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Sustainability of nature-based enterprises in Mexico

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ABSTRACT

Objective: To evaluate the performance of the economic, social, and environmental dimensions of Nature-Based Enterprises (NBE) in Mexico, with the aim of identifying positive deviants and the key factors that explain such differentiation.

Design/Methodology/Approach: An exploratory mixed-methods study was conducted using the enterprise as the unit of analysis. A total of 23 NBEs across 13 Mexican states were evaluated through purposive sampling. Between May and September 2023, 23 surveys were administered to enterprise representatives, and 9 interviews were conducted with key informants. The analysis included a descriptive phase and the calculation of economic, social, and environmental performance indices using an adapted methodological framework. Subsequently, hierarchical cluster analysis identified four categories of enterprises consolidated, developing, adapting, and incipient which were compared through ANOVA, mean difference tests, and chi-square tests.

Results: The study revealed that NBEs in Mexico achieved an average sustainable performance index of 0.85, with over 60% of cases scoring above the mean. Economic performance showed the greatest variability, social performance was moderate, and environmental performance remained relatively consistent across enterprises.

Limitations/Implications: The use of a purposive, non-probabilistic sample limits the generalizability of the findings to the broader NBE population.

Findings/Conclusions: The consolidated enterprises represented the closest cases to positive deviants. The findings suggest that NBE performance is enhanced by participatory governance, a clear organizational mission, economic diversification, certifications, and investment in capacity building and marketing. Conversely, key obstacles include reliance on initial subsidies, seasonal activity patterns, regulatory gaps, and weak organizational cohesion.

Keywords: economic diversification, governance, nature-based enterprises, sustainable performance.

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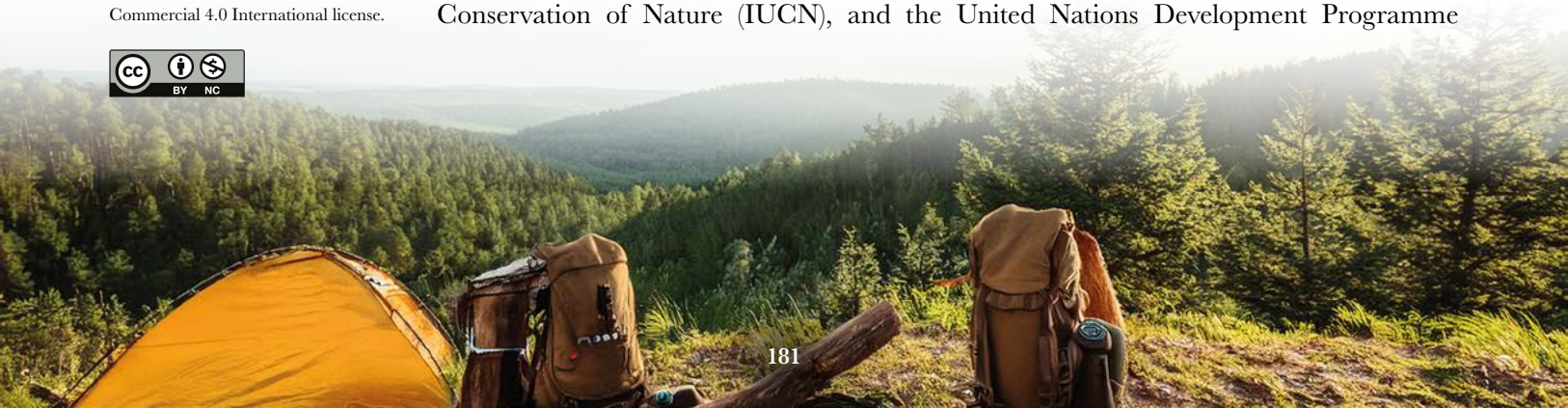
INTRODUCTION

The accelerated loss of biodiversity and the degradation of ecosystems represent global challenges with direct impacts on human well-being, food security, and economic stability (Meza & Rodríguez, 2022). International organizations such as the Organisation for Economic Co-operation and Development (OECD), the International Union for Conservation of Nature (IUCN), and the United Nations Development Programme



(UNDP) have highlighted a financing gap that hampers both the fulfillment of international commitments and the continuity of conservation policies (Deutz *et al.*, 2020). In Mexico a megadiverse country and an emerging economy these challenges are intensified by the need to simultaneously fund development priorities, biodiversity conservation, and climate policies, all within a context of increasing pressure on natural resources and declining budgets for the environmental sector. In response, alternative mechanisms are needed to complement public and international financing (Peña-Azcona *et al.*, 2022; Sosa & Ivanova, 2025). At the international level, Nature-Based Solutions (NbS) have been recognized as strategies that seek to align development goals with ecosystem protection (Meza & Rodríguez, 2022). The OECD (2020) defines them as "actions that protect, sustainably manage, or restore natural ecosystems, with the goal of maintaining or enhancing ecosystem services to address a range of social, environmental, and economic challenges." Within this framework, enterprises that contribute to the development and implementation of NbS are known as Nature-Based Enterprises (NBE) (Collier *et al.*, 2023).

