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EDITORIAL

Ecotourism flourished throughout the country in the 90s, especially after the United Nations Conference on Environment and Development - RIO 92. At that time, the Brazilian tourism market was living in a kind of euphoria due to the expectations of developing activities, principally due to the country's potential related to its diverse natural and cultural heritage.

However, the sustainability principles that should have guided ecotourism enterprises and destinations were lacking, and to some extent, still lack in practical application. So, the Brazilian conservationist scene began searching for pilot projects, with potential for replication, which could prove the feasibility of making sustainable tourism a complementary tool in the conservation of natural resources and improve the quality of life for the people involved in the activities.

In the Amazon biome, civil society institutions mobilized in pursuit of the objectives described above, to develop tourism, with an addendum: the central concern being the role of local communities. It was in this context that the Mamirauá Institute for Sustainable Development (MISD) launched the Community-based Tourism Program (CBTP), which in 2012 completed its fourteenth year.

Since 1998, the Mamirauá Institute for Sustainable Development has assisted local communities with the management of ecotourism services at the Uakari Floating Lodge, in the Mamirauá Sustainable Development Reserve (MSDR). Ecotourism was viewed as an economic alternative for communities in the MSDR, with the potential to reconcile the conservation of natural resources with the improvement of quality of life for local residents.

The Uakari Lodge, whose management is shared between the MISD and the residents of the MSDR,

is one of the first enterprises of its kind in Brazil and the only place inside the Mamirauá Reserve that provides accommodation for ecotourists. The lodge is situated in a special ecotourism area in the MSDR near the confluence of the Solimões and Japurá rivers, 1 hour and 15 minutes (via inland waterway) from the city of Tefé, in the State of Amazonas.

The Mamirauá Reserve is the largest protected floodplain area in the Brazilian Amazon. It encompasses the Central Amazon Corridor and is considered by UNESCO as a Natural World Heritage Site for humanity. The peculiar characteristics of the forest, landscape and way of life of the local population are created by the flood and drought seasons. This makes the MSDR a unique area for visitors wishing to escape from the artificialism of certain jungle hotels.

Within its boundaries, a rich ecosystem is protected, including endemic species (some threatened with extinction) and an impressive wealth of fauna. Ecotourists that visit Mamirauá Reserve are involved in ecotourism activities that combine natural, cultural and scientific elements.

In order to generate technical-scientific knowledge which can contribute to the development of sustainable tourism, research and monitoring activities are among the work carried out by Mamirauá Institute's Community-based Tourism Program.

Thus, the Uakari Floating Lodge, directly assisted by the program, works as a kind of laboratory. The information generated by the initiative (methods, techniques, lessons learned), through accumulated experience over the years, contributes to supporting interventions in locations with similar characteristics, mainly in the Amazon region. Therefore, this special volume of the Uakari

Journal was designed with the goal of supporting this process by generating knowledge about sustainable tourism.

In the introductory article, Janér makes a relevant contribution to the ecotourism market in the Brazilian Amazon, through a critical and realistic reading of available statistical data regarding demand. The article discusses fundamental points and ways of estimating the market potential for ecotourism, contributing information to aid decision making in the third sector, government and entrepreneurial segment.

The second and third articles in the issue address the environmental theme. Borges-Pedro adapted a methodology to identify and measure the environmental impacts of an ecotourism enterprise. The technique can be applied to initiatives with similar realities and thus contribute to minimizing the negative effects of ecotourism activity in the natural environment.

Paim and her team, in turn, evaluated the impact of ecotourism on existing fauna on visited trails. The methodology, which uses primate species as indicators in ecotourism areas in the MSDR, can be an important tool for monitoring other ventures concerned with the negative impacts on fauna related to visitation.

Bernardon and her team analyzed the richness and diversity of birdlife on the ecotourism tours on Mamirauá Lake, relating them to water level fluctuations throughout the year. Based on these results, the researchers discuss the local potential for birdwatching activities. The methodology employed suggests that potential exists to reconcile the movement of ecotourists with data collection for scientific purposes, showing that the synergy between research and ecotourism can be used in a better way.

Ozorio et al. evaluated the repercussions of 2010's severe drought on the management of ecotourism activity in the MSDR. The analysis identified the

challenges inherent in events of this nature to assist the enterprise's management team to plan strategies that would lessen the economic and financial impacts arising from these natural events.

Peralta made an important contribution by analyzing the relationship between the generation of income accrued from ecotourism and the local support for biodiversity conservation, using the Uakari Floating Lodge as a case study.

Finally, Ozorio and Janér evaluated the quality of community based ecotourism at the Uakari Floating Lodge. They also analyzed the economic and financial viability of the venture, measuring the impact of risks inherent in initiatives of this nature and reflecting on the economic activity and intangible benefits associated with this enterprise.

There is consensus that the decision to incorporate tourism into a conservation unit (CU) - sometimes championed for its potential to generate a range of benefits consistent with conservation objectives, and sometimes questioned because of the possible side effects. - must be preceded and monitored by studies that assess the potential and limitations of the activity, with the intention of leading it through a responsible planning and management process.

Thus, this special issue, whose unifying theme is sustainable tourism, intends to make a contribution by sharing lessons learned and stimulating research on a theme that has the potential to integrate conservation strategies, but which still requires more study.

