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TOURIST LOAD CAPACITY AS A TOOL FOR THE SUSTAINABLE MANAGEMENT OF THE GUAJARÁ MIRIM STATE PARK, RONDÔNIA, WESTERN AMAZON

CAPACIDADE DE CARGA TURÍSTICA COMO FERRAMENTA PARA A GESTÃO SUSTENTÁVEL DO PARQUE ESTADUAL GUAJARÁ MIRIM, RONDÔNIA, AMAZÔNIA OCIDENTAL

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Abstract: Ecotourism has been considered by many authors as the economic segment of tourism with the highest annual growth rates. In Brazil, the Amazon has been stimulating national and international interest for the on-site experience of this activity due to its rich biodiversity. And in this context, the tourist carrying capacity assumes a fundamental role in dimensioning the structure, organization and management of these enterprises. The general objective was to analyze, through the Miguel Cifuentes Method, the Tourist Load Capacity of the Guajará Mirim State Park, Western Amazon, in order to contribute to studies focused on the environmental management of this UC. The main results in the form of effective carrying capacity reached a quantity of 14.7 visitors per day (Trail 1), 130.07 visitors per day (Trail 2) and 107.32 visitors per day (Trail 3). The results ratify the difficult reality of Conservation Units in the Amazon, from the point of view of sustainability focused on ecotourism. It is evident that the low tourist load capacity of the Guajará Mirim State Park is due to the deficiency of the ecotourism policy in this UC, which reflects on the inexpressive internal infrastructure of the Park and on the management of these spaces as elements of ecotourism. However, it is worth highlighting the potential of the Guajará Mirim State Park as the locus of ecotourism in the border region between Rondônia (Brazil) and Beni (Bolivia).

Keywords: Tourist Cargo. Cifuentes Method. Sustainable development. Ecotourism. Guajará Mirim State Park.

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Resumo: O ecoturismo vem sendo considerado por muitos autores como o segmento econômico do turismo com as maiores taxas de crescimento anuais. No Brasil, a Amazônia vem estimulando o interesse nacional e internacional para a experiência *in loco* desta atividade devido a sua rica biodiversidade. E nesse contexto, a capacidade de carga turística assume um papel fundamental para dimensionar a estrutura, a organização e a gestão desses empreendimentos. Definiu-se como objetivo geral analisar, através do Método de Miguel Cifuentes qual a Capacidade de Carga Turística do Parque Estadual Guajará Mirim, Amazônia Ocidental, visando contribuir com os estudos voltados à gestão ambiental desta UC. Os principais resultados na forma de capacidade de carga efetiva, atingiram um quantitativo de 14,7 visitantes por dia (Trilha 1), 130,07 visitantes por dia (Trilha 2) e 107,32 visitantes por dia (Trilha 3). Os resultados ratificam a difícil realidade das Unidades de Conservação na Amazônia, do ponto de vista da sustentabilidade voltada ao ecoturismo. Evidencia-se que a baixa capacidade de carga turística do Parque Estadual Guajará Mirim é decorrente da deficiência da política de ecoturismo nesta UC, o qual reflete na inexpressiva infraestrutura interna do Parque e na gestão desses espaços como elementosdo ecoturismo. Todavia, merece destacar o potencial do Parque Estadual Guajará Mirim como o *locus* do ecoturismo da região de fronteira entre Rondônia (Brasil) e Beni (Bolívia).

Palavras-Chaves: Carga Turística. Método Cifuentes. Desenvolvimento Sustentável. Ecoturismo. Parque Estadual Guajará Mirim.

Introduction

When it comes to Tourism in Natural Areas or Ecotourism in the Amazon as a sustainable development policy, one can consider that the visitation of natural environments provides exuberant satisfaction in various forms of recreation and leisure, involving not only light physical activities, such as a walk along a pleasant trail or bird watching, but also activities full of adventure such as climbing, canoeing, and even rappelling. All these activities with the contemplation of the most incredible landscapes that the Brazilian biomes have, allows a true interaction of the human being with nature, helping to develop a sustainable conscience, respect for the environment, and the promotion of environmental protection policies that guarantee its use by present and future generations.

When conducting a literature review regarding the visitation of natural areas for recreational activities, it can be observed that the activities date back to ancient times, but their intensification occurs from the nineteenth century with the advent of the Industrial Revolution and the growth of cities [1, 2]. With this and due to the stressful work routine, the number of people has been gradually increasing in search of outdoor recreational activities, interacting with the environment. The author also states that with the creation of Yellowstone

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National Park in 1872, in the United States, there were initiatives to reserve large areas of wilderness available to urban populations for recreation, serving as a model for the whole world, especially since the 1980s, significantly increasing the conservation of natural areas.

The definition of conserved natural environments, according to Embratur [3], "are territorial spaces with relevant natural characteristics, legally established by the public power, with conservation objectives and defined limits, under a special administration regime, to which adequate protection guarantees are applied, in order to maintain the natural resources in their original state" [4].