Kooijman *et al.* (2021) and McQuaid *et al.* (2021) define NBEs as businesses engaged in economic activities that use nature sustainably as a central component of their product or service offering. Their interaction with nature may be direct through cultivation, harvesting, sustainable use, or ecosystem restoration or indirect, via the planning, implementation, or management of NbS. These enterprises contribute positively to biodiversity and ecosystem services.

NBEs may adopt various organizational forms, including conventional businesses, social enterprises, community associations, or non-governmental organizations (McQuaid *et al.*, 2021). In the literature, institutions such as the World Bank, FAO, and UNDP have referred to these entities as Community Forest Enterprises (CFEs), Sustainable Forest Enterprises, or Community-Based Tourism Enterprises (World Resources Institute *et al.*, 2008). In Mexico, the General Law on Forest Development recognizes similar entities under the term Social Forestry Enterprises (DOF, 2024). Studies conducted in Mexico have documented both the characteristics and limitations of these enterprises. Maldonado-Alcudia and Maldonado-Alcudia (2019) point out that nature tourism cooperatives need to strengthen their organizational and certification capacities. Bañuelos-Frías *et al.* (2020) note that game hunting tourism can be profitable and contribute to conservation, although ejido-level organizations face challenges. Likewise, Engbring and Hajjar (2021), Galicia *et al.* (2022), and Hernández *et al.* (2022) report that CFEs face trade-offs between productivity and conservation, and struggle with training, infrastructure, governance, and certification. Other relevant cases include tourism enterprises in Oaxaca (Palomino & López, 2019), in Oaxaca and Chiapas (Medina & Sánchez, 2023), and in Yucatán (de Yta-Castillo *et al.*, 2025). These studies converge in recognizing NBEs as key actors in addressing conservation, development, and social well-being challenges. However, the study of how organizational models, governance structures, and business culture influence their performance remains limited. Additionally, there is a growing need to integrate economic, social, and environmental indicators in performance measurement frameworks (Bota-Avram, 2023; Jonäll *et al.*, 2025; Stroe *et al.*, 2022). In this context, it is relevant to analyze NBEs that, despite facing similar constraints and conditions as their peers, achieve significantly better outcomes referred to as positive

deviants (Pascale *et al.*, 2010). Understanding their strategies and key success factors can offer valuable evidence on the viability of NBEs. This study is guided by the research question: What factors explain why some NBEs become positive deviants? Accordingly, the objective was to evaluate the economic, social, and environmental performance of NBEs in Mexico through an exploratory study aimed at identifying positive deviants and the key factors that explain such differentiation. The main contribution of this work is to provide integrated empirical evidence on the performance of NBEs in Mexico, establishing a comparative baseline to inform public policy design, funding programs, and business strategies oriented toward sustainability.

MATERIALS AND METHODS

The study followed a mixed-methods approach, combining qualitative and quantitative techniques through surveys, interviews, and result triangulation.

Unit of analysis

The unit of analysis was the enterprise. Selection was carried out through purposive sampling (Rofiaty *et al.*, 2024), considering only those enterprises whose economic activity uses nature as the central element of their product or service offering in Mexico, regardless of their legal structure, in accordance with the definition of a Nature-Based Enterprise (NBE).

Identification and selection of enterprises

The selection process began with a literature review and consultation of the Wildlife Directorate's database (CONANP, 2022), complemented by searches on websites and social media, as well as guidance from subject matter experts who facilitated contact with technical staff and representatives of potential enterprises. Only enterprises that met the following criteria were included:

- Nature is the central axis of their economic activity;
- The enterprise was operational during the interview period;
- The legal representative agreed to participate and provide the required information.

