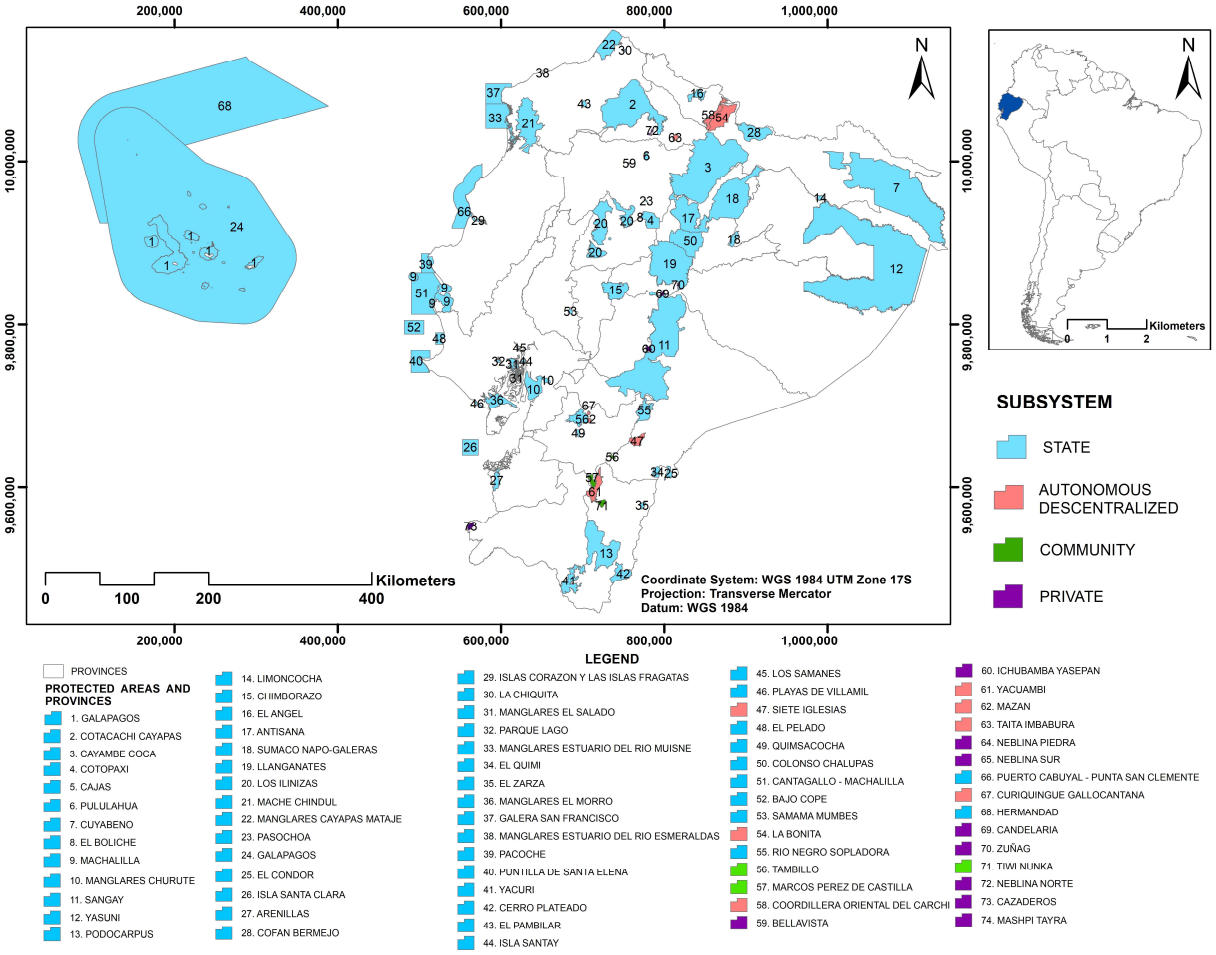

Figure 1. Total protected areas in Ecuador, according to the National System of Protected Areas (SNAP).