Happy reading!

Rodrigo Zomkowski Ozorio
Guest Editor



ASSESSING THE MARKET FOR ECOTOURISM IN THE BRAZILIAN AMAZON WITH FOCUS ON TEFÉ AND SANTARÉM.

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INTRODUCTION

Ecotourism is often seen as an important sustainable economic use of well preserved Amazon rainforest. The lure of ecotourism's sustainable use of natural resources has led both private investors and non-profit organizations to finance ecolodges and community based ecotourism projects. Successes over the years have been mixed and one of the reasons for projects not doing well is that not enough effort is dedicated to assessing market potential.

Admittedly, assessing the market potential for ecotourism is not easy. Most available tourism statistics are very general and market surveys that focused on ecotourism had difficulty pinpointing market size, as what a tourist or tour operator calls "ecotourism" might actually not be true to the definition of ecotourism.

The Amazon is a very large region geographically and is not homogenous, but in the mind of the majority of nature tourists it is. The Amazon ecotourism product itself is mostly small scale and can offer very different experiences, so what we see in reality are "pocket destinations" in the Amazon. So how can these pocket destinations evaluate their market potential, essential for assessing the feasibility of the investment and meeting the expectations of the local stakeholders?

The cost of collecting and analyzing primary data is prohibitive for small ecolodges and, even so, might not even yield the right answers. This opinion paper will discuss how to view the ecotourism market potential and how to mine readily available secondary data to estimate market size. It also presents a model for assessing if there is a market opportunity, given the competitive environment.

This paper will use data for the Brazilian Amazon to illustrate this and look specifically at the destinations of Tefé (Mamirauá Sustainable Development Reserve) and Santarém (Tapajos).

APPROACH

In order to establish the potential of a destination or a tourism product, it is essential to understand how big the current target market is, how attractive the destination or tourism product is (or needs to be) in the market context and assess how the market will develop.

Market research therefore needs to answer the following questions:

1) What is the market size and growth for a particular destination or product?

General market data are usually available at macro-destination level (e.g Brazil) or at major gateway level (e.g Manaus). Estimates about the size and growth of the "ecotourism" market

have also been made by The International Ecotourism Society (TIES, 2006) and UNWTO (2002). As these data are general and not necessarily applicable to specific destinations in the Brazilian Amazon, it is important to identify sources of additional data. By mining and crosschecking the data, it is possible to get a more realistic assessment.

2) From the point of view of the tourist: is the destination (product) attractive enough?

Those who promote a destination or their tourism product need to be realistic about how attractive (competitive) their product is in the market context. There are many studies on destination competitiveness, but they cannot be easily applied to small destination and sustainable tourism projects. To help destination stewards focus on the priorities and investors evaluate the challenges for developing a project, a simpler concept is needed.

The best way to do this is to take an outside perspective: this analysis should be from the view of a tourist. A tourist, who has never visited the destination and/or might not have had a similar experience. Maslow (1943) argued in his Theory of Motivation, that people's needs have a hierarchy and these explain their motivations. At the bottom of the Maslow pyramid are basic survival needs and at the top is self actualization. Now tourism is already related to self esteem and self actualization. So we need to create tourism motivation pyramid. So what is the hierarchy of needs of a tourist and how do they influence their decision making?

Traveling means venturing out of your comfort zone, making an extra effort and spending money

to come back relaxed, re-energized and re-inspired. What many tourists are also looking for, especially in the era of "time-poverty" and "zapping", is convenience, the ease of getting to the experience they want and getting the most out of it. Using this we can construct a Tourism Motivation Pyramid, divided in four layers or hierarchic decision levels.

Decision Level 1 – The Basics: How Far off my Comfort Zone?

People travel for a change of climate, scenery, activity and company. Adventure is appealing, but travelers want to come back safe and sound. So they are very sensitive to safety and health issues in a destination. Outbreaks of dangerous infectious diseases like SARS, dengue, swine flu or terrorism attacks and natural disasters lead to cancelled bookings. High prevalence of diseases like AIDS and malaria, dirty seawater, civil unrest and high crime rates will make many potential visitors think twice before booking.

Destinations that have wonderful natural and cultural attractions, but are too far out of most people's comfort zone, do not get a lot of tourists.

If this is the case, the destination needs to focus first in investing in the basics for population and tourists. And if the destination doesn't invest the accommodation or tour operator will need to invest extra to make sure that tourists return safe and healthy and also know how to communicate this effectively.

Decision Level 2 – Accessibility : How easy is it to get there and around?

Once the tourist is reassured (s)he won't go further out of the comfort zone than (s)he can handle, (s) he will start thinking about how to get there and

how to get around. How much time and money will I spend to get there? This is time and money (s)he won't be able to spend in the destination, so this is really important.

And before traveling the tourist needs information to plan the trip. If the right information isn't easy to be found on the internet, in a guidebook, through friends and family or a trusted travel agent how can you start imagining your trip?

So destinations that have accessibility issues should be realistic about how many tourists they can attract. For destinations that want to cultivate the happy few, difficult access can also be an asset, but then the experience should of course be exceptional.

Alternatively, destinations that are easily accessible should be extra careful to invest in sustainable stewardship if they don't want to be overrun and spoil their natural and cultural assets.