Data collection

The survey was developed based on a literature review and validated through a pilot test in April 2023. It included 50 questions covering general characteristics, decision-making, organizational structure, legal compliance, natural resource use, training, products and services, profitability, partnerships, and satisfaction. Most questions were closed-ended, while open-ended questions explored the motivations for creating the enterprise, its activities, offered products/services, and alliances. Additionally, nine key informant interviews were conducted with researchers from academic institutions and technical experts in biology, forestry, and natural resource engineering. These interviews focused on resource management, enterprise adaptation, and NBE challenges. Updated information was also requested on Wildlife Management Units (UMA) (SEMARNAT, 2023), which

helped validate the data and enrich the analysis. A formal invitation was then sent to the selected enterprises, of which 23 agreed to participate. Their representatives owners, general directors, or members of the governing council were interviewed either in person or through virtual meetings between May and September 2023. The collected data were systematized using Excel, and descriptive profiles were created for each enterprise. Table 1 presents the main characteristics, based on the size classification defined by DOF (2023).

Performance index

The performance of NBEs was assessed using the Nature-Based Enterprise Sustainable Performance Framework, which was adapted from the FAO's Sustainability Assessment of Food and Agriculture Systems (SAFA) Framework (FAO, 2014) and the Sustainability Evaluation Methodological Framework developed by Pineda-Vázquez *et al.* (2019). This framework incorporated a hierarchical structure comprising dimensions, general criteria, specific criteria, and indicators (see Table 2).

Table 1. Sample of nature-based enterprises.

ID	State	Municipality	Legal and organizational status	Surface (ha)	Size	Company's line of business
E1	Hidalgo	Huasca de Ocampo	Natural Person	1051.6	micro	Adventure Tourism
E2	Mexico	Amecameca	Cooperative Society	96.7	small	Wildlife Observation and Forestry
E3	Guanajuato	San Miguel de Allende	Civil Association	67	medium	Environmental Education
E4	Sonora	Álamos	Civil Association	114	micro	Wildlife Observation
E5	Yucatán	Tizimín	Civil Association	2300	micro	Environmental Education
E6	Veracruz	Coatzacoalcos	Owned by a Public Company	1048	small	Environmental Education
E7	Veracruz	Catemaco	Variable Capital Corporation	13.5	medium	Wildlife Observation
E8	Tlaxcala	Nanacamilpa de Mariano Arista	Rural Production Society	74	micro	Wildlife Observation
E9	Mexico	Tepetlaoxtoc	Ejido	5	micro	Wildlife Observation and Forestry
E10	Veracruz	Córdoba	Natural Person	4	micro	Environmental Education and Agroforestry
E11	Puebla	Cuetzalan del Progreso	Cooperative Society	2	small	Adventure Tourism
E12	Veracruz	San Andrés Tuxtla	Social Solidarity Society	983.5	small	Adventure Tourism
E13	Veracruz	San Andrés Tuxtla	Natural Person	15	small	Environmental Education and Agroforestry
E14	Chiapas	Tzimol	Cooperative Society	1200	micro	Adventure Tourism
E15	Puebla	Tetela de Ocampo	Rural Production Society	4	micro	Adventure Tourism
E16	Aguascalientes	San José de Gracia	Natural Person	200	micro	Sport Hunting
E17	Jalisco	Tamazula de Gordiano	Natural Person	180	micro	Environmental Education
E18	San Luis Potosí	Alaquines	Natural Person	20204	micro	Sport Hunting
E19	Sinaloa	El Fuerte	Natural Person	4502	micro	Sport Hunting
E20	Sonora	La Colorada	Natural Person	2116	small	Sport Hunting
E21	Sinaloa	El Fuerte	Natural Person	3568	micro	Wildlife Observation
E22	Querétaro	Pinal de Amoles	Natural Person	7	micro	Wildlife Observation
E23	Mexico	Texcoco	Natural Person	1	small	Adventure Tourism

ID=Nature-Based Enterprise identifier.

Performance framework

The performance framework encompassed indices for three dimensions. Economic performance was assessed based on financial resilience, considering factors such as stability, fulfillment of obligations, cash flow generation, and responsiveness to external changes. Environmental performance focused on habitat and species conservation, as well as compliance with the legal framework. Meanwhile, social performance included aspects of stakeholder engagement, satisfaction, and corporate ethics (FAO, 2014; Pineda-Vázquez *et al.*, 2019).

Index processing and calculation

The collected data were systematized into a data matrix through the coding of variables and indicators, enabling the transformation of qualitative and categorical responses into comparable numerical values, as established by Pineda-Vázquez *et al.* (2019). Subsequently, the coded data were processed in Excel®, assigning equal weights to each specific criterion within its respective general criterion, and to each general criterion within its corresponding dimension. This procedure resulted in the Dimension Performance Index (DPI) for the

Table 2. Sustainable performance framework of NBEs.

