

Protected Natural Areas: A literary analysis of the Decrees of the Cerro de San Juan Biosphere State Reserve in Nayarit

Áreas Naturales Protegidas: Un análisis literario de los Decretos de la Reserva Estatal de la Biosfera Cerro de San Juan en Nayarit

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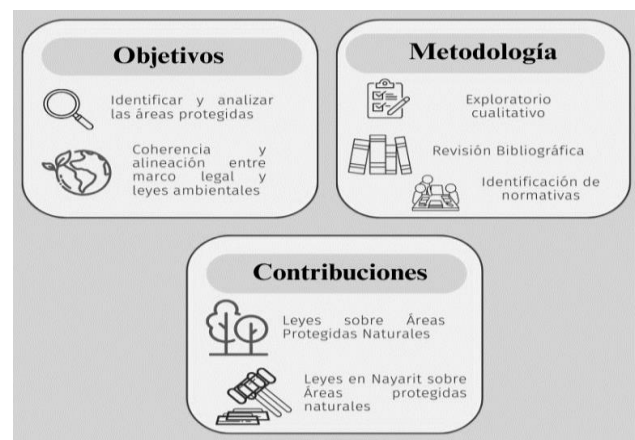
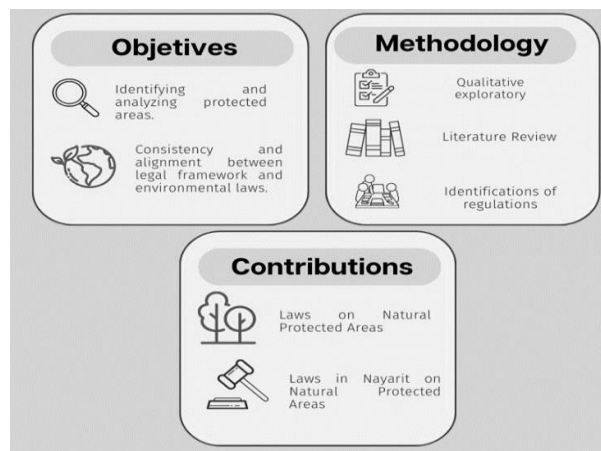


Abstract

Protected Natural Areas (ANP) in Mexico are key to conserving biodiversity but face challenges due to poor management and violations of environmental laws, resulting in degraded habitats. The LGEEPA and state laws are essential for their conservation, requiring alignment of local governments. Collaboration among governmental entities, research centers, and society is crucial to establish ANP that comply with environmental policies. A study in 2023 analyzed environmental legislation and its impact, aiming to identify effective regulations for local communities. For effective conservation, ANP need appropriate management categories, zoning, and plans supervised multidisciplinary. This approach will ensure efficient management aligned with national goals for conserving and restoring ecosystems in Mexico.

Resumen

Las Áreas Naturales Protegidas (ANP) en México son clave para conservar la biodiversidad, pero enfrentan desafíos por mala gestión y violaciones a leyes ambientales, resultando en hábitats degradados. La LGEEPA y leyes estatales son fundamentales para su conservación, requiriendo alineación de gobiernos locales. La colaboración entre entidades gubernamentales, centros de investigación y la sociedad es esencial para establecer ANP que cumplan con políticas ambientales. Un estudio del 2023 analizó legislación ambiental y su impacto, buscando normativas efectivas para comunidades locales. Para una conservación eficaz, las ANP necesitan categorías de manejo, zonificaciones y planes adecuados, supervisados multidisciplinariamente. Este enfoque garantizará una gestión eficiente alineada con objetivos nacionales de conservación y restauración de ecosistemas en México.



Protected natural areas, Environmental legislation, Biodiversity

Áreas Naturales protegidas, Legislación ambiental, Biodiversidad

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Introduction

Biodiversity is currently defined as all variation in the hereditary base at all levels of organization, from the genes in a local population or species, to the species that make up all or part of a local community, and finally in the communities themselves that make up the living part of the world's multiple ecosystems (Reaka-Kudla et al., 1997). One of the central elements in the strategy for biodiversity conservation in any country is the construction of a system of natural protected areas. The evaluation of the effectiveness of each area should be based on its contribution to conservation, but in the terms established by the designated management category (Íñiguez et al., 2014).