Decision Level 3 – How Good Will the Tourism Experience Be?

Once the tourist knows he can get to the destination (and return safely), the focus is on the main objective. How good will the experience really be? Who can give me the best experience? Is it worth the effort? And then there is still a possibility of a deal breaker: a price that is deemed not to fair considering the quality of experience.

Decision Level 4 – How does Sustainability enhance the Feel Good Factor?

Sustainability is the new self realization. If you feel that the destination you had such a good experience is well taken care of, so you can recommend it to friends or take your grandchildren, this enhances the feel good factor of travel. So when

tourism products look similar on money value for experience level, the decision is taken to the next level: which product will make me feel better for longer.



Figure 1 – Tourism Motivation Hierachy (apud Maslow)

HOW BIG IS THE ECOTOURISM MARKET?

Though ecotourism is well defined and used in marketing, we cannot be sure that tourists are buying the “ecotourism” experience, just because it is called ecotourism. The only thing we know is they are interested in nature, outdoor activities and local culture.

The nature tourism market is very big and estimated at 40% of the total travel market (HOLLAND, CBI, 2009), but this could also include part of the “sun&sea” segment. Another gross estimate (HOLLAND, CBI, 2009) puts the number of tourists who have at least some interest in seeing wildlife at 20-40% of travelers. Within this nature tourism market, which would be 392 million international travelers globally (UNWTO, 2012) in 2011, there are several overlapping segments.

The largest of these is the adventure tourism or active outdoor tourism. The adventure tourist looks for an enriching experience through technical challenges, physical exertion and small dose of adrenalin. The adventure tourist is not necessarily concerned with sustainability. Adventure tourism is also ecotourism if sustainability, interpretation and interaction with the local community are part of the experience. It is generally thought to represent up to 20% of the market (ATTA in HOLLAND CBI, 2009). Adventure tourists will be interested to visit the Amazon, a destination associated with adventure.

An ecotourist is motivated to learn, about the natural environment and other cultures, and to contribute, to conservation and communities, whilst traveling lightly. The ecotourist values good information, interpretation of the natural environment and exchange of experiences with local communities. S(he) is also concerned about the impacts of the visit – both positive and negative – on nature and on the community. In this sense it is a niche market and estimates vary between 3-7% of the market (TIES, 2006). A field study by Beaumont (2010) at Lamington National Park in Queensland, Australia indicated that only 16% of the nature tourism visitors to the park could be called a ‘true ecotourist’.

In Brazil, with a relatively younger population, adventure tourism (more active) is more popular than ecotourism (more contemplative). The Brazilian Adventure Tourist and Ecotourist Profile (ABETA, 2010) shows that the Brazilian nature tourist values firstly, presence of water (46%) and next regional culture (19%). Forest (4%) and fauna(4%) are less important. Brazilian adventure and ecotourists will compare the Amazon

experience with other nature destinations in Brazil (e.g Pantanal) and elsewhere (e.g South Africa or non-Brazilian Amazon).

Another related segment is backpackers. This type of tourist is motivated to discover the world, interacting with other travelers and local people. They try to go far on a limited budget and are generally younger than 40. It is an interesting market for community based tourism projects. Though many look for cheap accommodation, the backpacker likes to meet people and has a spirit for adventure. Often (s)he leaves more money in the destination than a conventional tourist.

According to WYSE (2008), 20% of international arrivals are young people, of which 25% are “backpackers”. South Africa (2009) estimated it receive 90 thousand international backpackers in 2006 (4% to 5% of the long distance leisure market). Australia (2004), one of the first countries that actively targeted this segment, estimated that it makes up about 10% of its international tourism flow.

There are no precise data on the number of backpackers that circulate in Brazil. A study done for SEMA-SP (Oliveira, 2005), estimates that about 50 thousand backpackers stay at youth hostels in Brazil. The same study indicates that the majority visit Rio de Janeiro and average stay in the country is 53 days. The growth of hostels and B&B in Brazil is also an indication of a growth market. Backpackers will have an interest in the Amazon experience, but not all of them will have a budget to pay for top products.

“*Voluntourism*” combines leisure and a learning experience with an opportunity to help in the destination. The volunteering can be the principal

objective of the trip or just part of a larger itinerary. It has its origins in development aid programs (sixties) and was boosted by the emergence of ecotourism and later social responsibility. In the younger generation there is growing popularity of the “gap year”.

There are not a lot of good data on the market size, but according to a study by Lasso Communications (2009), in the United States about 26% of the population is interested in voluntourism. In the United Kingdom about 200.000 people a year take a sabbatical.

The kind of tourist that is interested in community based tourism products is heterogeneous and overlaps with other segments discussed here. He or she is usually well educated, but can be high income or a backpacker student type. This kind of tourist is motivated by having an authentic interactive experience and has a spirit of adventure. A study by the HOLLAND,CBI (2009) indicates that the core market for community stays is only 2-5% of the long distance market, though it might be 20% for quality products. About half of the market might be interested in elements of community tourism, like a visit, lunch or a workshop.

The Amazon is an attractive destination for both voluntourism and those interested in a community experience, both because of its helping conservation and helping communities appeal. Demand might be limited by price and supply limited by projects that are organized to receive volunteers or visitors from Brazil or abroad.