Dimension	General criteria	Specific criteria	Indicators
Environmental	Conservation	Presence of natural vegetation	1
		Integrated habitat management	5
		Presence of water bodies	2
		Soil status	1
		Distribution and status of managed species	3
	Compliance with legal and operational guidelines	Annual reports to the appropriate authority	1
		Species inventory	1
		Legal accreditation of use	1
		Awareness of legislation	1
		Management plan	1
		Consistent with objectives	2
Economic	Investment Vulnerability	Promoción	3
		Capacitación y desarrollo del personal	1
		Certificaciones que demuestran el compromiso de sostenibilidad	2
		Rentabilidad	2
	Engagement Overall Satisfaction	Diversificación de ingresos	1
		Liquidez	2
		Estacionalidad	3
Social	Regulatory Compliance and Corporate Ethics Investment	Actividades de participación social	1
		Actividades de vinculación interinstitucional	1
		Satisfacción de los implicados	3
	Vulnerability	Legalidad	4
		Misión explicita	1
		Reglamento interno	1

Adapted from FAO (2014) and Pineda-Vázquez *et al.* (2019).

environmental, economic, and social dimensions, each considered of equal importance in the overall performance assessment. At each hierarchical level, scores were estimated using the arithmetic mean of the corresponding values.

Statistical analysis

Spearman's rank correlation coefficients (rho) were calculated among the three DPIs to evaluate potential associations. Since only the economic DPI exhibited a normal distribution, results were interpreted in accordance with Hinkle *et al.* (2003). To classify the legally constituted Nature-based enterprises (NBEs) according to their performance levels, a hierarchical cluster analysis was conducted using three variables. A total of 22 observations were included, while one excluded observation (E23) was subsequently assigned to the most similar group. The Ward method, recommended for hierarchical groups involving multiple variables, was employed for case grouping, while squared Euclidean distance was used to determine the similarity between examined enterprises (Aguilar-Gallegos *et al.*, 2015). Visual analysis of the dendrogram identified four distinct clusters.

Group comparison

Differences among groups were evaluated using analysis of variance (ANOVA) and mean comparison tests for quantitative variables, and contingency tables with the chi-square test (χ^2) for categorical variables. Of the 77 variables analyzed, only those with statistically significant differences were reported. Subsequently, a second analysis was conducted with the 15 enterprises from the two highest-performing groups, applying the same statistical methods. All analyses were performed using SPSS® software, version 27.0.

RESULTS AND DISCUSSION

General characteristics

The analyzed Nature-based enterprises (NBEs) have been in operation for periods ranging from 3 to 50 years. The number of permanent employees varies between 1 and 75, with an average of 15, and 60.8% of the NBEs also employ temporary staff. These enterprises operate under various land tenure regimes: communal (ejidal), private, and state-owned. Their direct representatives such as legal holders, general directors, or presidents of the communal board have an average age of 56 and exhibit diverse educational backgrounds: three with basic education, nine with upper-secondary, seven with tertiary education, and four holding postgraduate degrees. Regarding their origin, 39% of the NBEs were established to utilize natural resources from their territories, 30% were driven by environmental conservation interests, 22% aimed to diversify income sources, and 4% were created to access public subsidies. Additionally, 70% received financial support during their early operational stages, primarily through programs offered by the National Forestry Commission.

Enterprise performance

Sustainable performance index

The Sustainable Performance Index (SPI) ranged from 0.57 to 0.97, with a mean value of 0.85; 65% of the enterprises exceeded this average. Spearman correlation coefficients

revealed strong positive correlations between the SPI and both the economic and social Dimension Performance Indices (DPI), while the correlation with the environmental DPI was moderate (Table 3).

Economic performance

The Economic Dimension Performance Index (DPI) exhibited high variability. Enterprise E16 recorded the lowest value at 0.64, while E1 achieved the highest at 0.92. Overall, 61% of the enterprises scored above the mean (Figure 1).

Social Performance

Enterprise E23 recorded the lowest social DPI at 0.39, while E3, E4, and E15 achieved the highest possible scores. Sixty percent of the enterprises performed above the general mean (0.90). Notably, 100% of these enterprises contribute to job creation and the strengthening of labor capacities.

Environmental Performance

The lowest environmental DPI was observed in E23 with a score of 0.68, while E1, E3, and E4 reached the maximum value. The main environmental activities carried out by the NBEs include habitat conservation, waste collection, fire prevention, reforestation, and soil conservation. It was estimated that 60% of the enterprises are engaged in the restoration of

Table 3. Correlations between the SPI and the performance dimensions by dimension.

	SPI	DPI economic	DPI social	DPI environmental
SPI				
DPI económico	0.843**			
DPI social	0.726**	0.375		
DPI ambiental	0.579**	0.230	0.441*	

SPI: Sustainable Performance Index. DPI: Dimension Performance Index.
*Correlation is significant at the 0.05 level. **Correlation is significant at the 0.01 level.

