Socio-ecological and infrastructural potential for community-based ecotourism: a case study in northern Colombia

Potencial socio-ecológico e infraestructural para el ecoturismo comunitario: estudio de caso en el norte de Colombia

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Abstract

Introduction: Ecotourism in wetlands aims to promote environmental conservation while generating social and economic benefits through community participation. This approach enhances local empowerment and fosters a sense of ownership over the ecotourism project.
Objective: To assess the socio-ecological and infrastructural characteristics for the development of a community-based ecotourism program in the village of Caimital, Malambo.
Method: A mixed-methods approach was employed, combining qualitative and quantitative techniques. The qualitative phase included four field visits during which a checklist was applied to assess ecotourism-related infrastructure in the Ciénaga de Malambo (CM), focusing on road conditions, availability of terrestrial and fluvial transportation, and the presence and quality of local services such as gastronomy and handicrafts. In the quantitative phase, 45 structured surveys were administered to heads of households living closest to the CM. The survey was divided into three sections: socioeconomic characteristics of the community, environmental conditions of the wetland, and community perceptions of a potential ecotourism program. Additionally, documentary analysis was conducted to contextualize the socio-environmental background of the study area.
Results: The findings indicate a high level of community acceptance (90%) for implementing a community-based ecotourism program involving the CM, with a clear preference for economic benefits. However, significant limitations were identified in road infrastructure and fluvial transportation, as well as environmental issues such as pollution and the depletion of fishing resources in the CM.
Conclusions: In conclusion, ecotourism is presented as a viable alternative for sustainable development in the CM, provided that adequate coordination between the different actors involved in the territory is guaranteed.

Keywords: Wetland ecotourism, community participation, economic benefits, pollution, and socio-ecological aspects.

Resumen

Introducción: El ecoturismo en humedales busca la conservación ambiental, genera beneficios sociales y económicos a través de la participación comunitaria, maximizando el empoderamiento local y el sentido de pertenencia hacia el proyecto ecoturístico.
Objetivo: Evaluar las características socio-ecológicas e infraestructurales para el desarrollo de un programa de ecoturismo comunitario en la Vereda de Caimital Malambo.
Metodología: Se empleó un enfoque mixto que combinó técnicas cualitativas y cuantitativas. La fase cualitativa incluyó cuatro visitas de campo en las que se aplicó una lista de chequeo para evaluar la infraestructura asociada al ecoturismo en la CM, considerando el estado de las vías de acceso, la disponibilidad de transporte terrestre y fluvial, así como la presencia y calidad de servicios como gastronomía y artesanías locales. En la fase cuantitativa, se aplicaron 45 encuestas estructuradas a los líderes de hogar de las viviendas más cercanas a la CM. El instrumento se dividió en tres secciones características socioeconómicas de la comunidad, condiciones ambientales de la ciénaga, y percepciones sobre un hipotético programa de ecoturismo comunitario. Adicionalmente, se realizaron análisis documentales para contextualizar el entorno socioambiental en el área de estudio.
Resultados: Se evidencia una alta aceptación por parte de la comunidad (90%) hacia la implementación de un programa de ecoturismo comunitario que involucre la CM, con una marcada preferencia por beneficios de tipo económicos. Sin embargo, se identificaron limitaciones significativas en la infraestructura vial y el transporte fluvial, así como problemas ambientales asociados a la contaminación y disminución de los recursos pesqueros de la CM.
Conclusiones: En conclusión, el ecoturismo se presenta como una alternativa viable para el desarrollo sostenible en la CM, siempre que se garantice una adecuada coordinación entre los diferentes actores inmersión en el territorio.

Palabras clave: Ecoturismo en humedales, participación comunitaria, beneficios económicos, contaminación y socio-ecológicas.