Often organized by universities or interest groups (e.g an association linked to a zoo), the focus of scientific tourism is learning about a specific

subject. A small but interesting market, as their particular needs can help the creation of new programs or itineraries (which can be adapted to other markets) and has a good potential for word-of-mouth. The Amazon is, of course, a very interesting destination for scientific tourism.

Now how many of these travelers go to Brazil, considering that it is a long haul destination for many of the most important outbound destinations? According to the UNWTO outbound travel statistics (2011), only about 18% of international travel is outside the region of origin.

Ecotourism is often cited as a fast growing segment (TIES, 2006) and growth rates of 10-30% per year are often cited. However given that pinpointing who is the “true ecotourist” is difficult and growth rates are often based on specific destinations (e.g Kenya, Nepal, Costa Rica) or tour operator surveys (e.g. US specialty tourism operators) at a certain point in time, we have to be careful how to interpret this. According to the tourism life cycle theory, new destinations often grow quickly, but once they mature growth flattens out (Butler, 1980). So growth rates cited for ecotourism could also just reflect travel to emerging destinations or demand for new products.

This destination specific growth can also be seen in Brazilian ecotourism destinations. When we look over the period 1995 – 2005 we see very different growth rates for key ecotourism destinations in Brazil. Itatiaia, Brazil’s first national park, a mountain and rainforest destination between Rio de Janeiro and São Paulo, stagnated. Foz de Iguaçu, one of Brazil’s landmark nature destinations, showed modest growth. Fernando de Noronha, a top diving destination and Bonito,

considered Brazil’s best ecotourism destination by the tourism press, are newer and smaller destinations and grew much faster.

Table 1 – Growth rates of selected Brazilian Ecotourism Destinations 1995-2005

DESTINATION/STATE	IMPORTANCE	1995	2005	AAI
Itatiaia/RJ	Brazil’s First National Park	88,049	78,004	-1.2%
Foz de Iguaçu/PR	UNESCO World Heritage Site, National Park	884,838	1,084,236	+2.1%
Bonito - MS	Best Ecotourism Destination	29,811	73,177	+9.4%
Fernando Noronha/PE	UNESCO World Heritage Site, National Park	21,315	54,241	+9.8%

Source: ICMBio, Destinations

BRAZILIAN TOURISM MARKET: THE BIG NUMBERS

The principal market for most of Brazil’s tourism destinations is domestic. While international arrivals were 5.4 million in 2011 (BRASIL, 2012), domestic tourism was estimated at 184 million domestic trips (BRASIL 2010). Though many of these trips are low budget, 30% (55 million) involve paid accommodation and 11% (20 million) involve flights.

International arrivals to Brazil have been growing at an average rate of 4.6% per year between 1987 and 2011 (BRASIL, 2012). In recent years international tourism to Brazil has lost some of its force. With the economic crisis that first announced itself in 2007 and then deepened, global tourism fell nearly 5% in 2009 (OMT, 2010). Tourism recovered in 2010 and is expected to pass the barrier of 1 billion foreign arrivals in 2012, but long distance travel is lagging behind.

In Brazil, where the economy remained strong despite the international economic crisis, the

Real currency gained in value compared to US\$ and Euro. Together with higher inflation in Brazil this has resulted into the country being a much more expensive destination. Weaker international tourist confidence and buying power has meant that the growth of international long distance tourism basically stagnated since 2005, as can be seen in Figure 2. In 2011, long haul travel to Brazil (2.6 million) was 1.4% of the global long haul market.

As a destination, the trends of international travel to Brazil can be explained by the Tourism Motivation Pyramid. Tourism stagnated between 1987 and 1995, because of the violent image of the country, which meant that visiting Brazil was too far out of the comfort zone for many travelers. A growth period then started as Brazil’s image started to recover and a more favorable exchange rate (fair price) from 1999 onwards gave an extra boost. However, accessibility problems (visa for important markets, relatively expensive flights for long haul markets, Portuguese language) have also been barriers for part of the potential markets.

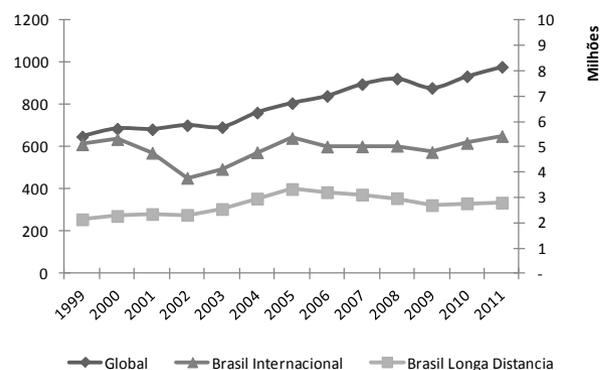


Figure 2 - Growth of Global International Arrivals, International Arrivals and Long Haul Arrivals to Brazil between 2001 and 2011.

* Global (millions) right Axis, Brazil (millions) left axis Source e: UNWTO, Ministry of Tourism Brazil.