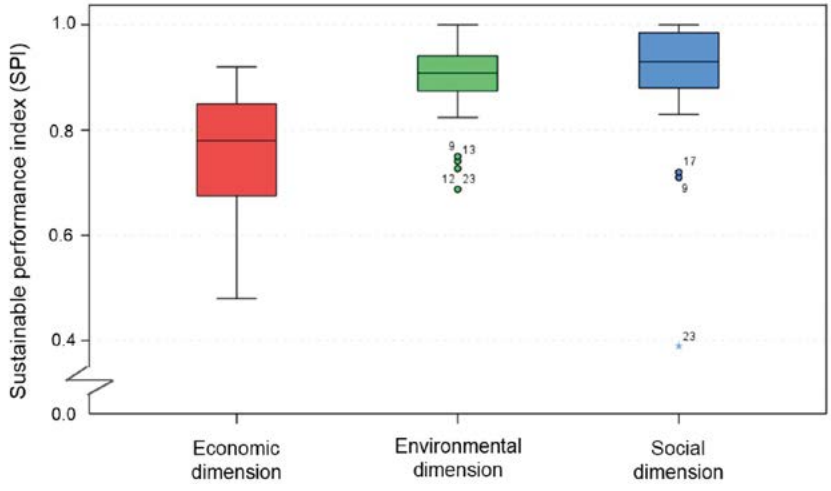


Figure 1. Variability of Sustainable Performance Across Enterprise Dimensions.

degraded areas; 52% exclusively manage native species, and 60% reported the presence of species classified under risk categories according to NOM-059-SEMARNAT-2010 within their territories.

Enterprise typology

A qualitative visual analysis of the dendrogram allowed the identification of four groups (Figure 1). Based on the results of the Dimension Performance Indices (DPI), the groups were named as follows: Group 1 (G1): Consolidated. Group 2 (G2): In Development. Group 3 (G3): In Adaptation. Group 4 (G4): In Incipient Development.

Table 4 illustrates the differences between groups with respect to the indices of the three evaluated dimensions and the general categories. Figure 3 displays the Sustainable Performance Index (SPI) for the identified groups.

Table 4. Comparison of means of variables within groups.

Indicator	G1	G2	G3	G4
Economic DPI	0.87 ± 0.03^{c}	0.80 ± 0.04^{c}	0.55 ± 0.06^{a}	0.68 ± 0.06^{b}
Investment Capacity#	0.98 ± 0.03^{a}	0.91 ± 0.12^{ac}	0.55 ± 0.12^{b}	0.79 ± 0.05^{cb}
Vulnerability Capacity&*	0.75 ± 0.075^{a}	0.69 ± 0.140^{ab}	0.54 ± 0.022^{b}	0.57 ± 0.07^{b}
Social DPI	0.97 ± 0.031^{a}	0.93 ± 0.04^{a}	0.92 ± 0.07^{a}	0.66 ± 0.19^{a}
Engagement Capacity**	0.71 ± 0.49^{a}	0.75 ± 0.46^{a}	0.25 ± 0.50^{a}	0.75 ± 0.5^{a}
Satisfaction Capacity**	0.88 ± 0.13^{a}	0.68 ± 0.22^{a}	0.66 ± 0.30^{a}	0.37 ± 0.32^{a}
Control Capacity**	0.97 ± 0.03^{a}	0.94 ± 0.04^{a}	0.92 ± 0.08^{a}	0.66 ± 0.19^{a}
Environmental DPI#	0.96 ± 0.03^{a}	0.87 ± 0.06^{b}	0.94 ± 0.03^{a}	0.77 ± 0.09^{b}
Conservation Capacity	0.94 ± 0.07^{a}	0.86 ± 0.07^{a}	0.93 ± 0.04^{a}	0.89 ± 0.09^{a}
Regulatory Compliance Capacity#**	0.99 ± 0.03^{a}	0.88 ± 0.13^{bc}	0.96 ± 0.05^{ab}	0.65 ± 0.20^{c}

DPI: Dimension Performance Index. C: General Criterion. a, b, c: Different letters indicate significantly different means ($p<0.1$) within each row. ± Values following the sign represent the standard deviation. Tests used: Scheffé, # Mann-Whitney U, and Games–Howell, ** ANOVA.

