ECORFAN Journal Republic of Peru 10[18]1-7: e41018107
Article

Ecotourism proposal for the Las Ventanas property of the Mineral del Chico National Park in Hidalgo, Mexico

Propuesta ecoturística para el predio Las Ventanas del Parque Nacional de Mineral del Chico en Hidalgo, México

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CONAHCYT classification:

Area: Social Sciences
Field: Economic Sciences
Discipline: Economic Accounting
Subdiscipline: Financial Accounting

https://doi.org/10.35429/EJRP.2024.10.18.1.7
History of the article:
Received: January 18, 2024
Accepted: December 21, 2024

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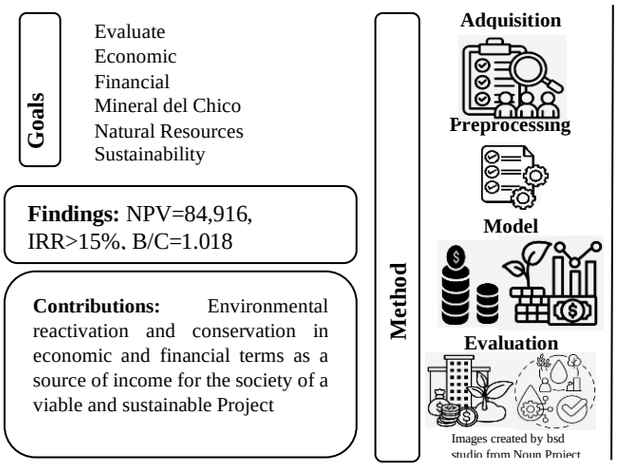
Abstract

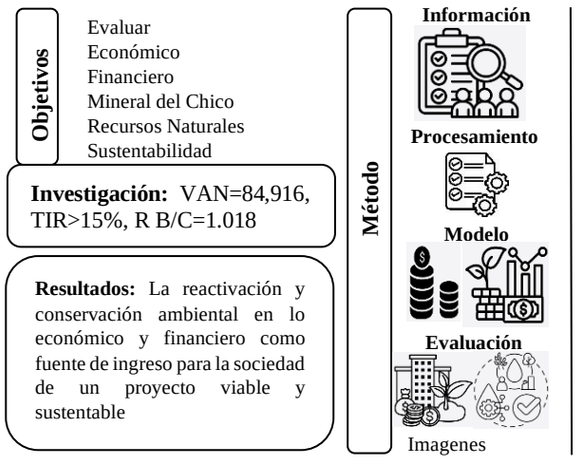
Alternative ecotourism contributes to the care and preservation of a nation's natural and cultural heritage and constitutes a response to the growing and constant environmental degradation of many sites and their attractions. The objective of this proposal is to elaborate an ecotourism project as a means to take advantage of the available unused resources, according to the geographical and productive characteristics of the site, based on the principles of sustainability, as an economic alternative to the owners of the site for the generation of income and improvement of their quality of life. The proposal presents a methodology that can be reproduced for the design and implementation of an ecotourism plan and is an alternative for the diversification of activities in the rural sector. The economic-financial evaluation of projects determines the main indicators of Net Present Value, Internal Rate of Return, Benefit-Cost Ratio and Payback Period of the investment. The results indicate that the ecotourism model is economically and financially acceptable for the main indicators calculated at a discount rate of 15% over a 5-year investment recovery period.



Ecotourism, Project Evaluation, Financial Indicators

Resumen

El ecoturismo alternativo contribuye al cuidado y preservación del patrimonio natural y cultural de una nación y constituye una respuesta a la degradación ambiental creciente y constante de muchos sitios, así como de sus atractivos. El objetivo de esta propuesta es elaborar un proyecto ecoturístico como un medio para el aprovechamiento de los recursos disponibles no utilizados, de acuerdo a las características geográficas y productivas del lugar, basado en los principios de sustentabilidad, como una alternativa económica a los dueños del lugar para la generación de ingresos y mejora de su calidad de vida. La propuesta expone una metodología que es posible reproducir para el diseño e implementación de un plan ecoturístico y es una alternativa para la diversificación de actividades del sector rural. La evaluación económico-financiera de proyectos, determina los principales indicadores de Valor Actual Neto, Tasa Interna de Retorno, Relación Beneficio-Costo y Periodo de Recuperación de la inversión. Los resultados indican que el modelo ecoturístico es económica y financieramente aceptable para los principales indicadores calculados a una tasa de descuento del 15% en un periodo de recuperación de la inversión de 5 años.