3.2. Main Threats and an Analysis of the Impacts on the SNAP

The bibliographic review process made it possible to explore the main documents on the activities and processes that influence the proper functioning of PAs to some degree. Thus, nine main threats were identified and consolidated (Table 2): climate change, deforestation, engineering works (infrastructure mining-oil and roads), fires, hunting, introduced species, land use change, tourism, and wildlife trafficking.

Once the main threats were identified, the impacts associated with biotic, abiotic, and socio-environmental components were evaluated (Table 3). Fourteen impacts caused by nine threats/activities were identified. The biotic component is generally affected by a loss of individuals and disturbance to ecosystems and their components. In the abiotic component, the main impacts are associated with disturbance and changes in properties such as soil, water, and atmosphere. Soil is generally affected by compaction and contamination processes. Water is generally affected in its properties due to contamination. Regarding economics, on the one hand, deforestation provides income to local communities,

but on the other hand, climate change actually damages plantations and agricultural activities, causing losses. In the social sphere, four of the nine threats are affected by disease.

Table 2. Description of the main threats in protected areas.

Threats	Description
Climate change	Climate change refers to the effect on the distribution, abundance, and quality of species or ecosystems and increasing threat from fires due to global warming.
Deforestation	Logging of timber species for commercial purposes within and around PAs.
Engineering Work (Infrastructure and roads)	Construction of new infrastructures linked to the different activities, mainly oil and mining. Additionally, the opening of roads for commercial purposes.
Fires	Direct impact on species, ecosystems, or cultural resources due to natural or anthropogenic fires.
Poaching	Activity that consists of killing an individual of a species for entertainment or commercial purposes.
Invasive Alien Species	Direct (elimination) or indirect (competition; disease transmission) impact on species or ecosystems due to the presence of exotic species or species introduced by anthropogenic activities such as tourism, livestock, trade, transportation, among others, within PAs.
Land use change	Direct (destruction) or indirect (isolation) impact on species or ecosystems due to changes in land use.
Aggressive tourism activities	Activities of any of the tourism segments developed within the SNAP.
Wildlife trafficking	Direct or indirect impact on species, ecosystems, or natural resources due to the direct action of complete or partial extraction of flora, fauna, or biological resources of any kind.

Table 3. Impacts associated with the components identified during gold mining in the parish.

Threats/ Activities	Components						
	Biotic		Abiotic			Socio-Economic	
	Fauna	Flora	Soil	Water	Atmosphere	Economic	Social
Climate change	Disturbance Loss of species	Disturbance/ Loss due to damage or removal	Disturbance	Disturbance	Contamination	Economic Loss	Diseases
Deforestation	Disturbance	Alteration/ Loss due to damage or removal	Disturbance	Disturbance Contamination	—	Income	—
Engineering Works (Infrastructure and roads)	Disturbance/ Loss of species	Disturbance/Loss due to damage or removal	Compaction	Contamination	—	—	Diseases
Fires	Disturbance/ Loss of species	Disturbance/Loss due to damage or removal	Disturbance	Contamination	Contamination	—	—
Poaching	Disturbance Loss of species	Disturbance	Contamination	Contamination	—	—	—
Invasive Alien Species	Disturbance/ Loss of species	Disturbance/Loss due to damage or removal	—	—	—	—	Diseases
Land use change	Disturbance/Loss of species	Disturbance/Loss due to damage or removal	Disturbance/ Biodiversity loss	Contamination	Contamination	—	Diseases
Aggressive tourism activities	Disturbance	Disturbance	Compaction	Contamination	Contamination	Income	—
Wildlife trafficking	Disturbance/Loss of species	Disturbance/Loss due to damage or removal	Compaction	Contamination	—	Income	—