According to the Brazilian Ministry of Environment [5], tourism activities that have nature as their main motivation have been addressed in countless newspaper articles, television programs, thematic events, specialized tourism products and guides, and academic works [6]. Siles [7] reports that public use in protected natural areas is allowed in almost all categories of Conservation Units, which makes its role in nature conservation much discussed, being defined as the enjoyment enjoyed by the public, recreational as well as educational, research or religious, that is, there are numerous modalities that can be developed, implying different forms of contact with nature, with a wide range of activities practiced by users with different profiles. For example, ecotourism, rural tourism, or adventure tourism are increasingly present in our daily lives.

The Education Manual for Sustainable Consumption [8] argues that ecotourism is an example of an activity that reconciles economic development and conservation of ecosystems, as it is dominated by micro and small companies and has been generating a rapid increase in employment and income, raising the quality of life of its visitors and the local population. However, the Manual itself warns that the orderly growth of this activity in Brazil and its recognized benefits for nature conservation depend on investments in improving the technical and business capacity of public and private agents and the communities involved.

According to Janér [9], Costa Rica receives about one million international visitors per year, although research by the ICT (Costa Rican Tourism Institute) shows that the most popular type of natural attraction is still sun and sea, this is clearly done in combination with other activities in nature. However, about 58% of North American and 70% of European tourists visit the Costa Rican National Park system.

In the United States in 2002 alone, 64 million visits were recorded to national parks

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and 277 million to the entire system of federal protected areas. The data also shows that more than half of Americans (55%) visit National Parks, with 15% of these traveling more than 100 miles to visit a national park and 25% of foreign visitors to the U.S. visit a national park during their stay in the country [9].

The World Labor Organization (WTO), projects that South American tourism should more than double by 2030, which is expected to surpass rich countries in international tourist arrivals in emerging countries, keeping the Americas in third place among the largest tourist receptors, behind only Europe and Asia [10, 11].

According to Embratur [3], in Brazil, ecotourism currently represents about 3.6% of the GDP, employing, directly and indirectly, more than 10 million people and stimulating a clean and sustainable development, which has as its principle to preserve in order to generate income. Embratur also affirms that, besides being a strong economic lever, it also contributes to the expansion of the Brazilian people's cognitive repertoire, diversifying historical, cultural, and social references, besides stimulating local development by injecting billions into the economy, since Brazil is one of the places that has the most tourist attractions, fitting in with several ecotourist profiles for the practices of almost all modalities foreseen, having a worldwide recognition due to its immense biodiversity, attracting tourists from all over the world.

Brazil is considered a mega-diverse country, along with the United States, Australia, Mexico, South Africa, and India, because it does not have political, religious, or other types of conflicts, and because it has the largest biodiversity on the planet, competing with regions in Indonesia and Central America [3, 4].

Santos [12] reports that in recent years the Brazilian government has shown considerable concern in implementing public policies to develop Brazilian tourism, through various programs, disseminating and expanding tourism activities not only for the wealthy Brazilian society, but also for the population with low purchasing power, reducing the costs of internal displacement and developing an appropriate tourism structure and skilled labor.

Brazilian municipalities have recently elected the two most important segments to be developed in their locality, highlighting cultural tourism and ecotourism, however, with the need to build an attractive and sustainable tourism product, and to be exposed to the public, such resources must be properly prepared and conserved, reviewed " [12].

Sansolo [13] reports that the reorganization of the Amazonian space that took place

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from the 1970s onwards triggered a series of economic development projects, placing the region in the spotlight of industrial production; however, this process triggered socio-environmental impacts from the burning, river pollution, the slums in the urban peripheries, and the land conflict. The author also affirms that in face of these problems, tourism arises in the Amazon, configuring as a new content of insertion of the territory that has been receiving considerable governmental and private investments.

Albuja, et al, [14], state that the Amazon, for being the largest tropical forest on the planet, is one of the richest ecosystems and one of the greatest biodiversity and natural resources, while its rivers harbor 20% in volume of water of all rivers on the planet, besides splendid forests and untouched forests, various other ecosystems and scenarios of great importance with the greatest wealth of animals and plants in the world, sheltering between 10 and 20% of the 1.5 million species already catalogued, among other thousands of animal and plant species that have not yet been identified, that make this region a unique place. It reaffirms the importance of development under the paths of sustainability, considering that this place is home to indigenous peoples, remaining quilombola groups, rubber tapper communities, Brazil nut gatherers, riverside dwellers, babassu nut gatherers, and several other ethnic groups that have maintained their customs and knowledge of living in harmony with nature.

The State of Rondônia has a great tourist potential, as it has a vast area of environmental protection, with its very distinctive scenic beauties, already known worldwide, however, it lacks a better structure and tourist service. Among the Conservation Units (UC) created with the advent of the Rondonia Agriculture and Forestry Plan (Planafloro), the Guajará Mirim State Park (PEGM) was created, with an area of 207,148.266 hectares, located in the municipalities of Nova Mamoré and Guajará-Mirim, in the western region of the state of Rondonia [15, 16]. According to its management plan, the Guajará Mirim State Park is a state Conservation Unit of full protection, under the administration of the State Secretary of Environmental Development (SEDAM) and is part of the State System of Conservation Units (SEUC) and the National System of Conservation Units (SNUC) [17].