INTRODUCTION

Wetlands are essential ecosystems that harbor high biodiversity and play key ecological roles, but they are threatened by urban development, agriculture, and climate change [1] and [2]. In Colombia, the second most biodiverse country in the world, these ecosystems face growing tension between conservation and development [3]. In response to this Situation, ecotourism has emerged as a viable strategy to promote environmental sustainability and the socioeconomic development of local communities, especially rural youth, by offering employment alternatives and strengthening territorial roots [4]. Several studies have shown that ecotourism can be an effective tool for restoring wetlands and promoting conservation practices [1] and [5]. However, many wetlands lack adequate sanitary conditions, which affects the health and well-being of local communities. Artisanal fishing communities are intrinsically dependent on natural resources for their livelihoods, which means that ecotourism, as a developing economic activity, also depends on these resources, which constitute the local attraction. Community participation and the identification of valuable cultural and biological elements are crucial for empowerment and sustainability in ecotourism, especially in protected areas. Finally, this research focuses on evaluating the socio-ecological and infrastructural characteristics for the development of a community ecotourism program in the village of Caimital Malambo. The objective is to propose a community ecotourism program that contributes to the conservation of the ecosystem and the improvement of the local quality of life [5].

LITERATURE REVIEW

Firstly, there is a growing line of research that recognizes the importance of community participation in the success of ecotourism projects, especially in contexts of high socio-environmental vulnerability. Several studies have highlighted that, to achieve sustainable tourism models, it is essential to understand local perceptions of natural resources and the ways in which communities wish to be involved. This article contributes to the state of the art by demonstrating, through an empirical analysis in the Ciénaga de Mallorquín, a coastal lagoon, that the willingness to participate in ecotourism is more associated with collective social benefits (such as health and education) than with direct economic incentives. This reinforces the need to design inclusive ecotourism initiatives that recognize local dynamics, strengthen the social fabric, and promote participatory environmental governance [5].

Other studies contribute Significantly to the state of the art of ecotourism by extending the framework of the Theory of Planned Behavior (TPB) with two key variables: the perception of human-earth coordination and self-mastery. Based on a survey of 847 participants in China, the authors found that the tendency toward ecotourism, ecological attitude, and sense of personal control are the main drivers of ecotourism intention and behavior (explaining 81.2% of the variance). Meanwhile, the stress of coordination between humans and the environment indirectly influences attitude and sense of control. This reinforces the idea that knowledge or social norms are not enough; it is essential to cultivate in tourists a perception of harmony with the environment and the confidence that they can act in favor of the environment [6].

In addition, community participation in conservation and economic activity can lead to a real process of local empowerment. Studying the case of Situ Cisanti (West Java), the authors identify two types of participation: (1) environmental conservation, with collective clean-up, reforestation, and green infrastructure work; and (2) economic participation, evidenced in community initiatives (food stalls, cafes, souvenirs, homestays, transportation) involving some 120 residents, including significant community involvement. The research highlights that this participatory approach has strengthened environmental knowledge and generated economic empowerment, especially for women, by diversifying sources of income beyond traditional agriculture, favoring a symbiotic and sustainable relationship with the environment [7].

On the other hand, local entrepreneurs conceive nature tourism as a strategy for conservation and regional development. Surveys and interviews in Caquetá conclude that tourism, especially when mediated by educational and heritage processes, not only generates income and employment but also promotes the preservation of the natural environment

through the participation of rural communities. The low level of education identified the need for dynamic and inclusive training strategies on environmental topics, marketing, and ICT, and local enterprises are valued as key players in the education of both visitors and residents. This approach aligns with the principles of sustainable ecotourism established by the UNWTO, such as biodiversity conservation, community benefit, and local ownership, and complements the Colombian regulatory framework, which promotes nature tourism as an engine of development and conservation in post-conflict contexts [8].

Participatory conservation in reefs demonstrates how coastal communities exert their agency beyond formal mechanisms, self-managing spaces for action to protect marine ecosystems in Colombia. Through an analysis of the Cartagena Bay channel variant project, the authors show that, even when not officially integrated into environmental management projects, these communities implement effective actions to mitigate ecological impacts, demonstrating that local initiative can serve as a catalyst for conservation. The document offers a theoretical contribution by emphasizing the importance of recognizing community rights such as food security, information, and environmental justice, and proposes recommendations for policymakers to integrate these aspects with a view to strengthening marine conservation from an inclusive perspective [9].