The impacts previously identified in Table 3 were initially subjected to a qualitative evaluation according to their magnitude (high, medium, or low) and then transformed into a quantitative percentage according to the degree of repetition. The results of the evaluation show that the threats/activities mainly generate impacts of a high magnitude that are likely to affect the biotic and abiotic components (Table 4). Thus, with 50%, disturbance to flora

and fauna, loss of floral species, chemical contamination of the soil, and water pollution and contamination are of the highest magnitude. Medium magnitude impacts are present with 42.86% and are essentially due to the loss of fauna, disturbance, soil compaction and erosion, and diseases in populations within the PAs. Finally, 7.14% of the low magnitude impacts are due to atmospheric pollution caused by anthropogenic activities and economic income for local populations as part of the use of some of their resources.

Table 4. Main results of the magnitude of impacts caused by hazards in the National System of Protected Areas of Ecuador.

Component	Impact	Magnitude
Fauna	Disturbance of fauna by anthropogenic activities/threats. Loss of species.	High Medium
Flora	Disturbance to flora by anthropogenic activities/threats. Loss due to damage or removal.	High High
Soil	Compaction. Contamination by chemicals. Soil loss due to erosion. Disturbance to soil quality.	Medium High Medium Medium
Water	Disturbance. Contamination.	High High
Atmosphere	Contamination by suspended particulate matter.	Medium
Economic	Income. Economic Loss.	Low High
Social	Diseases	Medium
Results	*Low impact.* *Medium impact.* *High impact.*	*7.14%* *42.86%* *50%*

Within the SNAP, the National Parks have had a higher profile in terms of anthropogenic pressures in industrial fields (oil and mining), tourism, and agricultural and livestock activities [38,39]. For example, Yasuní, Podocarpus, Sangay, and Cayambe Coca National Parks have been invaded by oil and mining activities in recent years [38,40–42]. Machalilla, Galapagos, and Antisana Parks have experienced a large number of visitors, according to statistics from the Ministry of the Environment [43,44]. Therefore, this study considered it important to delimit the analysis to this management category with respect to the main anthropogenic pressures (Table 5).

Table 5. Main threats in protected areas.

Protected Areas	Anthropic Pressures	Socio-Environmental Conflicts
Galapagos National Park	Marine transport pollution, poor management of solid and hazardous waste. Loss of vegetation cover and soil erosion. Risk of invasive species, alteration of sessile and benthic species of the seabed. Distribution of marine fauna due to impact. Inadequate environmental awareness, financing for public management, employment and income generation [45–47].	Change in public policies for the archipelago, inadequate community management of resources, rejection by local communities, little local community control. Vulnerability to climate change, agricultural and fishing activities.

Table 5. *Cont.*

Protected Areas	Anthropic Pressures	Socio-Environmental Conflicts
Cotacachi Cayapas National Park	Pollution, deforestation, overexploitation of natural resources [20]. Contamination of the lagoon by tourist boats. Solid waste to soils dedicated to agriculture, consequence of monoculture and soil erosion.	Environmental degradation, scarcity of resources, illicit economies, soil degradation and deterioration.
Cayambe Coca National Park	Bad agricultural practices, urban sprawl, land trafficking, wildlife hunting, selective logging, overgrazing [48].	Lack of legal enforcement and establishment of sanctions, absence of sustainable community development, scarcity of land use planning and environmental awareness. Non-compliance of management in regulation and control.
Cotopaxi National Park	Harmful effects caused to the human population, environmental threats such as the degradation of their ecosystems, climate change, deforestation, pollution, and eutrophication [49].	Scarcity of resources, impact of their scarcity on society and politics. Urban and rural poverty, poor relations between communities.
Cajas National Park	Accelerated natural erosion, loss of vegetation cover, logging, burning, overgrazing, inappropriate crops. There are also landslides, landslides, water and soil contamination [49,50].	Saturation or flooding of land near water bodies, destruction of resources.
Machalilla National Park	Tourism and its different activities together with a less than optimal management contribute to the increase in impacts [45,51,52].	Illegal timber, mining exploitation, dispute between communities.