Being inserted in the National System of Conservation Units (SNUC) in an integral protection category, PEGM has the following particularities: The basic objective of the National Park is to preserve natural ecosystems of great ecological relevance and scenic beauty, enabling scientific research and the development of environmental education and

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interpretation activities, recreation in contact with nature, and ecological tourism; The National Park is under public ownership, and the private areas included within its limits will be expropriated, in accordance with the law; Public visitation is subject to the norms and restrictions established in the unit's Management Plan, to the norms established by the agency responsible for its administration, and to those provided for in the regulations; Scientific research depends on prior authorization from the body responsible for managing the unit and is subject to the conditions and restrictions established by it, as well as those provided for in the regulations; The units of this category, when created by the State or Municipality, will be called, respectively, State Park and Municipal Natural Park.

Therefore, the management of the park must be in accordance with the unit's management plan, following its characteristics and objectives for which it was created. And according to the SNUC it provides for recreational and leisure visits, however, these visits must be controlled, because they generate environmental impact, especially for fauna and flora. To mitigate this issue, this work aims to answer the following problem: What is the tourism load capacity of the Guajará Mirim State Park so that it can contribute to the sustainable management of this conservation unit?

To this end, it was necessary to analyze the following questions: a) What is the relationship between Conservation Units and Sustainable Development? b) What is the legal basis and the public policies for a Conservation Unit to fulfill the role it was created for? c) What is the potential of ecotourism products for developing tourism in natural areas and their impacts on the environment?

Thus, the general objective of this work was to analyze, through the Miguel Cifuentes Method, the Tourist Load Capacity of the Guajará Mirim State Park, in order to contribute to studies on the environmental management of this UC, so that it can corroborate with sustainable development, integrating the surrounding populations, providing income and social inclusion, as well as adding economic value to the unit, ensuring its preservation.

Research Method

The method used developed by Cifuentes [18, 19], which defines the tourism carrying capacity considering three levels that must be calculated: a) physical carrying capacity (CCF); b) actual carrying capacity (CCR); and c) effective or allowable carrying capacity

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(CCE).

Physical Load Capacity (CCF)

It is the maximum limit of visits that a place, considering each site or trail, can receive per day in a given time, because it is given by the relationship between visiting hours, time needed, and the available space that a visitor needs for the visit. To calculate this, the following formula should be followed:

CCF=V/a x S x t

CCF = physical load capacity

V/a = visitor/occupied area

S = surface available for public use

t = time needed to execute the visit

To make this calculation, some basic criteria and assumptions must be followed:

1. A visitor generally needs 1m2 to move freely during the visit;

2. The available surface will be determined by the condition of the evaluated location, for example, on trails, space limitations must be given by the size of the groups and the distance that a group must have in relation to the other;

3. The time factor is conditioned on the visiting time and the actual time needed to visit the place, i.e. the number of times the place can be used by the same person in the same day.

$$\mathbf{t} = \frac{\text{time of visits/day}}{\text{time required for each visit}}$$

Actual Load Capacity (CCR)

It is the maximum limit of visits defined by reducing the CCF, by correction factors in function of the limitations imposed by the biophysical, social and management conditions of the area. It is represented by the following formula:

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CCR = (CCF-FC1) – FCn

CCR = actual load capacity

CCF = physical load capacity

FC = correction factor, which must be expressed as a percentage.

To calculate the correction factor you should use the following formula:

$$FC = \frac{ML}{MT} \times 100$$

FC= correction factor

ML= variable limiting magnitude

MT= total variable magnitude

It should also be noted that each place analyzed has a different correction factor group, that is, it needs different calculations for each specific place, for example, a flood that prevents access to one place, may not affect another, therefore, the three trails have unique characteristics.

Effective Cargo Capacity (CCE)

It is the maximum limit of allowed visits, as a function of the capacity to order and manage them. It is obtained by comparing the CCR with the management capacity of the unit (CM). It is necessary to know the minimum management capacity and determine the corresponding percentage with respect to the management capacity existing in the analyzed area, so it has the following general formula:

$$CCE = \frac{CCR \times CM}{100}$$

ECC = effective load capacity

CCR = actual load capacity

CM = handling capacity

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Where CM is the percentage of the minimum management capacity that the administration of a protected area needs to be able to develop its activities and fully comply with its functions and objectives of the area, considering variables such as: technical staff, equipment, infrastructure, facilities, and financing. It is worth mentioning that as the CM of protected areas in developing countries and in Latin America in particular are a chronic and critical problem due to the lack of structure there is the need to introduce here a concept of Acceptable Limit of Use (ABU), as the only way to ensure the permanence of visitors in a way that the minimum acceptable impact occurs, and that as the management capacity increases, the ABU can also be increased and consequently increase the CCE. However, this can never be greater than the CCR, even if the management capacity exceeds its optimal level, making the CCE flexible, dynamic, and adjustable, that is, the area manager should make periodic and permanent revisions as increases in the structure of the protected area occur.