METHODOLOGY

Description of the study area

The CM is located in the municipalities of Soledad and Malambo, in the eastern part of the department of Atlántico, Colombia. This wetland has a depth of 1.2 meters during the dry season, while in the rainy season it can reach a depth of up to 2.4 meters. (watch Fig 1).

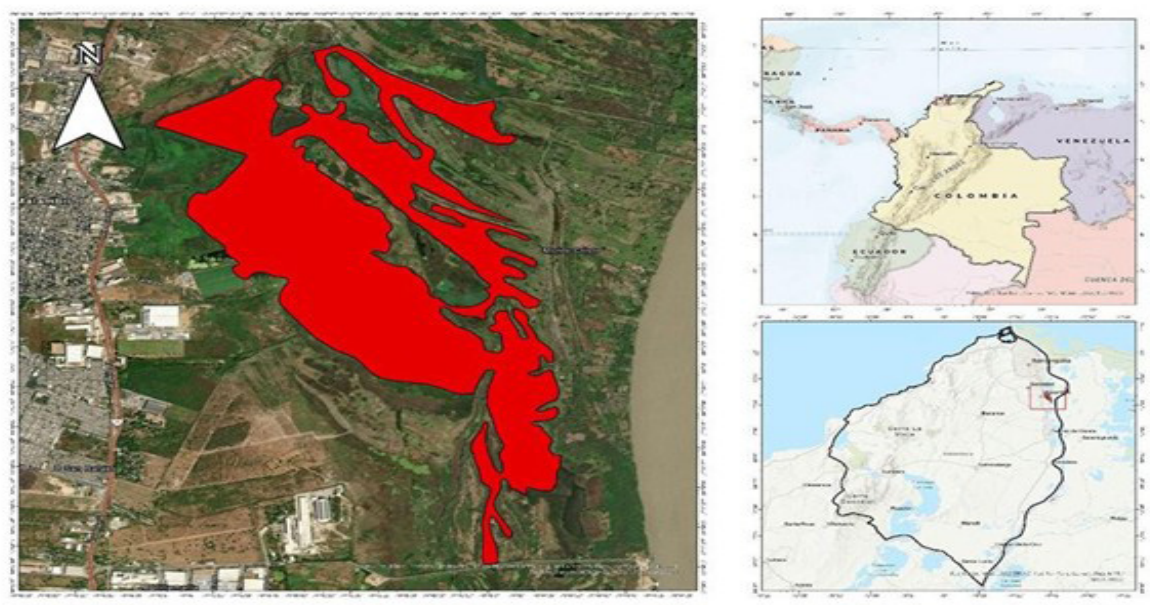


Fig 1. Geographic location of Ciénaga of Malambo. Source: own elaboration.

The surrounding communities are mainly dedicated to artisanal fishing. The homes in the nearby neighborhoods are rudimentarily constructed, reflecting the vulnerable conditions and limited economic resources of their inhabitants. The lagoon is dominated by abundant aquatic algae, indicating the presence of domestic and non-domestic wastewater discharges. This proliferation of algae causes navigability problems in some areas of the wetland, mainly affecting artisanal fishermen in the neighborhoods of Caimital and Espinal, located around the waterway.

Type of research

This is a descriptive, mixed-method, participatory diagnostic study. It is considered descriptive because it seeks to characterize the social, ecological, and infrastructure conditions of the Caimital community located in the municipality of Malambo in terms of its potential for ecotourism, using systematic criteria that allow for the identification of relevant patterns and relationships between the elements studied. It has a mixed approach, as it combines quantitative and qualitative techniques to obtain a comprehensive understanding of the local socio-ecological system [11]. Finally, it is also framed as a participatory diagnosis, as

it actively involves the community in gathering information and identifying opportunities, respecting their vision of the territory and promoting their empowerment in decision-making.

Therefore, this research is carried out in three stages:

Stage 1. An exhaustive documentary review was conducted in order to obtain accurate context on CM and its main social, environmental, and economic issues. To this end, scientific sources were consulted through specialized databases, university repositories in the city of Barranquilla, official websites of government entities, as well as gray literature available on the internet. [12], [13], [14], and [15].