Ecoturismo, Evaluación de proyectos, Indicadores Financieros

Citation: Omaña-Silvestre, José Miguel & Quintero-Ramírez, Juan Manuel. [2024]. Ecotourism proposal for the Las Ventanas property of the Mineral del Chico National Park in Hidalgo, Mexico. ECORFAN Journal Republic of Peru. 10[18]1-7: e41018107.

Introduction

Ecotourism, to be understood, is that which contributes to the care and preservation of the cultural and natural heritage of a nation. It is an option to the growing and constant environmental degradation of these environments in most places, including its attractions; which offers a diversity of options different from traditional tourism, allowing tourists to have a greater interest in nature and to get to know and admire the natural landscape together with its flora and fauna, and the diverse cultural manifestations of the region. For Oxinalde (2019), 'ecotourism is a segment of nature-based tourism that emerges as an important option in the conservation of Ecological Heritage and this is the central theme of the project that will allow us to analyse the development of this activity in our country' (p.23).

The development of this project has its origin in alternative ecotourism, which is a response to the changes and transformations in the tourist profile, as new characteristics are generated in their motivations and lifestyles (Pérez de las Heras, 2019).

The general objective of the work is to evaluate a technically, economically and financially viable ecotourism alternative in the private property of ''Las Ventanas'' located within the National Park of Mineral del Chico in the state of Hidalgo as a means to take advantage of the available unused resources, according to the geographical and productive characteristics of the place, based on the principles of sustainability. This economic alternative will allow the owners of the place to generate income and improve their quality of life.

Geographical location of 'El Chico' National Park

The National Park 'El Chico', belongs to the Federal Entity of Hidalgo, Mexico, shares the jurisdiction of the municipalities of Mineral del Chico, in its largest proportion, followed by those of Pachuca and Mineral del Monte. The park of 'Las Ventanas' is a private property located within the limits of the National Park of Mineral del Chico, with an extension of 29 hectares, under private property regime, subdivided into 3 sections: the mountainous area, the valley area and the wooded area.

Natural scenic attractions

The park of 'Las Ventanas' is characterized by the mountainous relief, which is crossed by an important fluvial dynamic and covered by an exuberant forest of oyamel, which creates a wonderful natural mosaic and attractive for the visitors.

The characteristic climatological conditions are: humid temperate with a cool and long summer, where the average annual temperature is between 12°C and 30°C.

The hydrographic network has special relevance due to the low volume streams that arise in the elevated structures of the crags and that converge in the lower sector, supplying their watercourse during the wet season of the year to the 'El Cedral' Dam and to the 'El Jaramillo' Dam.

The main arboreal plant communities are coniferous forests with characteristic species such as: oyamel, cedar, oaks and pine, among others, which form an important part of the habitat of animal species such as: squirrels, field rabbits, badgers, as well as a great variety of birds and reptiles.

The 'Las Ventanas' Park has been given priority by the State of Hidalgo in order to contribute to its policy of conservation and protection of resources. Likewise, an agreement was signed with the directors of the patronage for the Protection, Management and Development of the National Park 'El Chico A.C.', with the aim of joining the efforts of both public and private institutions that seek the rescue and safeguarding of the natural wealth of the park, and as the property 'Las Ventanas' is located within the national park, it was favoured by the benefits agreed by the state, which allowed the economic support for the implementation of this project.

Ecotourism project for the Las Ventanas Park

According to the technical studies, a series of guidelines or ecotourism activities were determined, which are proposed jointly to fulfil the objective set out at the beginning, the activities contemplated to be developed are described below:

ISSN: 2414-4819.
RENIECYT-CONAHCYT: 1702902

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https://doi.org/10.35429/EJRP.2024.10.18.1.7

Ecological cabin. The property ‘’Las Ventanas‘’ has a space of 80 mts^2, usable for the construction of two ecological cabins, for its construction a private company was contacted. The model of cabin that manages includes: area for living room, kitchen and dining room, area for rest (bedroom), a complete bathroom (washbasin, w.c. and shower), area of tapanco (on area of bath) and a corridor of 1.50 x 5.50 mts.