To calculate the Management Capacity (MC), it is necessary to list all the human resources, infrastructure, and equipment needed to have optimal visiting conditions, comparing them with the available resources according to the list, where the unit manager will have a basis for investments to implement the entire protected area, and the percentage reached should be at least 15% so that it can carry out its activities and meet the objectives it was created for, where:

$$CM = \frac{CA}{CNO} \times 100$$

CM = handling capacity

CA = current capacity

CNO = capacity optimal level

Research Sources

Surveys were carried out in locus to account for the structure of the base that receives visitors, a thorough investigation of the trails to establish length, possible erosion, flooding and other structures necessary for the maintenance and safety of the trails for visitation, as well as in books, master's theses, doctoral dissertations, and scientific articles on websites of

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official institutions related to the theme.

Research Object

This research was carried out in the three trails located in the Intensive Use Zone of the Guajará-Mirim State Park, whose area consists of both natural and man-made environments, and this environment is kept as close as possible to the natural one, containing a visitor center and services that facilitate intensive recreational and environmental education in harmony with the environment.

Location and Access

The Guajará Mirim State Park is located on the Brazil/Bolivia international border strip, in the area of the municipalities of Nova Mamoré and Guajará-Mirim, in the western region of the state of RO, bordered to the northwest by the Karipuna indigenous reserve area, to the northwest with areas in the process of land regularization, to the east with the lands of Issac Benayon Sabba, to the south southeast with the indigenous area of the Uru-Eu-Wau-Wau, to the southwest with the extractive reserve Rio Ouro Preto, and to the far west with the indigenous area Lages

Research Analysis and Discussion

Determination of the Load Capacity of Tracklogs 1, 2 and 3 Based on the Cifuentes Method

The practice of hiking on trails is an activity that seeks to bring the visitor closer to nature, stimulating the development of environmental perception and as an ecotourism activity, it has great importance because it is a sustainable activity, and the definition of the tourist load capacity is a fundamental tool to minimize the impacts resulting from its implementation.

To do so, the anthropic load capacity of the three existing trails in PEGM will be calculated using the Cifuentes method [18], considering the three levels already mentioned, emphasizing that the Physical Load Capacity will always be greater than or equal to the Real

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Load Capacity, which in turn will always be greater than or equal to the Effective Load Capacity, represented as follows:

CCF ≥ CCR ≥ CCE

Determination of the Physical Load Capacity (CCF)

As seen in the methodology, the physical load capacity is the maximum limit of visits that a place can receive per day, considering time, weather and space of each trail for the visit.

Calculation of the physical load capacity of trail 1

Parallel to Rio Formoso, with a slight incline, classified as a short trail of light difficulty, it is 250 meters long, measured with a GPS model Garmin, and does not require physical conditioning or any specific technique.

On this trail the visitor, in contact with nature contemplation, gets to know some species of native vegetation, with huge trees, birds, and traces of the activities of large mammals and rodents, making the trail attractive and very pleasant, with an expectant feeling of crossing with animals from the region at any moment, making it a unique experience. Trail 1 has the following characteristics: an area of vegetation composed of open submontane forest; with a surface area of 250 meters in length; one person occupies 1m2 of linear surface area; each visitor takes half an hour to complete the trail; it is recommended that each group has up to 10 members; distance between groups is required.

$$t = \frac{\text{8 hours of visits/day}}{\text{0,5 hours/time required for each visit}}$$

= 16 visits/day, then:

CCF = 1 visitor/m2 x 250m x 16 visits/day

CCF = 4,000 hits/day

Calculation of the physical load capacity of trail 2

This is a long trail with 1,800 meters in a straight line and 2,200 meters in length, also measured with a GPS Garmim model, classified as a long trail of moderate difficulty,

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although it requires good physical conditioning, it does not require any specific technique.

In this trail the visitor makes a pleasant walk, with two obstacles that require the crossing of bodies of water by fallen trees, in which the contact of nature contemplation, through an interpretation of the natural beauty that the trail presents. It allows you to meet several species of native vegetation, birds and traces of the activities of mammals and large rodents, making the trail attractive and very pleasant, with an expectant feeling that at any moment you may cross paths with animals of the region. An unforgettable experience.

Trail 2 has the following characteristics: it is a vegetation area composed of open submontane forest; it is 2,200 meters long; one person occupies 1m2 of linear area; it takes one hour for each visitor to complete the trail; it is recommended that each group has up to 10 members; it requires distance between groups.

$$t = \frac{\text{8 hours of visits/day}}{\text{1 hour/time required for each visit}} = \text{8 hours of visits/day:}$$

CCF = 1 visitor/m2 x 2,200m x 8 visits/day

CCF = 17,600 hits/day

Calculation of the physical load capacity of trail 3

Trail 3, as well as trail 1 and 2 are already in place, and trail 3 is the main trail in the park and leads to a waterfall in Rio Formoso. With a length of approximately 1,500 meters in a straight line (1,800 meters of trail), measured with a GPS model Garmin, with 1.5 meters of width, with a one-hour travel time, despite having more than 1.5 km of trail, it can be classified as a long trail of moderate difficulty, with a water body crossing through fallen trees, but does not require any specific technique.