Stage 2. It consisted of conducting fieldwork and collecting primary information. A structured survey was applied to 45 heads of households belonging to artisanal fishing communities in the village of Caimital, based on the instrument validated by [16]. The questionnaire included 38 questions distributed across three dimensions: socioeconomic profile, environmental perception, and disposition toward ecotourism. In addition, field visits were conducted to apply a checklist to determine the current state of the infrastructure and its impact on the development of a community ecotourism program [5]. Variables such as access roads, basic tourist services, existing ecotourism activities, and available natural resources were analyzed. This phase included photographic records and observation.

Stage 3. Information analysis: A quantitative and qualitative analysis was done. The survey data was processed using descriptive statistics, evaluating frequencies, percentages, and main trends in the SPSS statistical program. The consistency of the instrument was validated using Cronbach's coefficient (α=0.85), indicating high reliability. At the same time, the information obtained during field visits and the checklist for evaluating the current state of the infrastructure were systematized. The analysis also made it possible to identify opportunities, challenges, and key recommendations for the design of a viable community ecotourism program in the area.

RESULTS

Socioeconomic characteristics of the residents.

The results of this research in the village of Caimital, an area directly influenced by the CM, reveal a community with highly vulnerable socioeconomic conditions, which are presented in the following Table.

TABLE 1. SOCIOECONOMIC RESULT. SOURCE: OWN ELABORATION.

Variable	Frequency	%	Variable	Frequency	%
Gender			Residential property		
Male	18	40	Home ownership	22	48.89
Female	27	60	Rented housing	16	35.56
Other	0	0	A relative´s home	7	15.56
Age			¿Do you receive government subsidies?		
18-25	9	20	Yes	9	20
26-35	4	8.89	No	36	80
35-45	9	20	Family income		
>47	23	51,1	0 to $650.000	31	68.89
Marital status			$651.000 to $1.299.000	11	24.44
Married	10	22.2	$1.300.000 to $ $1.759.000	2	4.44
Single	10	22.2	>$1.760.000	1	2.22
Common-law marriage	23	51.1	¿Does your home have drinking water?		
Widowed	2	4.4	Yes	45	100
Education level			No	0	0
None	9	20	¿Does your home have sewerage?		
Primary school	19	42.2	Yes	0	0
High school	12	26.667	No	45	100
Technical studies	5	11.111	¿Does your home have electricity?		
University	0	0	Yes	45	100

¿Are you a victim of armed conflict?			No	0	0
Yes	9	20	¿Does your home have gas?		
No	36	80	Yes	0	0
¿Are you currently working?			No	45	100
Yes	15	33.33	Number of people in the family unit		
No	30	66.67	From 1 to 3	21	46.67
Employment			From 4 to 6	19	42.23
Construction	0	0	From 7 to 10	5	11.1
Farming	0	0			
Fishing	2	13.33			
Casual work	13	86.67			

Based on the results presented in the table above, from a social perspective, it was found that most respondents are women (60%), and that the population is predominantly elderly, with 51% of respondents over the age of 47. The level of education is low: 42.2% have only primary education, and no respondents have reached university level. Informal employment is notable, with 66.7% unemployed, and 68.89% of families reporting incomes below the current legal minimum salary. Although 48.89% live in their own homes, the vast majority do not have essential basic services such as sewage, which reflects precarious conditions that directly affect the quality of life of the inhabitants.

Community ecotourism is an approach that is notable for promoting community participation and well-being [17]. However, the data in Table 1 show a community with multiple indicators of structural vulnerability that negatively impact its ability to lead or sustain an ecotourism process. The high percentage of heads of households without formal employment (66.7%) and with low incomes (69% below the minimum salary) reflects the urgency of incorporating tourism and environmental training components, productive inclusion, and business capacity building into any ecotourism program [18], [19]. Likewise, considering that the majority of the population is over 47 years old (51.1%) and has low levels of education (42.2% with only primary education), this represents a challenge and an opportunity for innovation in the generation of pedagogical methodologies for the appropriation of knowledge about the territory, ancestral practices, and ecosystem conservation, Since it has been demonstrated that the negative consequences of irresponsible tourism are greater if it is not conceived from an educational perspective [20]. On the other hand, 48.89% of the population owns their own home, which can generate an additional source of income by offering traditional accommodation and an immersive experience of the local culture. However, the precarious state of public services in the area due to the lack of basic services such as sewerage and domestic gas must be considered, as these can affect visitors' perceptions and the sustainability of the destination. The high female presence among respondents (60%) suggests a strategic opportunity to promote women-led entrepreneurship, especially in gastronomy, crafts, and environmental guidance [18].