In 2010, 46% of international arrivals stated that their reason to come to Brasil was for leisure (BRASIL, 2011). For more than half of these visitors the principal motivator was “sun & sea”. For 27% of leisure tourists the motivation was “ecotourism/nature/adventure”¹. This represents about 12% of the total market and using the international arrivals of 2010, the “nature tourism” market was around 640 thousand visits. The Ministry of Tourism data indicate that the market increased from total of 6,2% of the total market in 2004 (about 300 thousand visitors). However, this increase has come at the expense of related special interest tourism segments, such as cultural tourism (Figure 3). The size of the nature tourism market is lower than the general ecotourism percentages would predict and growth rates are difficult to assess at this level.

In 2007, the most recent in depth study of the domestic market was made (BRASIL, 2009). This showed that about 40% of the Brazilian population travel. They make on average 3.2 trips per year and generated a total of 161 million domestic trips in that year. The available data show that the domestic tourism market has been growing strongly since: domestic airport arrivals in 2011 are up 66% on 2007. This can be attributed to a strong economy and an improving income distribution, which means a larger part of the Brazilian population travel for leisure. Figure 4 shows the growth of domestic airport arrivals and size of domestic tourism market based on specific studies of the domestic market done in 2002, 2006 e 2007 and projections for 2008 - 11 (BRASIL 2007, 2009, 2011).

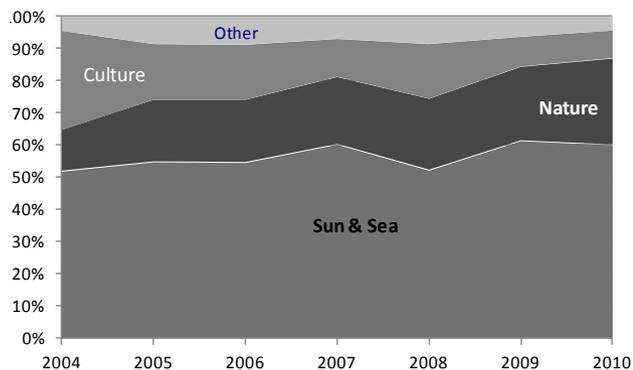


Figure 3 - Principal Motivating Factor for International Leisure Tourists to Visit Brazil 2004-2010 .

Source; Ministry of Tourism

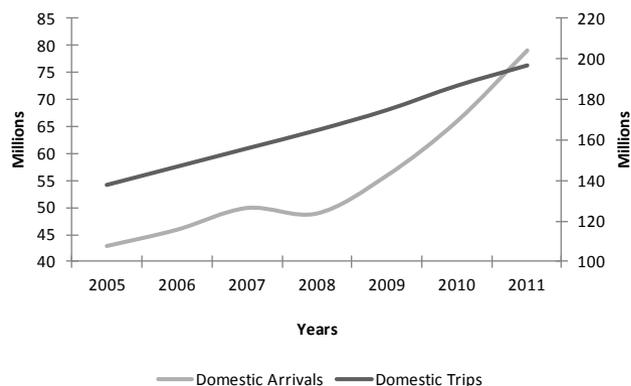


Figure 4 - Domestic Airport Arrivals and Domestic Trips in Brazil 2005-2007 .

*Domestic Arrivals - left axis Domestic Trips – right axis Source : Ministry of Tourism

¹Though are good definitions of ecotourism, we cannot be certain that the concept is the same for the tourist. When “ecotourism” is used in the text this is meant in a broad sense: nature tourism with good intentions.

In 2007, 3.4% of Brazilian tourists cited “ecotourism” as the main motivator for the most important domestic trip (BRASIL, 2009). Using the traveling population of 2010, this would imply a market of around 2.4 million ecotourists in Brazil.

The study of Brazilian Tourism Consumer Behaviour 2009 (BRASIL, 2009) shows that 33% of tourists and 37% of potential tourists say that **natural beauty/nature** is the principal motivator for choosing their trip, but this can include “sun & sea. Only 1% names observation of flora/fauna as the principal factor and only 8% is attracted by sports activities (related to adventure tourism). This suggests that the “ecotourism” market is much smaller and in the order of grandeur indicated by the domestic market study.

The size of the domestic market is in line with the general ecotourism predictions of 3-7% (TIES, 2006).

So there is a market of about 3 million international and domestic tourists, who might be attracted to ecotourism type products. How many go to the Amazon?

DEMAND FOR THE AMAZON DESTINATION

The International Tourist Demand Profile 2004-2010 (BRASIL, 2011) reveals that the principal “ecotourism” destination in Brazil is not the Amazon (rainforest), but Foz de Iguaçu (waterfalls).

According to this study, 23% of foreign leisure tourists visited Foz do Iguaçu in 2010. More than 90% of these tourists affirmed that the principal motivator was “nature/ecotourism/adventure”. This is also confirmed by the visitor statistics of the Foz de Iguaçu National Park (FOZ DE IGUAÇU, 2010), which received 547 thousand foreign visitors in 2009 (of a total of 1,1 million)².

The same study shows that Manaus, the principal gateway to the Brazilian Amazon, receives less than 5% of international leisure tourists that come to Brazil. Of the tourists that go to Manaus,

78% cite “nature/ecotourism/adventure” as their motivator.

These numbers make sense, when applying the Tourist Motivation Pyramid. Visiting the Amazon means going further out of the comfort zone for most travelers and it is also a longer and more expensive trip than going to Foz de Iguaçu.