Septic tank. The implementation of a septic tank as an additional ecological accessory to the cabins is added to this model; which includes the following: septic tank and exclusive Polyplas filter and anaerobic tank with natural filter, which will solve in an economical, practical and efficient way the problem of wastewater from suburban homes and country houses, where sewage systems are not available, avoiding harmful impacts on the environment.

Restaurant, toilets and parking. According to the diagnosis, a space of 28m^2 next to the road was selected for the construction of a place for the sale of food, including the construction of 2 bathrooms and the conditioning of a space for the parking of cars, for a good functioning.

Cookers and barbecues. The property ‘’Las Ventanas‘’ has traditional barbecues; however, it is intended to replace them with Patsari® cookers, which integrate technological innovations that improve the burning of firewood through a combustion chamber that separates and isolates the chemicals that produce toxicity. It is planned to build 6 cookers that will be distributed on the plain of the property.

Mist water collection. This is a proposal to capture water from the mist to be used for the park's own hygiene tasks, which is a sustainable alternative eco-technique.

Tyrolean traverse. The aim of this tourist activity is to provide tourists with an experience of adventure, contemplation and integration with the forest in order to understand the importance and balance with nature. This activity arises from the need to move and recently, it has been installed for nature tourism purposes due to the fact that it is a recreational activity.

Horses for rent. The park ‘’Las Ventanas‘’ has a relief suitable for horseback riding, both for children and adults, its rugged terrain makes this ride a recreational experience; for horse rental we have contemplated the acquisition of 2 horses by the owner and their maintenance will be from the income of the rental.

Methodology

The methodology to be used is based on the application of instruments and techniques applied to the evaluation of the investment project, from which the financial indicators are obtained that allow optimal decision making in the consolidation and viability of this project, which are mainly applied:

Net Present Value (*NPV*): It is the monetary value that results from subtracting the sum of the discounted flows to the initial investment. Adding the present discounted cash flows and subtracting the initial investment is equivalent to buying all the expected profits against all the disbursements necessary to produce those profits, in terms of their equivalent value at this moment or time zero. It is clear that for a project to be accepted, the returns must be greater than the outlays, resulting in an NPV greater than zero.

$$NPV = \sum_{t=1}^{n} \frac{BN_t}{(1+i)^t} - I_0 \quad [1]$$

Where:

NPV: Net Present Value
BN_t: Net flow benefit in period t.
i: Discount rate.
I_0: Initial investment

Internal Rate of Return (IRR): It is the discount rate at which the NPV equals zero. It is the rate that equals the sum of the discounted cash flows to the initial investment. It is so called the internal rate of return because it assumes that the money earned each year is reinvested in its entirety. In other words, it is the rate of return generated entirely within the company through reinvestment. The project acceptance criterion under this indicator is to accept projects whose IRR is greater than or equal to the discount rate used.

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$$\sum_{t=1}^{n} \frac{BN_t}{(1+r)^t} - I_0 = 0 \quad [2]$$

Where:

BN_t: Net flow benefit in period t.
i: The discount rate.
I_0: Initial investment

Benefit/Cost Ratio (RB/C): It consists of assessing the costs and benefits of a project considering the evaluation horizon to determine whether or not it should be implemented. In order to accept a project, this indicator must be greater than or equal to one.

$$R\frac{B}{C} = \frac{\sum_{t=1}^{n} \frac{Y_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{E_t}{(1+i)^t}} \quad [3]$$

Where:

R B/C: Benefit-Cost Ratio
Y_t : Revenue in period t
E_t: Expenditure in period t (including investment I_0)
i: Discount rate.

Recovery period: This criterion measures the number of years required to recover the capital invested in the project. Break-even point: A useful technique for studying the relationships between fixed, variable and revenue costs. It is the level of production at which sales revenue equals costs.

$$PE = \frac{CF}{(PV - CVu)} \quad [4]$$

Where:

PE: Break-even point
CF: Fixed cost
PV: Unit selling price
CVU: Variable unit cost.