Environmental condition of the swamp

TABLE 2. ENVIRONMENTAL SECTION RESULTS.

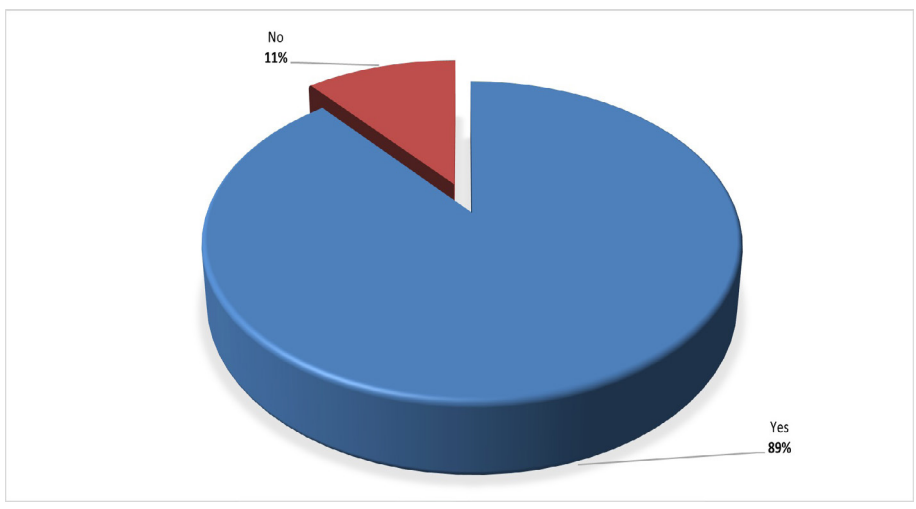
Variable	Frequency	%	Variable	Frequency	%
Most prevalent environmental issue in the CM			Predominant vegetation in the CM		
Drying the swamp	4	8.89	Reeds	4	8.89
Fishery decline	18	40	Taruya	28	62.22
Presence of litter	19	42.22	Red mangrove	0	0
Sewage	4	8.89	White Mangrove	0	0
Water quality			Enea	13	28.89

Very good	0	0	¿If the answer is Taruya, do you consider to?		
Good	5	11.11	Benefit	4	14.2
Regular	17	37.78	Problem	22	78.57
Bad	16	35.56	Another	3	7.13
Very bad	7	15.56	Changes in vegetation		
Presence of sewage			Yes	20	44.44
Yes	38	84.44	No	25	55.56
No	7	15.56	Presence of wildlife		
Major sewage problem			Manatees	4	8.89
Bad smells	20	44.44	Babilla	4	8.89
Algae growth	2	4.44	Otter	7	15.56
Diseases	10	22.22	None of the above	30	66.67
Fishery decline	13	28.89	¿Do you seeing the same number of fish as in the past?		
Another	0	0	Yes	10	22.22
Are you responsible for the state of the swamp?			No	35	77.78
Yes	12	26.67	Have you noticed a decrease in fish numbers recently?		
No	33	73.33	Yes	42	93.33
			No	3	6.67

Source: Own work.

In terms of the environment, residents identify the main problems as sewage discharge into the CM (84.44%), the accumulation of solid waste (42.22%), and the decline in artisanal fishing (40%). In addition, 93.33% have noticed a significant reduction in aquatic fauna, especially fish, while 77.78% say that the presence of terrestrial fauna has also decreased. Despite this situation, 73.33% do not consider themselves directly responsible for the deterioration of the CM ecosystem.