The fact that the Amazon, in spite of its high visibility, still receives few visitors is also emphasized in the IPK Consulting Market Survey undertaken in the context of the ProEcotur Program (BRASIL, 2010).

In 2006, cross referencing the data of the International Tourist Demand Profile with the Yearbook of Tourism Statistics (BRASIL 2007), the Amazon received less than 250 thousand tourists. Only 121 thousand were leisure tourists. Of these approximately 77% traveled to the State of Amazonas, principally the Manaus area. The State of Pará receives about 18% and the remaining 5% goes to other Amazonian states.

In terms of domestic tourism, the Domestic Market Study of 2007 (BRASIL, 2009) indicates that 2,7% (+/- 4 million) of domestic trips has the northern region as the destination. However, only 37% of these tourists come from outside the region. The state that receives most domestic visitors is Pará (44%), followed by Amazonas (19%).

The findings of the Brazilian Tourism Consumer Behavior Study of 2009 (BRASIL, 2009) are in line with this. Here demand for the northern region is also modest. Only 2,1% of those who traveled recently went here and only 2,7% pretends to go there in the future.

Amazonastur (2010) and Paratur (2010) collect data at state level for the principal states of

Amazonas and Pará. They are based on hotel occupancy surveys, cruise ship data and tour operators and their accuracy depends on how well this reporting is done. The numbers they report are consistent with the surveys of the Ministry of Tourism. These data, which refer to all types of tourism (not just leisure), confirm Manaus as the principal destination of foreigners and Pará as the main destination for Brazilians in the Amazon. Adding the data of these two states, we find 285 mil foreigners (including from neighbouring countries) e 817 thousand Brazilian visitors in 2009.

So assuming that 78% of the foreign visitors (222 thousand), registered at hotels in Amazonas and Pará are motivated by “nature/ecotourism/adventure”, this means that about a third of the total of visitors who came to Brazil for nature tourism, actually went to the Amazon.

For the domestic tourism market, looking only at extra-regional travel to the Amazon region, this would mean that about 10% of domestic trips motivated by ecotourism have the Amazon as a destination.

Table 2 – Domestic and International Tourism to the Amazon region (2009)

ORIGIN	AMAZONAS (MANAUS)		PARÁ (BELÉM)		TOTAL
Brazil	264 th	32%	553 th	68%	817 th
International	230 th	81%	55 th	19%	285 th
Total	494 th	45%	608 th	55%	1.102 th

Source: Amazonastur, Paratur 2010

The Amazonastur statistics help shed a light on the size of the market for nature tourism in the State of Amazonas. In 2011, 81 thousand tourists from Brazil and abroad reportedly used jungle hotels, sports fishing and cruise ships. This represented 21% of the total of foreign visits and 4% of domestic visits to the state of Amazonas in that year.

The Amazonastur data also indicate that international tourism to the Amazon destination has been growing firmly since 2003³, despite the stagnation in long haul tourism in Brazil. A likely explanation is that the combination expensive Real and economic crisis affected the international charter volume to the Northeast more than upscale tourism. Direct flights from the USA to Manaus, have also facilitated access to the Amazon region for North American tourists.

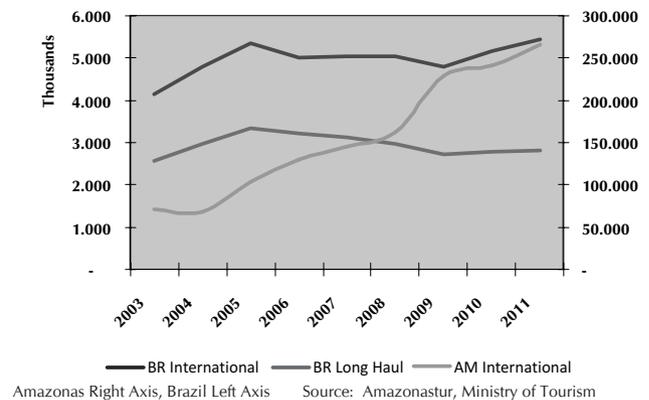


Figure 5 - International Tourism to Brazil and to Amazonas 2003-2011

² In 2011, the park received 1,4 million visits of which 640 thousand were international

³ Sergio Carvalho of the AHS – Amazon Jungle Lodge Association, said in 2009 that his study showed that tourism was not growing. However the full study was not released and the association does not appear to be active any more.

The Amazonastur data reveal that international tourism (business and leisure) grew at a rate of 22% per year between 2003 and 2011. The number of tourists (domestic and international) who stayed at jungle lodges grew at 15% per year in that period, indicating high growth rates for ecotourism during this period. However, if we compare data for the year 1995 with 2005 for international tourists, growth would have been -2.5% per year. Unfortunately, it is not clear if the methodology for collecting data in 1995 is comparable to the methodology applied from 2003 onwards.

ESTIMATING FLOW TO SMALLER AMAZON DESTINATIONS : TEFÉ AND SANTARÉM

Many smaller destinations in the Brazilian Amazon do not collect data consistently and regularly. So how can you estimate their tourism flow? This can be done by using Manaus and Belém as a reference and mine available destination data. To illustrate this we look at the secondary gateways of Tefé (Mamirauá) and Santarém (Tapajos region).