Results

Unit prices and costs are governed by the Engineering Institute of Unit Pricing which in turn governs valuers. These prices are updated to September 2023.

For the development of the ecotourism project an initial investment of $1'225,097.00 is contemplated, of which 82% comes from the program of Support for the Protection, Management and Development of the National Park "El Chico A.C." of the government of the state of Hidalgo and the remaining 18% is to be paid by the owners of the property. Within the investment concepts, fixed assets represent 95% of the total investment, leaving 5% for the payment of deferred assets and working capital.

The fixed assets are destined for the construction of cabins, septic tank, restaurant, bathrooms, parking, Patsari® cookers and the fog water collection system; the amount of these assets represents an outlay of $870,345, while $101,852 was invested in equipment and the purchase of utensils for the restaurant, and $101,852 was invested in the purchase of horses and a zip line.).

Box 1

Table 1

Financial structure and sources of funding, ecotourism project

Concept	Total	Contributions	
		Partners	Programme
Fixed investment			
Civil works	870,345	67,395	802,950
Restaurant equipment and utensils	101,852	84,602	17,250
Recreational equipment	186,150	-	186,150
Subtotal Fixed Assets	1,158,347	151,997	1,006,350
Deferred investment	52,500	52,500	
Working capital	14,250	14,250	
TOTAL	1,225,097 100%	218,747 18%	1,006,350 82%

Source: Own elaboration with data from the ecotourism project

A 5-year planning horizon for the project was envisaged, based on a gradual growth of 80% in the first year, 90% in the second and 100% from the third to the fifth. During this time an average income of 1.09 million pesos was obtained, while the costs derived from the operation were $800,000, which generated profits of around $290,000.

However, when taxes are deducted, this profit does not reach $200,000 a year.

ISSN: 2414-4819.
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If we consider that the project is constituted by 6 partners, each of them will receive around $20,000 per year; this indicates that the profits derived from the project, although present in terms of return on investment, are low, which could indicate an additional support scheme (Table 2).

Box 2

Table 2

Income Statement, ecotourism project

Concept/ period	Year 1	Year 2	Year 3	Year 4	Year 5
Capacity used	**80%**	**90%**	**100%**	**100%**	**100%**
Revenues	956,145	1,051,760	1,156,935	1,156,935	1,156,935
Variable Costs	558,313	614,144	675,558	675,558	675,558
Fixed Costs	148,926	163,818	163,809	163,809	163,809
Profit before tax	248,907	273,798	317,568	317,568	317,568
I.T. (30%)	74,672	82,139	95,270	95,270	95,270
E.P.S. (10%)	24,891	27,380	31,757	31,757	31,757
Net profit	**149,344**	**164,279**	**190,541**	**190,541**	**190,541**
Dividends (80%)	119,475	131,423	152,433	152,433	152,433
Retained earnings (20%)	29,869	32,856	38,108	38,108	38,108
No. of partners	6	6	6	6	6
Profit per partner	19,913	21,904	25,405	25,405	25,405

IT: Income Tax EPS: Employees' Statutory Profit Sharing

Source: Own elaboration with data from the ecotourism project

In determining the break-even point at which the project will operate, the calculation indicates that revenues of at least $390,000 per year are required for the enterprise to recover operating costs and start generating profits, which represents 34% to one hundred percent of the project's operating capacity (Table 3).

Box 3

Tabla 3

Balance point of the ecotourism project

Concept/ period	Año 1	Año 2	Año 3	Año 4	Año 5
Capacity used	**80%**	**90%**	**100%**	**100%**	**100%**
Revenue	956,145	1,051,760	1,156,935	1,156,935	1,156,935
Fixed Costs	148,926	163,818	163,809	163,809	163,809
Variable Costs	558,313	614,144	675,558	675,558	675,558
Breakeven point in pesos	357,925	393,718	393,696	393,696	393,696
Percentage break-even point	37%	37%	34%	34%	34%

Source: Own elaboration with data from the ecotourism project

With regard to the financial indicators, considering a discount rate of 15%, all the indicators comply with the project acceptance criteria, i.e. the NPV is positive at $84,916, which indicates the amount of resources additional to the 15% with which the project was evaluated. Likewise, the IRR is higher than the discount rate, which indicates that the maximum profit that the project can obtain is 23.41%, under the conditions that were evaluated. The RB/C is greater than the unit, 1.018, which indicates that for every peso invested, the peso is obtained plus 0.18 cents, considering a discount rate of 15%. Under these results, the project is financially acceptable (Table 4).