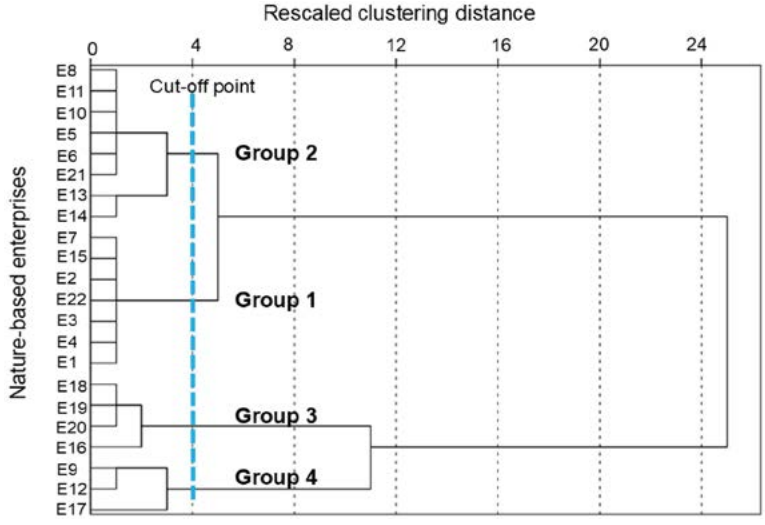


Figure 2. Groups Resulting from the Hierarchical Cluster Analysis.

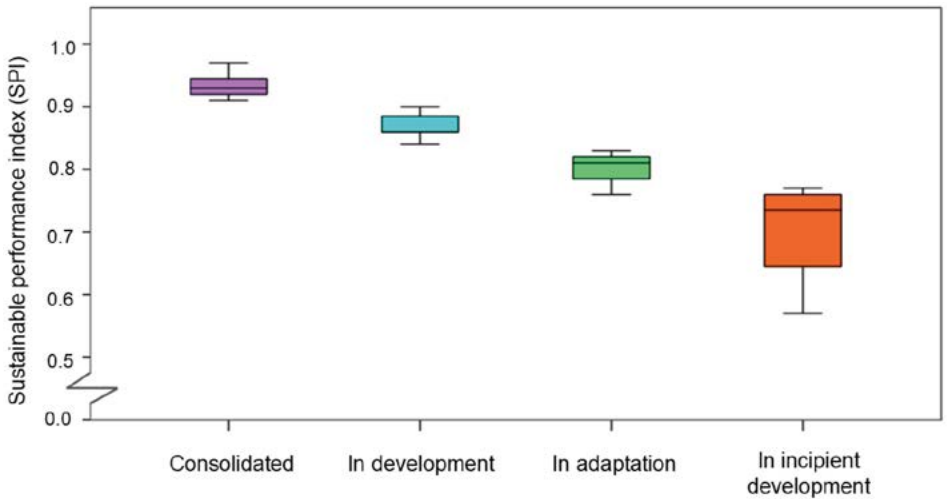


Figure 3. Sustainable Performance Index by Group.

Distinct attributes were identified among the groups, including investment capacity, income diversification, and environmental certifications. These contrasts are presented in Table 5.

Comparison of highest-performing groups

The comparison between the groups with the highest SPI scores (G1* and G2*) revealed significant differences in both economic and environmental indices, consistently favoring the consolidated group (Table 6).

The analysis of attributes associated with sustainable performance revealed that G1* presents greater advantages in conservation and income diversification, while G2* relies more on targeted strategies. Details are shown in Table 7.

This study showed that Nature-based enterprises (NBEs) in Mexico reach, on average, a high Sustainable Performance Index (SPI=0.85), with over 60% of the cases scoring above the mean. This finding directly answers the research question by demonstrating that, despite common limitations, some enterprises achieve superior performance, establishing themselves as positive outliers.

The strong correlation between the economic and social Dimension Performance Indices (DPIs), along with the moderate correlation between the environmental DPI and the SPI, confirms the relevance of these dimensions to overall performance (Table 3). However, the weak correlation between the social and environmental DPIs indicates that strong environmental performance does not always translate into social benefits. This suggests the influence of other organizational or contextual factors a pattern consistent with findings in Puebla (Hernández *et al.*, 2022), but differing from cases in Oaxaca, where participatory governance and indigenous cultural components generate synergies between both dimensions (Engbring & Hajjar, 2021; Palomino & López, 2019). The economic DPI was the most variable dimension (Figure 1), associated with disparities in market access, financing, and management capacities (Galicia *et al.*, 2022; Hernández

Table 5. Differentiating Attributes of NBEs by Group.