Natural Protected Areas (NPAs) are clearly defined geographic spaces, recognized and managed, through legal or other types of effective means to achieve the long-term conservation of nature and its ecosystem services and associated cultural values. In Mexico, NPAs are considered environmental policy instruments that seek the conservation of biodiversity, the sustainable use of natural resources and the maintenance of the environmental services they provide. Currently, the country has 182 federal NPAs, covering a total area of 90,839,521.55 hectares, which represents approximately 10.78% of the national territory (CONANP, 2023).

In the state of Nayarit, located in the western region of Mexico, there are several Natural Protected Areas that seek to preserve the natural and cultural richness of the state. Among the most outstanding NPAs in Nayarit are the Marismas Nacionales Biosphere Reserve, which protects important coastal wetlands and is home to a great diversity of aquatic birds; the Isla Isabel National Park, a volcanic island that is home to important colonies of marine birds and is a nesting site for the frigate bird; and the Sierra de Vallejo Biosphere Reserve, which protects tropical and temperate forests, as well as a great variety of endemic and endangered species of flora and fauna.

These NPAs, along with others present in the state, contribute to the conservation of Nayarit's natural heritage and provide important environmental services to the local and regional population (SEMARNAT, 2016).

Problem Statement

It is known that the mining industry has a negative reputation in environmental terms in developing countries (Muduli et al., 2013).

In very recent studies in the Mount Korok area, Juba, Central Equatoria State, South Sudan, according to studies by Moilinga y Athian (2023) rock cutting and quarrying activities have been found to affect the environment in general, including the destruction and removal of local vegetation cover, particularly grass and non-woody herbaceous plants in low-lying areas. The physical crushing, excavation and removal of rocks produces high concentrations of particulate matter (dust), fumes, smoke and other gaseous substances, which negatively affect vegetation in the vicinity of quarrying areas.

Another similar study is found in Latin America, especially in Colombia, where there is a problem related to the extraction of stone materials in the Caño Camelias tributary of the Municipality of Guamal, located in the Department of Meta, in the Vereda Húmadea. In this case, it has been the inhabitants who have presented disagreements, due to the fact that the National Government, regional and local entities do not do anything to take care of the habitat, even though there are different regulations in force to address conflicts such as the alteration of the aquatic ecosystem.

This has resulted in the exploitation and expansion of mining concessions, which generates environmental and social conflicts in this area of the country, which increase due to the basins where deposits rich in stone materials are found. In this sense, the development of not only formal but also informal mining reflects an obsolete development in good mining practices proposed by the Ministry of the Environment (Aya Angie et al, 2022).

Based on the comments made in Colombia, it is important to generate more research to show to what extent and under what conditions environmental regulations can be established and applied to obtain positive environmental results and maintain competitiveness in the mining industry.

To address this problem, Kusi-Sarpong, Sarkis and Wang (2016) propose the adoption of green practices in management, given that the activities that make up the mining production chain (exploration, extraction, processing and metallurgy) have serious environmental and social impacts, with important economic implications. For example, exploration involves the removal of vegetation, which causes erosion and habitat destruction; excavation, loading and transport of ore can disturb natural water flows or increase sediment loads in rivers; rock removal and excess water generate dust in the air.

These internal mining operations require careful attention and mitigation, which implies an extended responsibility from the producer to other stakeholders (customers, suppliers, society, government).

In Brazil, the study by Nepstad et al. (2006) analyzes land use conflicts in the Brazilian Amazon, focusing on the role of protected areas. The study found that protected areas can exacerbate land-use conflicts by restricting access to resources and creating competition between different interest groups.