Although it presents a degree of difficulty in crossing bodies of water, on this trail the visitor takes a pleasant walk, also in contact, contemplating nature. At the end of the trail there is a waterfall of extraordinary beauty, where the visitor can cool off before returning to the headquarters. In addition, the visitor can learn about the characteristics of the different species of native vegetation such as large trees and observe a wide variety of birds. This trail runs parallel to the Formoso river, where animals drink water, showing traces of animal activity, which makes it the main trail, with a unique sense of expectation, where at any time you can come across animals along the trail and surroundings. It presents the following characteristics: it is a vegetation area composed of submontane open forest; with a surface

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area of 1,800m in length; one person occupies 1m2 of linear surface; each visitor takes one hour to complete the route; it is recommended that each group has up to 10 members; need distance between groups.

$$t = \frac{\text{8 hours of visits/day}}{\text{1 hour/ time required for each visit}} = 8 \text{ visits/day, then:}$$

CCF = 1 visitor/m2 x 1,800m x 8 visits/day

CCF = 14,400 hits/day

Determination of the Actual Load Capacity (CCR)

To calculate the CCR it is necessary to analyze some correction factors, and the sun glare correction factor, which is when the sun's glare is very strong, especially in the period between 10:00 am and 4:00 pm in this region, causing a limitation for visitation, was not considered in this work, since the trails are all covered by vegetation, making visitation pleasant throughout the day.

Although in the periods between February and March, when the rivers flood in the region, even if the river overflows and floods part of trails 1 and 3, the flooding correction factor will not be considered in this work, because the trails are located in a strip of open ombrophilous forest, and it is possible to get around the flooding points without effort.

Although the soil type of the trails is susceptible to erosion, both are new and little used by visitors, therefore, they do not present erosion sectors, which makes it unnecessary to calculate the erodibility correction factor, because the method applied by Cifuentes (1992) considers as limiting only the points that present evidence of erosion.

Determination of the Effective Load Capacity of the Trails

To determine the effective capacity we have to calculate the management capacity of the unit by analyzing the minimum necessary infrastructure through the optimal level management capacity and the current capacity of the Park by calculating its percentage.

Analysis and Discussion of Results

Once the effective load capacity was concluded, in which the maximum capacity that the Guajará Mirim State Park can receive visitors per day and per year was defined,

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considering the necessary infrastructure to receive tourists, the following table summarizes the final result, facilitating the annual definition of visitors, corroborating the decision-making for the park management.

Table 1 - PEGM Load Capacity Summary

Load Capacity	Trail 1	Trail 2	Trail 3
Physics (CCF)	**4,000 visits/day**	**17,600 visits/day**	**17,600 visits/day**
Correction Facto			
FCs	83,6%	83,4%	83,3%
FCet	14,2%	14,2%	14,2%
FCp	19,6%	19,6%	19,6%
FCa	-	0,86%	0,66%
Real (CCR)	**452,52 visits/day**	**1,997.27 visits/day**	**1,647.95 visits/day**
Manageability (CM)	**52,1%**	**52,1%**	**52,1%**
Effective (CCE)	**235.7 visits/day**	**1,040.57 visits/day**	**858.58 visits/day**
CCE Visitors/daily	14,7	130,07	107,32
CCE/annual visitors	4.601,1	40.711,91	33.591,16

Source: Cifuentes *et al.* [19], modified by the authors.

By observing table 1, it can be seen that the maximum daily load capacity of trails 1, 2 and 3 correspond to 14.7 visitors, 130.07 visitors and 107.32 daily visitors, respectively. The trails are the main tourist product that allows the visitor to interact with the environment, getting to know the several species of local fauna and flora, in a safe way, with a feeling of well being and satisfied with the visit.

The management capacity reached a value of 52.1%, showing the need to implement the infrastructure, both physical and human that the Guajara Mirim Park needs to develop ecotourism in a safe way and a minimum of comfort for visitors, in order to enhance the tourism products, encouraging both the return and the coming of new visitors, ensuring a flow of people and thus guaranteeing new economic investments for the unit and economic gains for the surrounding populations.

It is worth pointing out that the numbers obtained, although not expressive, are unlikely to reach the total number of visits, since the Park is located in a region of difficult access and lacks adequate infrastructure to ensure a flow of people sufficient to reach the maximum capacity that the Unit can support, in order to ensure excellent environmental quality.

It is important to highlight the total amount of annual visitors that the park can support, because this helps managers to make decisions for the constant implementation of the enterprise based on the principles of sustainable development and justifying the

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implementation of ecotourism as the main vector of local development.

Teixeira [20], says that sustainable development was a solution to problems caused by human occupation in conservation units, considering that in many protected areas there was already occupation by traditional populations (indigenous and quilombolas) who have the right to stay in the area, but their use must be controlled and regulated according to the creation and characteristics of each unit.

Ratifying Andrade's statement [21], the trails, the main tourist product of the Guajará Mirim State Park, stopped being a simple displacement and started to incorporate a new meaning, awakening in the visitors an environmental education with awareness in the conservation of the units, influencing behaviors for sustainable development, involving a man-nature relationship as a central focus, as also pointed out by Watanabe [22].