3.3. Strategies

Currently, the PAs cover important territorial extensions of indigenous peoples, communities, afro-descendants, and mestizos. In recent decades, several areas of the SNAP have suffered territorial conflicts between inhabitants and environmental authorities. PAs and indigenous people share legal [53–55], political, and technical differences; however, they can create complementary strategies for the conservation and improvement of the quality of life of rural populations and their PAs. In addition, they have access to sources of financing and technical assistance, thanks to their main characteristics. They allow experimentation with alternative production models and resource conservation practices.

One model for resolving conflicts is the recognition of indigenous lands; this process builds trust, promotes dialogue, consensus, and also allows for the creation of conditions for environmental democracy [56,57]. The following are the possible strategies that should and must be addressed in the National Parks of SNAP in the coming years (5–10) (Table 6). Each one of them was inscribed according to the needs of the area since some of them correspond to diverse conflict situations that surpass the position of a single individual responsible for the legitimate fulfillment of the action. That is to say, it is necessary to count with the help of several people involved in the area, such as biologists, research authors, Autonomous Decentralized Cantonal–Provincial Governments, research magazines, MAATE, national police, etc.

Table 6. Strategies.

Protected Areas	Strategies on Anthropic Action	Strategies on Socio-Environmental Conflicts
Galapagos National Park	Adequate implementation of sewage and wastewater processing plant, which does not affect the sea water and its species, especially drinking water. Better control over the agricultural extension in the sector. Efficient control of the coast guard and those responsible for the environment, such as pure and marine biologists. Training on environmental education.	Community demand on the proper management of resources, through public marches, environmental debates. Adequate control over overfishing in the area.

Table 6. *Cont.*

Protected Areas	Strategies on Anthropic Action	Strategies on Socio-Environmental Conflicts
Cotacachi Cayapas National Park	Efficient control over proper land use practices, vegetation, flora, and fauna. Change in the tourist system of boats on the lagoon.	The union of the communities through meetings that allow grouping and unifying social needs such as education, health, among others. Additionally, then these are presented to the authorities in charge of the management such as the Ministry of Environment, will allow a greater possibility of reaching achievements.
Cayambe Coca National Park	Training on the efficient and sustainable development of agricultural practices. Efficient control on indiscriminate hunting of wildlife, apply criminal and economic sanctions for those who carry it out.	Formation of community groups to control and monitor the PAs internal regulations. Complemented with training in environmental education in conjunction with the Ministries of Environment and Tourism.
Cotopaxi National Park	Control the means of transportation that circulate in the protected area, apply carrying capacity processes, delimit access limits, and promote reforestation with native species.	Trainings on undertakings on the use of resources in the sector, without harming the environment. Public union. Intervention of public and environmental organizations. Community union with public and private companies for the enhancement of community tourism.
Cajas National Park	Collective union of educational institutions, schools, universities, etc. With the aim of planting plant species to cover the desert part of the soil. Efficient control of public environmental and social organizations.	Community activities for the removal of debris from sidewalks and culverts. Proper garbage management.
Machalilla National Park	Training on sustainable tourism and environmental education. Creation of ventures with the help of environmental agencies and tourism organizations.	Functional control of environmental and social entities. Public union.
Sangay National Park	Community union for law enforcement. Adequate control of environmental organizations. Invitations to educational institutions to develop programs of control.	Intervention of provincial and cantonal entities, educational institutions, environmental companies, and other social forces.
Galapagos National Park	Adequate implementation of sewage and wastewater processing plant, which does not affect the sea water and its species, especially drinking water. Better control over the agricultural extension in the sector. Efficient control of the coast guard and those responsible for the environment, such as pure and marine biologists. Training on environmental education.	Community demand on the proper management of resources, through public marches, environmental debates. Adequate control over overfishing in the area.
Cotacachi Cayapas National Park	Efficient control over proper land use practices, vegetation, flora and fauna. Change in the tourist system of boats on the lagoon.	Public union to demand environmental, social, political, and economic rights.
Cayambe Coca National Park	Training on the efficient and sustainable development of agricultural practices. Efficient control on indiscriminate hunting of wildlife, apply criminal and economic sanctions for those who carry it out.	Community union to establish uses of the law for those who violate it. Environmental education trainings. Adequate control of the entities that watch over the environment.
Cotopaxi National Park	Control of automobiles using hydrocarbon burning. Criminal and economic enforcement. Training on excessive use of greenhouse gases, such as aerosols.	Trainings on undertakings on the use of resources in the sector, without harming the environment. Public union. Intervention of public and environmental organizations. Community union with public and private companies for the enhancement of community tourism.