Another study in Colombia, by Rodriguez and Van der Hammen (2012) examines land-use conflicts in the Serrania de Chiribiquete National Natural Park, Colombia. The study found that conflicts are driven by a variety of factors, including agricultural expansion, mining, and tourism. Similarly, in Peru, Naughton-Treves and Weber's (2009) study analyzes land-use conflicts in Tambopata National Reserve, Peru. The study found that conflicts are mainly caused by illegal logging, mining and agriculture. On the other hand, in India, the study by Nautiyal and Khera (2016) investigates land use conflicts in Corbett National Park, India. The study found that conflicts are mainly caused by the expansion of agriculture and grazing, as well as tourism and infrastructure development. And in South Africa, the study by Biggs and Rogers (2000) examines land-use conflicts in Kruger National Park, South Africa. The study found that conflicts are caused mainly by agricultural expansion, grazing and tourism.

For its part, Mexico has an immense natural wealth of animal species, flora, precious woods, and reefs, among others.

On the road to economic growth and development, the country has created a series of regulatory guidelines on the environment, in addition to its adherence to international treaties and agreements, thus ensuring a healthy environment. These indicate how to use natural resources, the timeframe, who can do so, the penalties and responsibilities in the event of non-compliance, as well as the obligation to restore the damage caused (Globalstd, 2023).

In this sense, in Mexico, the General Law of Ecological Balance and Environmental Protection identifies Natural Protected Areas (LGEEPA) as: "The areas of the national territory over which the nation exercises sovereignty and jurisdiction, in which the original environments have not been significantly altered by human activity, or whose ecosystems and integral functions require preservation and restoration" (DOF, 2012).

The use of natural resources and economic activities in these NPAs are subject to regulations through various legal frameworks, also known as "environmental legislations" or "Eco laws", as indicated by (Castro-Salazar & Tovar-Cabañas, 2018). At the federal level, the LGEEPA is the main legal framework, while, at the state level, the State Environmental Laws of each federative entity, along with decrees, regulations and norms, play a crucial role in their regulation. Throughout the evolution of human beings and their progress in the scientific, industrial and economic fields, the imperative need to establish rules has arisen, this with the objective of preventing an imminent collapse in itself. This has led to the development and use of regulatory standards around the world and in various spheres, covering aspects such as health, economics and human rights.

However, having a defined and robust legal framework does not always guarantee effective representation of NPAs, which puts both environmental protection and sustainable development at risk. It is important to note that there is uncertainty about the alignment of local jurisdiction NPA decrees with the requirements of State Environmental Laws. In addition, it is uncertain whether the local legal framework has fully adhered to the guidelines of the LGEEPA in terms of establishment and nomination of state NPAs.

The purpose of the present study was to analyse whether current environmental legislation facilitates an adequate representation of NPAs in the state, within the decrees established for the conservation and restoration of the Cerro de San Juan biosphere state reserve area, which is located in the state of Nayarit. This was achieved through two main approaches:

(1) Identifying the key characteristics of the NPAs under local jurisdiction, as established in the decrees, and

(2) To assess the coherence between the legal framework of these local decrees and the State Environmental Laws and the LGEEPA, in terms of the creation of NPAs.

Research Question

Based on the problem posed, one main research question and two secondary research questions can be established.

Main

To what extent does the current environmental legislation contribute to an adequate representation of the Natural Protected Areas (NPAs) in the state of Nayarit, specifically in the area of the Cerro de San Juan Biosphere State Reserve, through the decrees established for its conservation and restoration?

Secondary

1. What are the key characteristics of the NPAs of local jurisdiction in the state of Nayarit, as established in the decrees for the conservation and restoration of the Cerro de San Juan Biosphere State Reserve area?

2. How is the coherence between the legal framework of these local decrees and the State Environmental Laws and the General Law of Ecological Balance and Environmental Protection (LGEEPA) evaluated in terms of the creation and management of NPAs in the state of Nayarit?

These questions will guide the research towards a detailed analysis of environmental legislation and its impact on the protection and management of natural protected areas, focusing on a specific but relevant case to understand the overall picture in the state of Nayarit.