Although negative socio-environmental impacts occur with the implementation of ecotourism, such activity is justified by the great return it brings to society in the search for a more just social equity for the populations involved, by the economic gains in the generation of direct and indirect jobs, besides providing improvements in transportation, comunication, education, safety, health, and basic sanitation systems, stimulating environmental preservation and the creation of protected areas.

By analyzing the current situation of the Guajará Mirim State Park, it can be observed that since the opening of the road that cuts through the park, deforestation and invasions by squatters and land grabbers have increased, requiring a quick response from the managers with the support of the security forces to stop and inhibit new invasions, which shows the latent need to implement ecotourism in order to enhance the value of this unit and promote local development and the surrounding area, making the park fulfill its social function in generating jobs and income for the populations involved.

By analyzing the international conferences already held, regarding the environmental issue, we can ratify the importance of conservation units for the improvement of environmental quality in the world, in view of the important contribution in carbon sequestration, air recycling performed by forests, and various benefits that they can bring to society corroborating with the signatory countries to achieve their goals in the pursuit of a development based on sustainability.

The international conference that created the document known as "The Charter of Lanzarote", for example, which guides the States to develop a tourism based on the

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principles of sustainable development, makes the protected areas one of the main objects in the achievement of this agreement [23]. In this sense, there is no way to talk about tourism in protected areas without such an enterprise being linked to responsible tourism, since Law 9985, which created the National System of Nature Conservation Units, came to systematize both the creation and the management of the units. Thus, they must follow the characteristic objectives of each conservation unit, in accordance with the management plan previously prepared, and the use of the natural resources of the units must follow the principles of sustainable development, ratifying the Declaration of Quebec, which occurred in 2002, which emphasized that ecotourism cooperates with a sustainable model, economically benefiting the local and surrounding communities, favoring the conservation of natural wealth, respecting and maintaining the local culture.

According to Embratur's data, tourism is an activity that grows the most in the world, contributing to the global GDP, in the provision of various services, and in the creation of direct and indirect jobs. Brazil, due to its megabiodiversity, presents thousands of tourist attractions, pointing ecotourism as one of the main activities in development. Thus, it puts the Parks in the spotlight for the large number of units in this category and for their exuberant scenic beauty. Certainly these Parks can contribute to local development by minimizing regional differences [3].

According to Duarte [24], the visitation of national and state parks has the potential to attract thousands of tourists a year, generating capital of more than R$ 1.6 billion, besides avoiding the emission of more than 2.8 billion tons of carbon, equivalent to about R$ 96 billion, and 80% of the hydroelectricity generated in the country has as its source of water at least one river downstream of a conservation unit, besides other benefits that the units exert which makes the Parks the locus of sustainable development of the regions involved, providing social inclusion of the surrounding populations through the raising of financial resources directly and indirectly by the tourist activity.

The national tourism public policies have ambitious goals to boost tourism in Brazil, with the increase in the offer of flights and foreign tourist arrivals, besides expanding domestic tourism, and ecotourism is among the main products that will be contemplated by this implementation policy with decentralized guidelines and based on the principle of sustainable development with a holistic vision, strengthening the regions, improving the quality and competitiveness in the provision of services and encouraging innovation, which

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makes the Parks even more evident, ratifying Duarte's statement [24].

Regarding public policies for tourism in the state of Rondônia, the Sustainable State Development Plan of Rondônia/PDES-RO is an instrument created with the objective of reducing regional inequalities in relation to the large developed centers of the country [25]. The Plan contemplates four guidelines based on sustainable development, with emphasis on the promotion of regional tourism, valuing the already identified tourist spots, besides including the activity in conservation units through the bidding for the concession of the public space where the Guajará Mirim State Park is located. With its management plan elaborated, it becomes a potential vector for tourism development that can favor the surrounding communities, collaborating with the plan's effectiveness and developing a sense of belonging, since the plan foresees that the local community itself will be trained with the different functions of escorts, cooks, caterers, security guards, nurses, and guides prepared to serve a national and foreign public.

The global, national, and regional public policies researched here are tools in force that enhance ecotourism as a vector for sustainable development. However, when we analyze the region where the Guajará Mirim State Park is located, we can see, by calculating the management capacity, which reached 52.1%, the visible need for investment in infrastructure, both in the park and in the surrounding region.

According to Vasconcelos [26], Environmental or Nature Interpretation is a stimulating way to make people understand their ecological surroundings, in which ecotourism has manifested itself with an increase in people's search for more contact with natural environments, with the need to find relaxation, beauty, and interaction, with the principle of harmony between the use and conservation of the natural areas visited and consequently the local socio-economic development, and must find alternatives to solve these conflicts, influencing attitudes and behavior, and cannot do without educational activities.

At this conjuncture, ecotourism translates itself into an excellent tool for the development of environmental education, mainly through the practice of hiking on trails, considering that the contact with nature, guided by a trained professional through an environmental interpretation, makes a spirit of cooperation emerge from the visitor, stimulating an ethical conscience based on the responsibility of each one to preserve the natural environment in order to guarantee a healthy quality of life for the present and future generations.