Fig 2. Main environmental problems identified. Source: own work.



In terms of the main environmental problems in the CM, it is notable that 42% report the presence of a lot of trash on the site, 40% note a significant decrease in fishing, 9% report drying and/or loss of the CM area, and 9% believe there are other environmental problems.

The community's perception of the environment reveals an ecosystem in critical condition. Sewage discharge and waste accumulation not only degrade the ecosystem but also represent an obstacle to the consolidation of an attractive tourist image [1] and [5]. The decline in fish species and the loss of fauna in general imply a reduction in the ecological value of the site as a wildlife viewing destination, a key component of ecotourism. Despite the environmental deterioration, there is a low perception of individual or collective responsibility (only 26.6%

consider themselves responsible), which points to the urgent need for environmental education campaigns and co-responsibility strategies to minimize the impacts [4] and [11].

The predominant vegetation, such as water Taruya (Eichhornia Srassipes), considered problematic by 78% of respondents, could also be reinterpreted as an educational element along interpretive trails and reused as raw material in artisanal or agricultural products such as organic fertilizer [21], [22].

In contrast to this situation, various experiences documented in scientific literature indicate that ecotourism can be an effective tool for ecosystem conservation, highlighting the fundamental role that ecotourism can play in protecting biodiversity [23]. There are cases where it has actively contributed to forest restoration processes [24], the conservation of protected areas [25], and the preservation of wildlife [26].

Community perceptions of a potential ecotourism program

TABLE 3. ECOTOURISM SECTION RESULTS.

Variable	Frecuency	%	Variable	Frecuency	%
Community participation in an ecotourism project in the CM			Increase in visitors because of ecotourism		
Yes	35	88.89	Yes	37	92.5
No	5	11.11	No	3	7.5
Incentive to participate			Will there be more jobs with ecotourism?		
Daily payment	18	45	Yes	39	97.5
Social security payments	5	12.5	No	1	2.5
Credit	2	5	Do you think that local authorities will manage more resources with ecotourism??		
Academic scholarship	11	27.5	Yes	34	85
Another	4	10	No	6	15
Ecotourism project leader			Safety improvement		
Foundation	11	27.5	Yes	36	90
Mayor's office	3	7.5	No	4	10
Community	16	40	Improvement in quality of life		
Fishermen's organizations	9	22.5	Yes	40	100
Another	1	2.5	No	0	0
Cultural attractions			Ecotourism and conservation at CM		
Craft production	1	2.5	Yes	37	92.5
Gastronomy	7	17.5	No	3	7.5
Festivals y traditional events.	16	40	Have you participated in protection and conservation programs in the area during the last 6 months?		
None	16	40	Yes	5	12.5
Activity to be developed in the ecotourism program			No	35	87.5
Tour guide	9	22.5	If the answer is Yes, which ones have you participated in?		
Handicrafts	1	2.25	Cleanup day	4	88.9
Forest ranger	3	7.5	Planting day	1	12.1

Chalupa's tour	16	40	Environmental education workshop	0	0
Local commerce	11	27.5	Another	0	0
Obstacles to the development of ecotourism					
Lack of community organization	12	30			
Lack of resources	22	55			
Lack of infrastructure	6	15			
Another	0	0			

Source: own work.

Finally, regarding perceptions about the development of a community ecotourism program in the CM, the population was found to be highly motivated (88.89%) to actively participate in a project of this type. The main reasons are related to economic incentives (45%) and education and training opportunities (27.5%). The first must be carefully managed to avoid frustration if the benefits are not immediate or proportional, since expectations are mainly focused on receiving a daily payment for participating (45%). Therefore, it is suggested that the activity be planned and managed in advance with the community. The second incentive chosen, academic scholarships, indicates a population with aspirations for improvement and openness to knowledge, which in turn would facilitate participation in tourism, environmental, and business education initiatives. In this context, the perception is positive in terms of the expected benefits; it is notable that 100% believe that it would improve their quality of life, 97.5% believe that it would generate employment, 90% believe that it would improve security, and 92.5% believe that it would promote environmental conservation, which indicates strong hope placed in ecotourism [6] and [7].