Theoretical framework

The Ministry of Environment and Natural Resources (SEMARNAT) is the government agency whose fundamental purpose is to establish a State policy of environmental protection, which reverses the trends of ecological deterioration and lays the foundations for sustainable development in the country, in conjunction with the National Council of Protected Natural Areas (CONANP), which also aims to conserve Mexico's natural heritage through the Protected Natural Areas and the Regional Sustainable Development Programmes in Priority Regions for Conservation (CONABIO, n.d.). (CONABIO, n.d.). Environmental legislation is a set of treaties, conventions, statutes, laws and regulations; its main objective is to regulate the interaction between humans and the rest of the components of the natural environment. Among its main areas are pollution control, remediation and conservation of resources and environmental management (Hernández, n.d.).

Taking into account all these factors, the need arises to create laws that can generate the preservation and restoration of the ecological balance. In Mexico there are different laws that help to regulate all environmental aspects, some of them are the following: (a) General Law on Ecological Balance and Environmental Protection, (b) Law on National Waters, (c) General Law on Sustainable Forest Development, (d) General Law on Wildlife, (e) Law on Sustainable Rural Development, (f) General Law for the Prevention and Integral Management of Waste, (g) Law on Biosafety of Genetically Modified Organisms, (h) Law on Organic Products, (i) General Law on Sustainable Fisheries and Aquaculture, (j) Law on the Promotion and Development of Bioenergy, (k) Federal Law on Environmental Responsibility, (l) General Law on Climate Change (CESE, 2021). According to Art. 44 of the General Law on Ecological Balance and Environmental Protection (LGEEPA), Natural Protected Areas (NPA) are areas of the national territory and those over which the Nation exercises sovereignty and jurisdiction, in which the original environments have not been significantly altered by human activity, or whose ecosystems and integral functions require preservation and restoration, shall be subject to the regime provided for in this Law and other applicable regulations (CONANP, 2023).

The underlying purpose of the General Law on Ecological Balance and Environmental Protection is to conserve the biological diversity represented by the various ecosystems, ensuring the balance and continuity of evolutionary and ecological processes, without essentially modifying their characteristics. These areas are managed by means of a policy instrument that has a more precise legal definition, regulating activities according to the normative framework established by the General Law on Ecological Balance and Environmental Protection. In addition, they are subject to specialised regimes of protection, conservation, restoration and development, categorised according to the provisions of the CONANP legislation (CONANP 2023).

Complementarily, Natural Protected Areas (NPAs) aim to monitor the sustainable use of resources within the area to ensure the preservation of specific flora and fauna. They also aim to promote research and study of these ecosystems to generate knowledge and facilitate their sustainable use. NPAs can have social, economic, cultural and educational potential, and proper tourism management can contribute to the economic, social and environmental development of the territory and local communities (De Souza & Franco, 2023; Blanco-Cerradelo et al., 2022).

The forestry profession plays a crucial role in preserving the health and stability of forests within protected areas, including monitoring and implementing environmentally friendly protection measures. Protection of natural areas is essential to prevent biodiversity loss and habitat degradation, and proper organisation of protection measures is necessary to minimise negative impacts on nature and ensure abundance and sustainable use of natural resources (Zyablova, 2022). The effectiveness of protected areas can be assessed using methods such as large-scale outcome evaluation, which allows monitoring changes over time at a large scale (Rivarola et al., 2022).

Study area

The study area is the Sierra de San Juan. Seven natural vegetation units are recognised: a) tropical sub-deciduous forest, b) mountain mesophyll forest, c) oak forest, d) pine forest, e) mixed oak-pine forest and f) secondary scrub.