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Andrade [21] says that although the main function of the trails has always been to supply the need for displacement, it can be seen that over the years there has been a change in the conception concerning trails, i.e., from a simple means of displacement to a new means of contact with the environment, incorporating a new meaning and offering visitors the opportunity to enjoy an area in a peaceful way and to achieve greater familiarity with nature. The author also emphasized the need for good planning in the construction of the trails, because, properly maintained, they protect the environment from the impacts of use, and also ensure that visitors have more comfort, safety, and satisfaction, besides leaving a significant impression that the tourist will take about the area, as well as the institution that manages it.

About the social and environmental impacts of ecotourism, Ferreira [27] reminds us that "the tourist activity cannot be seen or analyzed only from the economic perspective, as it most often happens; there is a need to understand that there are cultural and social aspects of tourism that generate significant impacts and contribute to the construction of the phenomenon in various spaces. Although ecotourism is seen as a tool for the construction of a society based on sustainable development, because its purpose is linked to income generation and social inclusion of the communities involved in harmony with nature conservation, aiming at the use of present and future generations, we know that the occurrence of negative impacts from this activity is inevitable, not only social and economic but also environmental. Corroborating with the socio-environmental impacts of ecotourism, Prado [28] affirms that "in some communities involved, for example, an ambiguity is experienced, since, on the one hand, tourism brings employment generation, on the other hand, it can bring the evils of urban life and the degradation of local ecosystems, often irreversible.

Analyzing the negative impacts of ecotourism, we can affirm that ecotourism is a very important instrument to guarantee the sustainability of the regions where it has been implemented. However, we know that its activities, even with a good planning, generate negative impacts, therefore, knowing them is very important for the manager, along with his team, to be able to create ways to reduce or mitigate these impacts, thus avoiding the devaluation of the tourism product or the depreciation of the implemented region. The authors Siles [7]; Prado [28]; PMF [29]; Hirata [30] list the following negative socio-environmental impacts from tourism activities: impacts on the soil; impacts on the vegetation; impacts on

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the fauna; impacts on the water resources; socio-economic impacts; anthropic impacts, among others.

Although ecotourism presents negative impacts during and after its implementation, good planning can be justified by the positive impacts it provides to the entire region, in addition to adding economic value to forests in protected areas by preventing or reducing the entry of trespassers or squatters on public lands. Corroborating this, Prado [28]; PMF [29]; Hirata [30]; Pereira [31], list some positive impacts that ecotourism can provide: socio-economic impacts, which stands out for providing economic gains through the generation of direct and indirect jobs and income for the community; it stimulates the production of handicrafts; diversify the local economy; fix the man in the interior; stimulate the local market by creating demand for agricultural products, manufactured goods, goods with added value, keeping the traditional customs and uses; allow additional revenues, such as vehicle and boat rentals; provide improvements to local transportation and communication systems; create alternatives for revenue collection through fees for the conservation units; provide improvements in education, security, and health in the region; promote community awareness about the value of local culture; promote tax collection; and improve the infrastructure for transportation, communication, sanitation, public lighting, etc. About the positive environmental impacts we highlight: stimulates environmental preservation; encourages the creation of protected areas; maintains the natural attractions and cultural heritage of the region, attracting more ecotourists; promotes community awareness about environmental appreciation; improves the image of the places visited.

Pereira [31] also affirms that "in this scenario, ecotourism emerges with the expectation of promoting economic development with environmental and cultural equity, in order to guarantee the sustainability of the place visited, maximizing the benefits and avoiding the practice of predatory tourism. It is worth pointing out that although ecotourism is based on the principles of sustainable development, it is important to have a good plan for its implementation, and the calculation of the anthropic load capacity is an important guiding tool for decision making.

About the Public Tourism Policies in the municipality of Nova Mamoré, it is convenient to clarify that although the Guajará Mirim State Park belongs to the municipalities of Nova Mamoré and Guajará-Mirim, the largest extension of the Park is inserted in Nova Mamoré, municipality that has the road that gives access to the physical infrastructure and trails.

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According to the Organic Law of Nova Mamoré, in the articles that deal with tourism and environment issues, the competencies to promote the development of tourism, supporting and encouraging tourism as an economic activity, recognizing it as a form of social and cultural development, preserving, restoring, and maintaining the historical heritage, cultural manifestations, natural beauty, flora, fauna, and other renewable resources, through the binomial leisure x capital, stand out. Although Nova Mamoré presents a small budget for tourism, in relation to other sectors, with the completion of the Tourism Map conducted by the Secretary of Tourism of the State of Rondonia, in which the city of Nova Mamoré is inserted, it should increase its budget for tourism, because to be part of the tourist regions the municipality commits to provide budget for the area, as well as cooperate with the State and Union to develop tourism, ensuring more investment and local social inclusion with the generation of employment and income for the population involved [32, 33].