Tefé is the smaller of the two destinations and is about an hour's flight from Manaus. Tourism wise it is closely associated with the Mamirauá Sustainable Development Reserve and the Uakari Floating Lodge. The Uakari Lodge is internationally recognized as a top ecotourism experience by both international and Brazilian guidebooks and tourism magazines. It has also won several prizes and is highly rated on Tripadvisor (www.tripadvisor.com). Tefé has other potential tourism attractions, but they are not ready to receive tourism and Tefé does not market itself as a tourism destination.

Santarém is the gateway to the Tapajos region and is renowned for its spectacular river beaches, which appear in the dry season. Santarém is an hour's flight from both Manaus and Belém and

also accessible by road. Cruise ships that do the Amazon often stop here for a day. Santarém is a much larger and nicer city than Tefé, with a more vibrant cultural life. Within a radius of one to three hours there are also several ecotourism attractions, that can be visited (ABETA, 2011). However they could be much better organized and are timidly marketed. Table 3 lists the key data for both cities.

Now we need to examine the destinations from the tourist point of view. Once an international tourist has opted for the Amazon, going to a smaller destination is not a much bigger step in terms of leaving your comfort zone. For the average domestic tourist, Santarém is probably the more comfortable choice and its river beaches are an extra draw.

Both destinations ask the tourist to take an extra flight, which adds extra cost and time to the trip.

Santarém has an accessibility advantage, especially for the domestic market (Belém gateway). It gets more flights per day, has road access and better riverboat access.

In terms of information, Tefé is mostly known as a gateway to the Mamirauá Reserve and Uakari Lodge, which is seen as a highlight of Brazil by Lonely Planet and gets very good reviews generally. There is a lot of good information online in English and Portuguese. Santarém is also highlighted by Lonely Planet for the Alter do Chão (beaches) and the Tapajós National Forest. But online there is much better information on the destination in Portuguese than in English.

To attract tourists to go beyond the major Amazon gateways, Manaus and Belém, to see the Amazon, these destinations need to be able to show they have a special experience, which is worth the effort.

Table 3 – Tefé and Santarém Key Data

INDICATOR	TEFÉ	SANTARÉM
Population (2010)	61.543	294.580
GDP/capita (2009)	R\$ 4.539,00	R\$ 6.382
Comfort Zone	Equal for international	Equal international Better domestic
Access – Logistics	1 hour flight from Manaus, one daily	1 hour from Manaus and Belém (several per day)
Access – Information	Main site is the Uakari Lodge site (bilingual)	Official sites and incoming tour operators, mostly portuguese
Experience	Top Quality International Product	Beach experience, many other ecotourism options, but no top product
Price	Fair for top experience	Range of prices depending on experience
Sustainability	Strong through Mamirauá	Not marketed

So how many tourists do these destinations attract? Most tourists that are looking for a jungle lodge experiences in the Amazon will fly in. A first source of information is therefore passenger movement (arrivals and departures) of the gateway airports. Of course airport movement also includes inhabitants of the region traveling for various reasons and visitors traveling for non-leisure motives.

Supposing⁴ that arrivals represent 50% of airport movement and 50% of arrivals are passengers, who live in the region served by the airport, we then have an estimate of the flow of visitors . For

instance, applying this calculation to Manaus, it would be receiving 700 thousand visitors. The Amazonastur visitor number for this year was 755 thousand, which is in the same order of grandeur. In press releases, Paratur refers to the number of visitors in 2011 as 770.000, again in line with what would be expected from the airport passenger movement.

For Santarém, which like Manaus also receives business travelers , this would mean about 110 thousand visits in 2011. For Tefé, the number would be 22.5 thousand. However, this destination is a bit more complicated to analyze as its airport was closed twice for a total of 9 months in the period 2006-2007. Recently there has been a considerable oil&gas investment in the region, which explains the big increase of airport passenger movement in the past two years.

Table 4 - Passenger Traffic at Amazon Gateways 2005 – 2011

	Unit	2005	2007	2009	2011	Growth 2011/05
Domestic Arrivals						
Brasil	Millions	43	50	56	79	84%
Passenger Flow						
Manaus	Thousands	1.463	1.967	2.150	2.856	95%
Belém	Thousands	1.473	2.058	2.168	2.951	100%
Santarém	Thousands	181	364	365	461	155%
Tefé	Thousands	24	15	20	86	258%
Santarém/ Manaus		12%	19%	19%	16%	
Tefé/ Manaus		2%	1%	1%	3%	

Source : ANAC

People who travel by plane often stay in hotels, so it is useful to crosscheck the airport data with available hotel total capacity data and occupancy rates.

⁴ If airlines make these data available, it is possible to know how many trips originate in the destination and also use more precise numbers on business and leisure travelers.

In 2009, according to the Tourism Inventory of 2009 (SEMTUR, 2009), there were 49 hotels and inns, offering 747 rooms and 1.443 beds in Santarém. However, only 6 of these hotels (203 rooms) are listed in Brazil's most used tourism guide, Guia, 4 Rodas) So only 27% of hotel room capacity is easily visible for the tourism market.

In Manaus, city hotel bed occupancy rate is 55% and the visitor stays an average of 2.6 nights. In jungle lodges the occupancy rate is much lower (15%) and visitors stay shorter (2.3 nights) (AMAZONASTUR, 2010).