Attribute	G1 (%)	G2 (%)	G3 (%)	G4 (%)	(x^2)	p<
Economic dimension						
Investment in digital marketing	85.7	62.5	0	0	12.05	0.007
Investment in social media marketing	85.7	87.5	25	25	8.75	0.033
Investment in training	57.1	75	0	0	9.92	0.019
Sufficient income to cover expenses and generate profits	85.7	62.5	0	25	9.04	0.029
Income has increased in the last 2 years	100	62.5	0	75	11.43	0.01
Income has decreased in the last 2 years	0	0	75	0	16.39	0.001
Income from wildlife watching	57.1	25	0	75	6.36	0.096
Income from adventure tourism	57.1	12.5	0	0	7.78	0.051
Income from agricultural activities	14.3	37.5	100	50	7.81	0.05
Income from sport hunting	0	12.5	100	25	14.57	0.002
Income from gastronomy	85.7	62.5	0	75	8.38	0.039
Seasonality in the use of natural resources	0	12.5	100	25	14.57	0.002
Social dimension						
Committee of decision-making representatives	57.1	25	0	0	6.33	0.097
Reference marketing	14.3	25	100	100	13.55	0.004
International visitors received	100	75	25	50	7.65	0.054
Mission: conservation, research, and environmental education	71.4	25	0	25	6.78	0.079
Environmental dimension						
Natural vegetation >90% of the property	85.7	12.5	75	50	9.05	0.029
Pest and disease control	71.4	12.5	25	0	8.58	0.035
Reports to the appropriate institution	71.4	37.5	100	25	6.50	0.089
Species inventory	100	50	100	25	10.01	0.018
Knowledge of applicable legislation	100	75	100	25	9.77	0.021
Management strategy considers 3 dimensions	85.7	37.5	50	0	8.04	0.045
Management strategy considers ≥2 dimensions	14.3	62.5	50	100	8.04	0.045
ADVC Certification	57.1	25	0	0	6.33	0.097
UMA Certification (free-living)	42.9	12.5	100	25	8.98	0.03

ADVC: Voluntarily Designated Conservation Area. UMA: Wildlife Conservation Management Unit.

et al., 2022). The social DPI ranked in the middle, while the environmental DPI showed more homogeneous patterns, consistent with literature reporting widespread compliance with regulatory frameworks and basic conservation practices (Engbring & Hajjar, 2021). Nevertheless, the cluster analysis (Table 4) revealed that such environmental homogeneity is relative and that performance is shaped by factors such as the quality of natural resources, access to certifications, and organizational capacity aligned with

Table 6. Relationship Between the Two Highest-Scoring SPI Groups and Variables Associated with Sustainable Performance.

Indicador	G1*	G2*
Economic DPI	0.87 ± 0.03^{a}	0.80 ± 0.04^{b}
Social DPI	0.97 ± 0.03^{a}	0.93 ± 0.04^{a}
Environmental DPI#	0.96 ± 0.03^{a}	0.87 ± 0.06^{b}
SPI	0.94 ± 0.02^{a}	0.87 ± 0.02^{b}

SPI=Index of Sustainable Performance. DPI=Dimension Performance Index. [a, b]: Different letters indicate means with significant differences ($p<0.01$) within each row. ± Values following the sign represent the standard deviation, according to independent samples t-test. Mann–Whitney U test ($p<0.05$).

Table 7. Comparison between G1* and G2* enterprises.

Attributes	G1* (%)	G2* (%)	(x^2)	p≤
Environmental dimension				
Natural vegetation >90% of the property	85.71	12.5	8.04	0.009
Natural vegetation ≥50% of the property	14.29	62.5	3.62	0.084
Pest and disease control	71.43	12.5	5.40	0.035
Species inventory	100.0	50	4.77	0.051
Management strategy considers 3 dimensions	85.71	37.5	3.62	0.084
Management strategy considers ≥2 dimensions	14.29	62.5	3.62	0.084
Mission: conservation, research, and environmental education	71.43	25	3.23	0.100
Income from adventure tourism	57.14	12.5	3.35	0.100

findings by Galicia *et al.* (2022) and Pineda-Vázquez *et al.* (2019). This suggests that apparent environmental uniformity is not absolute but rather conditioned by governance arrangements and productive contexts. Groups G3 and G4 are characterized by low investment in training and marketing, concentrated governance structures, and limited regulatory knowledge (Table 5). In particular, although G4 has increased income from wildlife observation and gastronomy, it exhibits the weakest performance in conservation actions and compliance with legal-operational guidelines, linked to a lack of regulatory awareness. These patterns reflect trade-offs between income generation and conservation, similar to those described in community forestry enterprises (Engbring & Hajjar, 2021; Galicia *et al.*, 2022), ecotourism ventures (Hernández *et al.*, 2022), and communities with limited technical-regulatory knowledge, which intensify negative impacts (Pineda-Vázquez *et al.*, 2019). Although similar to G4, G3 differs in achieving greater legal-operational environmental compliance, explained by its focus on sport hunting under the UMA (Wildlife Conservation Management Unit) framework. This strengthens legal and environmental control but limits economic benefits due to quotas and seasonality (Bañuelos-Frías *et al.*, 2020), consistent with the reported decrease in income. Its referral-based marketing responds to the need to attract "trusted" clients who meet legal