In relation to the carrying capacity as a tool for sustainable management of protected areas, the method used in this work, it is a tool of fundamental importance for a responsible management that can ensure that the purposes and objectives of the units are met, thus perpetuating their conservation, so that the surrounding communities can also be rewarded through social inclusion, enabling their development in harmony with the local environment.

According to Cifuentes [18], the method has six basic steps: Analysis of public policies on tourism and protected area management at national, regional and local levels; Analysis of the objectives of the area under evaluation, which is closely related to the management category; Analysis of the status of public use sites within the evaluated area and their zoning; Defining, strengthening or changing policies and decisions regarding the management category and zonification of the area; Identify factors/characteristics that influence each public use site; Determination of the carrying capacity for each of the sites.

After analyzing the six basic steps, the load capacity by the Cifuentes method [18] considers three levels that must be calculated: a) physical carrying capacity (CCF), which is given by the ratio between the available space and the normal need for space per visitor; b) The actual load capacity (CCR) is determined by subjecting the CCF to a series of correction factors (reduction) that are particular to each site, according to its characteristics; and c) effective or permissible carrying capacity (CCE), which takes into account the acceptable limit of use, while considering the management capacity of the area's administration, bearing in mind that protected areas in developing countries have chronic and critical problems that

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cannot be ignored when determining the feasible form and levels of visitation to order and manage.

Cifuentes [18] also points out that the determination of the carrying capacity should not be taken as an end in itself, nor as a solution to the visitation problems of a protected area, but as a planning tool that supports and requires management decisions, and that it is relative and dynamic, because it depends on variables such as infrastructure or trained human resources, which may increase or decrease, forcing the manager to make periodic reviews, according to the objectives of each protected area as per its category.

The carrying capacity must be determined for each site (place) or trail separately, that is, the carrying capacity of all the sites or trails must not be added up to define the carrying capacity of the protected area, because in certain occasions the existence of critical limiting factors will be determinant to define it, for example, the partial or total lack of water could substantially limit the number of allowed visits, or even several associated sites forming an interconnected complex that may have only one access. It is likely that the carrying capacity is determined by the site with the lowest actual capacity, because otherwise it would mean an overload on some places, where it is recommended to better consider "visits/time/place" than "visitors/time/place", because if the same visitor passes repeatedly at a certain place, the impact will also be repeated [18, 19].

Final considerations

Nature conservation through conservation units, although strictly necessary for the maintenance of the ecological balance, capable of guaranteeing the present and future generations a healthy quality of life, was considered for a long time a bottleneck for the capitalist system in economic development, especially with regard to parks, due to their restricted use, making managers think about how to add economic value to forests so that the surrounding communities could benefit from helping local development.

Allied to this bottleneck, the search for new areas for the expansion of agribusiness and the lack of resources needed by the governments for ostensive inspection has weakened the protected areas, which constantly suffer invasions by land invaders and/or squatters who have no sense of preservation and respect for the law.

On the other hand, the frenetic life in the big cities has awakened the desire to go to

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natural places in search of tourism and leisure. Enabling visitors to have pleasurable experiences and renewing their energies, making the parks the locus of ecotourism, which, in turn, stands as an indispensable activity that guarantees the economic development of less developed regions. In addition to adding economic value to these areas, it promotes a change in behavior in the surrounding community and begins to protect and assist law enforcement agencies.

Although ecotourism is an activity based on sustainability, with conservation practices, it is known that any venture causes impacts, both positive and negative, so good planning is essential, so that managers can be prepared to take mitigation actions, avoiding the saturation and depreciation of the environments used.

In this context, the method developed by Miguel Cifuentes becomes an important tool for managers when making decisions to implement ecotourism in natural areas, because it limits visitation, based on the infrastructure and fragility of the area used, with the aim of avoiding, reducing or mitigating environmental degradation, thus avoiding the devaluation of the tourism product, because good planning protects the environment from the impacts of use ensuring visitors greater comfort, safety and satisfaction, thus contributing significantly to the impression that the tourist will have about the area and the institution that manages the Conservation Unit.

It was evident with this work that the values obtained are far below an optimal amount for the maintenance of ecotourism in this region, however, it should be noted that these results are not related to the attractiveness of the tourism products of the State Park of Guajará Mirim (PEGM), because the Conservation Unit has an exuberant biodiversity and scenic beauty. The current infrastructure of the Park presents its management capacity of only 52. 1%, besides the need to implement the trails, making them safer, facilitating hiking and making them more suitable for the practice of ecotourism.

The present infrastructure of the Park demonstrates the portrait of the situation of this activity that does not escape the reality of the Amazon, evidenced by the low number of visitors, which reflects the current concern of public managers with the theme, demonstrating the need to implement/improve the infrastructure of the region with the purpose of implanting ecotourism in Nature Conservation Units in Rondônia.

In this sense, this research hopes to corroborate with the effectiveness of the management of PEGM, regarding the decision making for the implementation of ecotourism

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by the practice of walking on ecological trails, ensuring excellence in providing services to visitors, leaving them satisfied and with good memories, enabling both their return, as new visitors to the Unit, ensuring greater fundraising for the maintenance of environmental preservation, as well as in local sustainable development.

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