Box 4

Table 4

Financial Indicators, Ecotourism Project

Concepts	Value	Criteria
Net Present Value (NPV)	84,916	Accepted
Internal Rate of Return (IRR)	23.41%	Accepted
Benefit-Cost Ratio (R B/C)	1.018	Accepted

Source: Own elaboration with data from the ecotourism project

Regarding the payback period, this is reached after 5 years, which indicates that it takes 5 years for the initially invested resources to be recovered (Table 5).

Box 5

Table 5

Payback period for investment, Ecotourism Project

Concept / period	Year 1	Year 2	Year 3	Year 4	Year 5
Updated flow	-270,672	-36,991	-10,729	-10,729	726,990
Balance	-270,672	-307,664	-318,393	-329,122	397,868

Source: Own elaboration with data from the ecotourism project

According to the results, the project is financially viable, however, a sensitivity analysis shows that the indicators are highly sensitive to small changes in two of the main variables that can affect the results. The project is highly sensitive to changes in the level of revenues, as a decrease in revenues of 2.5% causes the project to become unprofitable; the same is true for changes in costs, as a general increase in costs of 3.4% causes the project to become financially unviable.

ISSN: 2414-4819.
RENIECYT-CONAHCYT: 1702902

Omaña-Silvestre, José Miguel & Quintero-Ramírez, Juan Manuel. [2024]. Ecotourism proposal for the Las Ventanas property of the Mineral del Chico National Park in Hidalgo, Mexico. ECORFAN Journal Republic of Peru. 10[18]1-7: e41018107.
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This indicates a level of risk that must be kept in mind when implementing the project (Table 6).

Box 6

Table 6

Comparative sensitivity analysis, ecotourism project

Indicators	Baseline situation	Cost increase 3.40%.	Decrease in income -2.50%.
NPV	84,916	-5,265	-5,687
R B/C	1.02	0.99892	0.9988
IRR	23.41%	14.51%	14.47%

Source: own elaboration with data from the ecotourism project

Conclusions

Ecotourism is a financially viable activity to reactivate the local economy and help regional development, also allowing a sustainable conservation of the environment and the participation of the communities involved. This proposal reflects the development of a project made especially under the characteristics of the property itself, as it clearly defines the point of view of the users as a fundamental part in the establishment of the activities to be implemented; which turned out to be a source of income for the owners, allowing them to define the long-term benefits, generating an engine of development under a concept of sustainability, with an integral vision of nature tourism, which involves ecotourism and adventure tourism. It should be noted that, although the financial indicators were satisfactory under the conditions under which they were evaluated, when performing a sensitivity analysis, the project is very sensitive to changes in income levels and cost increases, which is an indication of risks that must be taken into account for the implementation of the project. A relevant point in this type of project, given the low profitability of the activities, is the vital importance of financial support from the government for the conservation and development of natural resources.

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

Omaña-Silvestre, José Miguel: Contributed to the project idea, research method and technique. He supported the design of the field instrument. He carried out the data analysis and systematisation of results, as well as writing the article.

Quintero-Ramírez, Juan Manuel: Contributed to the research design, the type of research, the approach, the method and the writing of the article. Worked on the application of the field instrument, data collection and systematisation of the results.

Availability of data and materials

The information and data for the project were obtained from questionnaires conducted with people from the area, who provided valuable information to obtain these economic and financial indicators. The images of the Graphical Summary were obtained from the web page https://thenounproject.com/

Funding

The research did not receive any funding.

Abbreviations

E.P.S	Employees` Statutory Profit Sharing
NPV	Net Present Value
I.T	Income tax
IRR	Internal Rate of Return
R B/C	Relation Benefit Cost
BN_t	Net flow profit for the period t
I	Discount rate
I_0	Initial investment
Y_t	Income for the period t
E_t	Expenses in the period t
PE	Break-even point
CF	Fixed cost
PV	Unit selling price
CVU	Unit cost of sale
$	Prices expressed in mexican pesos

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ISSN: 2414-4819.
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