requirements and to a focus on international visitors. G2 represents an intermediate stage moving toward the G1 profile: it invests more in digital marketing and, most notably, in training, thus enhancing capabilities that complement public support. Although it preserves a smaller proportion of natural vegetation compared to G1, it maintains operational practices aligned with sustainability. The literature describes such enterprises as "in transition": they incorporate training and conservation but still exhibit limited impact (Galicia *et al.*, 2022; Pineda-Vázquez *et al.*, 2019). In contrast, G1 achieved the highest performance, combining financial strength, investment in digital marketing (*e.g.*, websites), income diversification, preservation of natural vegetation, and management strategies that explicitly integrate the three dimensions of sustainability along with participatory structures. These features present across various legal formsposition it as the group most closely aligned with positive outliers. These results align with studies that indicate successful cases of economic, social, and environmental balance typically share factors such as robust governance, long operational trajectories, and land extensions that facilitate sustainable management. Solid governance, environmental certification, diversification, and reinvestment in conservation and social cohesion are common characteristics (Engbring & Hajjar, 2021; Galicia *et al.*, 2022; Prins *et al.*, 2024). The comparative analysis between G1* and G2* revealed that the differences lie in income generation strategies and the integration of environmental approaches (Tables 6 and 7). G1* maintains a high proportion of natural vegetation, consistently complies with legal standards, and prioritizes conservation, research, and environmental education as core strategies. This orientation aligns with a logic of resource dependence, which motivates NBEs to ensure the long-term preservation of natural assets (Wigger & Shepherd, 2020) and supports evidence that implementing strong environmental policies ensures resource conservation and reliable access (Regmi *et al.*, 2023). While G2* has made progress in training, conservation, and organizational innovation, its consolidation may still be constrained by external factors (McQuaid *et al.*, 2021; Solís-Mendoza *et al.*, 2024). Thus, strengthening NBEs also requires a supportive institutional and regulatory environment. The literature highlights that sustainable performance results from the interaction between internal and external factors. Among the former, having a clear vision and mission from the outset translated into regulations, boards, and associative structures is key, as seen in G1* enterprises (Engbring & Hajjar, 2021; Pineda-Vázquez *et al.*, 2019). This organizational foundation supports social cohesion, legitimacy, and intergenerational continuity. However, realizing these elements depends on enabling external conditions such as supportive public policies, access to differentiated markets, and collaboration networks (Galicia *et al.*, 2022). Together, these internal and external conditions determine whether an enterprise remains in an incipient stage or consolidates as a successful model of sustainability. In this context, NBEs represent a complementary mechanism for mobilizing resources toward conservation, partially helping to bridge the biodiversity financing gap. By generating income linked to sustainable activities, these enterprises channel local and private capital toward the protection of natural resources (Álvarez-Peredo & Contreras-Hernández, 2023; Peña-Azcona *et al.*, 2022).

CONCLUSIONS

The study demonstrated that Nature-based enterprises (NBEs) in Mexico achieve, on average, a high level of sustainable performance (SPI=0.85), with over 60% of the cases above the mean, although with marked differences across dimensions and groups. Economic performance was the most variable, social performance ranked at an intermediate level, and environmental performance remained more homogeneous due to widespread compliance with basic conservation practices. The cluster analysis identified four groups consolidated, developing, adapting, and incipient and revealed that sustainability is enhanced by participatory governance and a clear mission, economic diversification, access to certifications, and investment in capabilities and marketing. The main structural obstacles are related to initial support dependency, limited current financing, production seasonality, regulatory constraints, and weak organizational cohesion. Strengthening these enterprises requires robust internal structures, flexible financial instruments, access to differentiated markets, and territorial collaboration networks. Although the exploratory nature of the study and the limited sample size prevent generalization, the findings provide initial evidence of the existence of positive outliers and the ways in which they overcome common limitations. Future research should incorporate longitudinal analyses and mixed methodologies that integrate both quantitative and qualitative indicators to deepen understanding of the factors that explain the sustainability of NBEs in Mexico and Latin America.

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