However, only 12.5% have participated in environmental conservation programs in the last six months, which shows a discrepancy between intention and action [7] and [9]. The main barriers identified—lack of resources (55%) and community organization (30%)—must be addressed through project governance, prioritizing participatory processes, leadership training, and ongoing technical and institutional support [8] and [9].

Despite these limitations, positive perceptions reveal latent social capital that can become a key asset for the success of community-based ecotourism, if empowerment and training strategies are properly articulated. Studies such as those in [27] and [28] show that when local communities participate actively and in an organized manner, ecotourism becomes an effective tool for sustainable development and social cohesion. In addition, the creation of alliances with external actors such as NGOs, universities, and government entities can compensate for the lack of initial resources and strengthen local capacities [29]. In this sense, continuing education programs in tourism management, community leadership, and environmental education, as well as the implementation of micro-finance schemes or green funds, could be catalysts for converting community intentions into effective and sustained action.

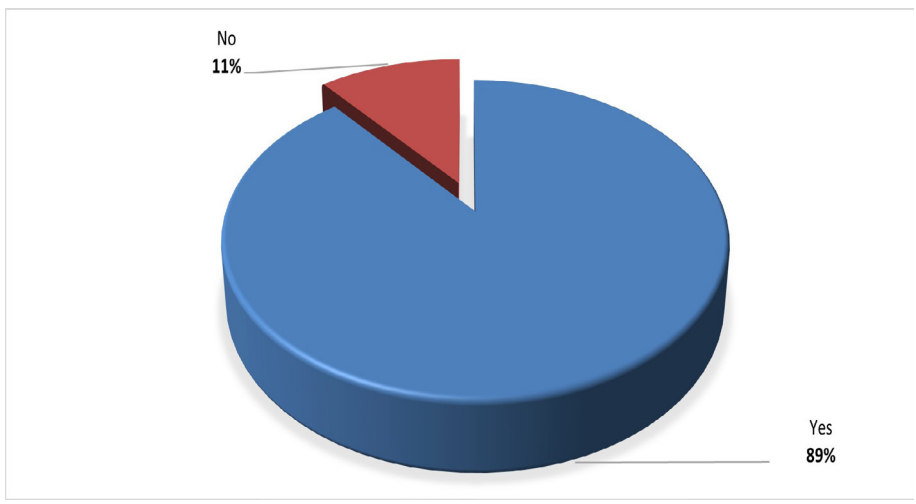


Fig 3. Perspectives about community participation in an ecotourism program. Source: own work.

On the other hand, one of the most relevant results of this study was the determination of the level of community participation in the development of a community ecotourism program

in the CM. It was found that 89% of respondents agree with its implementation, while 11% do not.

Characteristics of the infrastructure for the development of ecotourism

This section presents the results of a field checklist, which was applied during one visit to the study area.

TABLE 4. RESULTS OF APPLYING FOR THE CHECKLIST.