It was declared as a Conservation and Ecological Balance and Environmental Regeneration Reserve ‘Cerro de San Juan’, on October 28th, 1987, by the Government of the State of Nayarit, more for conjunctural situations than with scientific knowledge bases, for its delimitation only the elevation 980 m above sea level was used as a criterion; in the municipalities of Tepic and Xalisco. It was reclassified as a Biosphere Reserve by decree published on 18 October 2003, where its delimitation was modified to adjust it to the Tepic Urban Development Plan 2000-2020, which contemplates urbanisation up to 1080 m above sea level, in addition to excluding large areas of crops that surrounded the previous elevation. Its management programme was published in December 2008; subsequently, on 18 June 2011, in order to exclude the exploitation of stone materials from the Reserve, its polygon was reformed by decree, reducing its surface area to 19,912 hectares (P.O.E.N., 2019).

Box 1

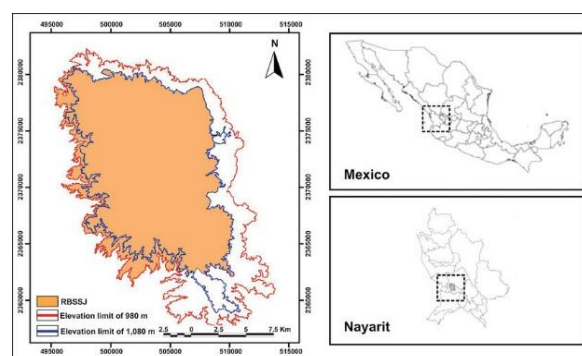


Figure 1
Location of the state biosphere reserve Sierra de San Juan in the Sierra San Juan, Nayarit.

Modified from González (2010)

Methodology

Approach and type of study, relevance of the research. This is an exploratory study of a qualitative nature, it is a documentary research and according to the sources consulted it is of the bibliographic type; methodologically speaking, the following was complied with: Through specialised databases and consultation spaces such as official websites, where information was found regarding the problem under investigation, on how current environmental legislation contributes to an adequate representation of the Natural Protected Areas (NPA) in the state of Nayarit.

Specifically in the area of the Cerro de San Juan biosphere state reserve, through the decrees established for its conservation and restoration, a survey of sources was carried out in which first the available texts on this subject were consulted and a selection of the most specific documents possible was made.

This implied carrying out a bibliographic review, in which we sought to identify the regulations and social, political and environmental impacts related to the exploitation of Natural Protected Areas. In addition, we looked for the best way to take advantage of them and adapt them to the needs that arise, for the benefit of the localities, as this is in great demand; we also sought to define strategies that would allow for the adequate development of these activities through the environmental regulatory norms and the benefit of the interested parties. The importance of developing the study is that it will facilitate the identification of the possible impacts of non-compliance with current regulations, due to the opacity in the application of the laws by the state government. This leads to the generation of economic, political and social conflicts.

Subsequently, a review of sources was carried out with the aim of determining the existing material on the topic under investigation, thereby filtering the content, discarding that which was not useful for the present research; the materials were then selected in detail, finding mainly decrees, legal frameworks and regulatory laws, with which a thorough review of the selected material was carried out, but this time taking textual quotations that allowed the arguments that support the present study to be mapped out.

In order to locate the necessary bibliographic documents, various sources of documentary information were used. This in the course of June to December 2023, a bibliographic search was carried out in internet search engines, such as Google Chrome, Google academic, as well as in the databases of the official newspaper of the state of Nayarit, laws and constitutional decrees of Mexico and repositories of different universities, as well as in physical books of authors, using key terms such as decrees, environmental legislation, natural protected areas, theses and other related articles of reading and criticism.

Likewise, for the bibliographic review, studies were selected that would provide information on the formal aspects necessary to carry out a critical reading of documents and the steps to carry out a bibliographic review. To achieve this, digital databases from different universities were used, such as: the Autonomous University of Nayarit, Autonomous University of Ciudad Juarez, Autonomous University of Aguascalientes, Cooperative University of Colombia, as well as the official newspaper of the state of Nayarit to search for the different norms and laws that govern the environment in Mexico.

Development and discussion

To define the limits of the reserve, the officials did not base themselves on a justification study that would highlight the value of the biodiversity elements, the landscape or the most outstanding natural processes; instead, the criteria used for its delimitation was the area that would be included above the altitude of 980 m above sea level, which meant that areas with human settlements such as Xalisco, Tepic and El Ahuacate were included, as well as large areas of cultivated land.