Table 6. *Cont.*

Protected Areas	Strategies on Anthropic Action	Strategies on Socio-Environmental Conflicts
Cajas National Park	Collective union of educational institutions, schools, universities, etc. With the aim of planting plant species to cover the desert part of the soil. Efficient control of public environmental and social organizations.	Community mingas for the removal of debris from sidewalks and drains. Proper garbage management.
Machalilla National Park	Training on sustainable tourism and environmental education. Creation of ventures with the help of environmental agencies and tourism organizations.	Functional control of environmental and social entities. Public union.
Sangay National Park	Community union for law enforcement. Adequate control of environmental organizations. Invitations to educational institutions to develop programs of control.	Intervention of provincial and cantonal entities, educational institutions, environmental companies, and other social forces.

4. Conclusions

Ecuador currently has seventy-four PAs distributed in the four regions, twenty-four on the coast, thirty-one in the Andean, fifteen in the Amazon, and three in the island region. Of these areas, fifty-five belong to the State, seven to Decentralized Municipal Governments, three to communities, and eight are managed by the private sector. The country has fourteen National Parks, ten Wildlife Refuges, eight Marine Reserves, eight Marine Reserves, nine Private Protected Areas, seven Ecological Reserves, six National Recreational Areas, five Ecological Conservation Areas, five Biological Reserves, four Fauna Production Reserves, three Community Protected Areas, two Decentralized Autonomous Protected Areas, and one Geobotanical Reserve. The country's protected areas are subject to anthropogenic pressures such as climate change, deforestation, engineering works (infrastructure and roads), fires, poaching, invasive alien species, land use change, aggressive tourism activities, and wildlife trafficking. If protected areas are not managed according to basic conservation principles, they may be subjected to impacts that will affect their biodiversity and productivity with respect to ecosystem services.

After analyzing the threats, 50% of them have a high impact. These high-magnitude impacts are associated with activities related to engineering works, such as the oil and mining industry, and these impacts occur in protected areas of the Ecuadorian Amazon. Tourism activities also affect high-demand protected areas such as the Galapagos National Park, Cuyabeno Fauna Reserve, Yasuní National Park, and Chimborazo Fauna Reserve. The high impact on the biological environment is mainly linked to the loss and disturbance of fauna and flora. In the abiotic environment, soil and water are generally affected by high levels of contamination. Regarding the loss of biodiversity, the magnitude of the impact is medium. In this sense, with good management, it is possible to preserve the different species in protected areas. Actions should be oriented towards the proper control and monitoring of environmental management plans for activities permitted in protected areas, such as the oil and mining industries. On the other hand, protected area management plans should focus their efforts on updating these documents and include studies on carrying capacity and the evaluation of the magnitude of impacts.

Based on these results, we are aware that in-depth studies should be performed for each category and protected area since the reality of each one is different, either because of their environmental conditions or because of the two forms of anthropogenic pressures to which they are exposed. One of the main limitations and complications in this study was the difficulty in accessing the different ministerial agreements in order to consolidate the new protected areas. In this regard, the Ministry of Environment, Water and Ecological Transition, as the governing body of the SNAP, should improve its management and keep information channels updated in a practical and effective manner.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/environments10050079/s1. Table S1: Protected Areas Update Categories and subsystems.

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