Variable	Observation
Access road status	It was determined that the road under study is a tertiary road connecting the Troncal de Occidente highway with the villages of El Espinal and Caimital, ending at the banks of the Magdalena River. The road corridor has a heterogeneous morphology, characterized by sections with construction and demolition waste (CDW), as well as areas where the surrounding vegetation partially invades the roadway. These conditions reflect poor environmental management and irregular maintenance. In functional terms, the road does not guarantee smooth and safe traffic flow for four-wheel drive or larger vehicles, limiting its operability to light means of transport, which can travel with relative ease, although not without risk in certain segments.
Transportation availability (land and river)	The presence of a light transport system was observed, consisting mainly of motorcycles and motorized tricycles, which serve the daily mobility needs of the local population. These modes of transport are the main alternative for land transport in the area, given the limited capacity of the road infrastructure. In addition, the use of canoe-type boats was observed on the banks of the Magdalena River; however, these are privately owned and do not form part of a structured public river transport system. The availability of mobility options is therefore limited and responds to informal dynamics, which restricts equitable and safe access to transport, especially for vulnerable communities.
Availability and variety of gastronomy	During the reconnaissance tour, there were no formal establishments dedicated to offering food services, such as restaurants. However, there were at least two roadside restaurants located in the village of El Espinal, which operate under informal conditions. In addition, advertisements for the sale of homemade food were observed, suggesting the presence of an unregulated food market characterized by family-run businesses. This situation highlights a limited and predominantly informal supply of food services, with implications for both health and local economic development.
Existence of local handicrafts	In the villages of El Espinal and Caimital, there was no evidence of craft shops or activities associated with the sale of local cultural products. However, ongoing initiatives by the municipality of Malambo were identified, aimed at creating a museum that would house archaeological pieces, with the aim of strengthening the heritage and tourist value of the territory. Likewise, community leaders stated that members of the Mokaná indigenous communities practice traditional pottery in areas surrounding the Ciénaga de Malambo, which represents a significant cultural manifestation with the potential to be integrated into strategies for sustainable cultural tourism and identity strengthening.
Special event inventory	According to testimonies from local residents, the existence of celebrations associated with the patron saint festivities was confirmed, which take place annually between July 16 and 20 each year. However, these festivities are held in the municipal capital, which significantly limits the active participation of residents from the villages of El Espinal and Caimital. This low representation is attributed to factors such as geographical distance, mobility difficulties, and poor coordination between municipal cultural programming and rural community dynamics. This suggests the need to design cultural inclusion strategies that promote the involvement and participation of peripheral communities in the municipality‘s festive events.
Ecotourism practices (environmental interpretation trails, flora and fauna sightings, community participation)	Representative species of flora and fauna were identified in the study area, notably the presence of Taruya (Eichhornia crassipes) and mangrove species, key elements in the ecological structure of wetlands and riparian areas. Although there are currently no formal bird watching activities, the conditions of the ecosystem show high potential for the implementation of ecotourism and environmental interpretation practices, given the possible transit and permanence of resident and migratory birds. The structuring of observation routes and community training could constitute sustainable strategies to promote the conservation and responsible use of local biodiversity.

Source: own work.

In terms of infrastructure, it was determined that current conditions are not adequate for the development of ecotourism. Access roads are in poor condition, there is no efficient river transport network, and there are no ecological routes, signage, or basic services geared toward tourism. These deficiencies were recorded through field observations and checklists applied in the study area.

In response to this diagnosis, strategies were designed based on three main components. In terms of infrastructure, proposals were made to improve access roads, enhance river transport, and implement ecological routes. In terms of the environment, community clean-up days and the repopulation of fish species were proposed. Finally, in the educational component, ecotourism diploma courses and craft workshops for single mothers were proposed, seeking to strengthen the family economy and territory appropriatio.

CONCLUSIONS

The research results are notable for highlighting community ecotourism as a viable alternative for sustainable development in the Ciénaga de Malambo (CM), promoting the conservation of natural resources and improving the local quality of life. There was evidence of high community interest in participating in these initiatives (90%), which reinforces their potential as a participatory development strategy.

However, a strong preference for immediate economic incentives (45%) was also observed, posing the challenge of balancing sustainability and economic benefits. This suggests the need to design strategies that integrate community expectations with the project's long-term objectives.

The lack of adequate infrastructure, such as access roads and water transportation, was identified as a key obstacle to the development of ecotourism, underlining the need for investment in infrastructure and better territorial planning.

Finally, the importance of coordinating efforts between the community, the public sector, and the private sector to strengthen local capacities and consolidate a sustainable ecotourism offering isemphasized. These findings provide a basis for involving government, educational, and civil society actors in the promotion of ecotourism and wetland conservation.

CRediT AUTHORSHIP CONTRIBUTION STATEMENT

D. Cuao-Martinez: Conceptualization, methodology, research. F. Lara-Nuñez: Conceptualization, methodology, research. F. Pineda-Vides: Conceptualization, methodology, research, data curation, supervision. A. Suarez-Agudelo: Conceptualization, methodology, research. J. Andrade-Perez: Writing – Review and editing, review and editing. J. Padilla-Barrios: Review and editing, review and editing.

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