With this initiative, in 1987 Nayarit came to possess two decreed protected areas, one as a national park (Isla Isabel) and the other as a state ecological reserve (Sierra de San Juan), covering barely 1% of the state's territory ([González Flores, 2010](#)).

It is important to point out that the Sierra de San Juan has traditionally been subject to economic exploitation based on activities such as crop and perennial agriculture, exploitation of forests, livestock and extraction of materials for construction; all these activities have been developed without any vocational planning which, to date, has resulted in the alteration and ecological imbalance of the environment, and this is expressed in the depletion of water tables, deforestation, forest fires, soil loss, atmospheric and water pollution and deterioration of the landscape in general.

All this has direct repercussions on the decrease of the region's floral and faunal biodiversity, and indirectly, on the alteration of the population of Tepic, the state capital ([Bojórquez Serrano & López García, 1995](#)).

According to the Municipal Planning Institute of Tepic (2000), the third function of the city as a mining centre has appeared in the last century, due to the proliferation of construction material mines in the San Juan hill, a function that has been consolidated since the exhaustion of the 'Loma del Toro' mine and the accelerated demographic growth that Tepic has had in comparison to the rest of the State.

The analysis of the coherence between local and federal regulations in the creation of Natural Protected Areas (NPAs) in South-Southeast Mexico revealed that, although most of the decrees partly follow the guidelines of the State Environmental Laws for the establishment of local NPAs, there are notable disagreements, especially with regard to the nomenclature of the management categories as compared to what is stipulated in the state laws.

This is often due to a lack of knowledge or willingness on the part of local authorities to implement effective environmental policies, resulting in hasty or inappropriate categorisation decisions, influenced by political interests or governmental plans that may compromise the management and sustainable use of these areas.

Conclusions

In order to answer the main research question: To what extent does the current environmental legislation contribute to an adequate representation of the Natural Protected Areas (NPA) in the state of Nayarit, specifically in the area of the Cerro de San Juan biosphere state reserve, through the decrees established for its conservation and restoration?

It is necessary to answer the secondary questions: What are the key characteristics of the NPAs of local jurisdiction in the state of Nayarit, as established in the decrees for the conservation and restoration of the Cerro de San Juan state biosphere reserve area? And how is the coherence between the legal framework of these local decrees and the State Environmental Laws and the General Law of Ecological Balance and Environmental Protection (LGEEPA), in terms of the creation and management of NPAs in the state of Nayarit, evaluated?

The current environmental legislation in Mexico, particularly the General Law on Ecological Balance and Environmental Protection (LGEEPA) and the State Law on Ecological Balance and Environmental Protection of Nayarit (LEEN), provides a legal framework for the creation and management of Natural Protected Areas (NPAs). The Decree declaring 'Cerro de San Juan' as a State Biosphere Reserve, published in the Official Gazette of the State of Nayarit on 22 July 2010, establishes the basis for the conservation and restoration of this important natural area. The decree defines the objectives of the reserve, which include the protection of biodiversity, the conservation of ecosystem services and the promotion of sustainable development in the region. It also establishes the reserve's zoning categories, which include core zones, buffer zones and transition zones.

Consequently, the creation of the Cerro de San Juan State Biosphere Reserve is an important step towards ensuring the long-term protection of this valuable ecosystem. However, it is essential that the state government and responsible authorities effectively implement and enforce the provisions of the decree to ensure that the reserve meets its conservation objectives. The impact of mining activities on the environment goes beyond extraction, generating serious consequences such as deforestation, habitat destruction and air and water pollution. These activities pose a significant threat to biodiversity and ecosystem health, requiring strict regulations and enforcement mechanisms to mitigate their adverse effects.

However, the alignment of state environmental laws with the LGEEPA is not only crucial, but imperative to ensure a coherent and comprehensive approach to conservation efforts. By harmonising state regulations with national environmental policies, a unified framework can be created that promotes sustainable practices, protects natural resources and effectively mitigates environmental degradation.

It is recommended that optimising Natural Protected Areas to benefit local communities involves a multi-faceted approach that goes beyond legal compliance.

It requires the development of tailored strategies that consider the socio-economic context, cultural particularities and ecological sensitivities of each region.

Collaboration between government agencies, research institutions and civil society is essential to design and implement conservation initiatives that not only protect biodiversity, but also support community well-being and sustainable development.

Consequently, in order to establish an effective conservation policy through state NPAs, it is imperative that governments develop criteria in line with the LGEEPA, ensuring that decreed NPAs have adequate management categories, zonings aligned with their objectives and well-defined management plans.

The Decree declaring the ‘Cerro de San Juan’ Biosphere Reserve as a State Protected Natural Area establishes the following key characteristics for NPAs of local jurisdiction in the state of Nayarit: (a) Conservation objectives: NPAs must establish clear and specific objectives for the conservation of biodiversity, ecosystem services and cultural values; (b) Zoning categories: NPAs should be divided into different zoning zones, each with its own objectives and use regulations; (c) Management plans: NPAs should have management plans that describe the actions and strategies needed to achieve conservation objectives; (d) Social participation: Local communities and other stakeholders should be involved in the planning and management of NPAs; (e) Financing: NPAs should have sufficient sources of funding to cover management and conservation costs.

In this sense, the legal framework of local decrees for the creation and management of NPAs in the state of Nayarit is generally consistent with the State Environmental Laws and the LGEEPA. However, there are some areas where local decrees could be strengthened to ensure greater alignment with the federal legal framework. For example, the LGEEPA establishes that NPAs must have management plans approved by the Ministry of Environment and Natural Resources (SEMARNAT). However, the Decree declaring ‘Cerro de San Juan’ a Protected Natural Area as a State Biosphere Reserve does not explicitly mention the need for a management plan.

Furthermore, the LGEEPA establishes that NPAs must have mechanisms for social participation in their planning and management. Although the Decree declaring ‘Cerro de San Juan’ a Protected Natural Area as a State Biosphere Reserve mentions the importance of social participation, it does not provide specific details on how this participation will be implemented. In general, the legal framework for the creation and management of NPAs in the state of Nayarit is sound and provides a basis for the long-term conservation of the state's natural resources. However, local decrees could be strengthened to ensure greater alignment with the federal legal framework and address the specific concerns of local communities and other stakeholders.

Finally, it is crucial to maintain constant vigilance in the declaration and management of NPAs. This requires collaboration between the federal government, state governments, research centres and civil society to carry out meaningful multidisciplinary studies and review environmental legislation. The process of declaring a NPA should start with the establishment of a clear conservation objective, to ensure its efficient management in accordance with the national policy of conservation and restoration of ecosystems in Mexico.

Declarations

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Authors' Contribution

The contribution of each researcher in each of the points developed in this research, was defined based on:

Gómez-Pintado, Rocío: Contribuyó con la idea principal y la realización del proyecto, así como el primer borrador.

Zepeda-Martínez, Gabriel: Contribuyó con la revisión en redacción y estilo, así como la revisión y modificación de citas y referencias, y finalmente la adaptación al formato de ECORFAN.

Article

Enciso-Arámbula, Rosalva: Contribuyó con el asesoramiento en temas de sustentabilidad, estructura del artículo, normatividad y leyes vigentes en sustentabilidad.

Soto-Ceja, Edel: Contribuyó como asesor experto en temas de desarrollo Urbano, Sustentabilidad y preservación de áreas protegidas.

Availability of data and materials

La disponibilidad de los datos y materiales se encuentran en posesión de los autores del estudio. Favor de comunicarse a gabrielzepeda@uan.edu.mx para obtener los datos.

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Abbreviations

ANP	Áreas Naturales Protegidas
LGEEPA	Ley General de Equilibrio Ecológico y Protección Ambiental
LEEN	Ley Estatal de Equilibrio Ecológico y la Protección al Ambiente

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Background

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