Manaus statistics also suggest that about 11% of visitors come specifically for an off-city nature experience (jungle lodge stay, sports fishing trip or cruise).

If we assume that the Manaus indicators apply in Santarém, the number of visitors (for all motives) would be around 84 thousand. This number is similar to the number to the one that airport movement indicates. The number of nature tourists would be around 9 thousand, however local tour operators think that number is too high and statistics of some of the main attractions also suggest that the market is smaller.

One explanation could be that the Tapajós region mainly markets the beach experience around Alter do Chão to domestic tourists and so few ecotourism excursions are sold. The region has many natural and cultural attractions, but as yet no investment has been made in a standout product or experience that highlights this part of the destination. Data provided by one top leisure pousada on the beach show more than 10.000

room nights sold in 2009, of which 18% are to foreign guests. Assuming average stay of 3 nights and 2 people per room, this means about 6,700 visitors, of which 2,100 are foreign guests. But less than 1000 people visit the easily accessible Santa Lucia Nature Reserve or the Tapajos National Forest per year (ABETA, 2011).

OZORIO (2012) estimated that in 2010 around 10 thousand people stayed in Tefé hotels in 2010, in line with the airport arrivals. The Uakari Lodge, the principal ecotourism attraction international recognition in the region received 600⁵ visitors that year, and is the main reason Tefé is on the tourism map. About 75% of visitors are foreigners.

An interesting way to measure accessibility in terms of information is using Tripadvisor (www.tripadvisor.com), one of the largest user-generated travel planning website in the world. Tripadvisor was ranked #241 in global traffic by Alexa (www.alexa.com) and # 2 in the Travel category with 0.4% reach.

An analysis of the virtual market confirms that the Amazon is still quite an unknown destination compared with Brazil's no 1 destination, Rio de Janeiro. Within the Amazon region, Manaus and Belém are much better known than Santarém and Tefé. Note that the Tefé data, do not include the Uakari Lodge or the Mamirauá Reserve, which is seen as a stand-alone attraction by Tripadvisor. The lodge and the reserve get more than 40 reviews on Tripadvisor, more than all the hotels and attractions of Santarém together.

⁵ The Uakari Lodge would probably have been receiving closer to 1,000 visitors, if the airport closure in 2006 and 2007 had not generated a major accessibility problem.

Table 5 – Comparing Brazilian Amazon Destinations on Tripadvisor (2012).

Type of Content	Manaus	Belém	Santarém [#]	Tefé*	Rio de Janeiro
Accommodation	90	50	14	5	439
Things to Do	72	22	15	1	312
Forum Topics	352	14	9	1	6134
Travelers Articles				1	
Photos	2214	639	166		16922
Vídeos	6		1		139

[#]Santarém data was non-existent on Tripadvisor before 2010

*Tefé does not include Mamirauá

Table 6 - Brazil Competitive Position

Region	Reference	2011	#	Average 2007-11	#	Price	#
World	Suíça	5,7	1	5,6		3,7	127
Latin America	Costa Rica	4,4	44	4,5		4,6	57
Africa ¹	South Africa	4,1	66	4,1		4,9	61
Asia ²	Malaysia	4,6	35	4,7		5,6	3
Brazil		4,4	52	4,3		4,1	114

¹ Excludes Mediterranean Africa

² Excludes Japan and Singapore

WEF Ranking

Source: World Economic Forum

So though Santarém has a slight accessibility advantage and receives many more general leisure tourists than Tefé, the size of the ecotourism market seems to be similar. Possibly Tefé even attracts more foreign ecotourists. This can be explained by the fact that through the Uakari Lodge and Mamirauá Reserve it has more appeal for the ecotourism market.

So what can these destinations expect in terms of future growth? This depends on growth to the Brazil destination and how tourism trends affect ecotourism and the demand for the Amazon destination.

FUTURE GROWTH BRAZIL 2020

Brazil is competitive as a long distance destination except for its current price levels. In 2011, it ranked #52 out 139 countries in the World Economic Forum Travel and Tourism Competitiveness Index with a score close to rival destinations such as Costa Rica, South Africa and Malaysia. But for price it is ranked #114, with a score closer to

Switzerland. This means Brazil has a barrier at the experience versus fair price level.

Future growth will depend on a more favorable exchange rate and/or better quality and variety of the tourism supply. At present the image of Brazil as a tourism destination is good. The 2014 World Cup and 2016 Olympic Games will ensure that the destination will be in the media for the coming years. So there is repressed demand to visit Brazil, which will appear as soon as prices are seen as fair for the experience offered.

In 2000, the UNWTO estimated international arrivals to Brazil to reach 14 million in 2020. However, September 11 and, subsequently, the economic downturn have meant that projections needed to be adjusted. In 2009, the goal of the Ministry of Tourism for 2020 was already a more modest 11.1 million. More conservative would be applying historic growth rates on the 2011 arrival numbers. In that case, arrivals would reach 8.1 million. For the domestic market, which is growing at 5.1%, domestic trips would top 300 million.

Table 7 - Current Prognosis for Brazil

Source	2020	% 2020-2011
UNWTO Global Tourism Brazil International	1.6 billion	5,6% py
UNWTO Brazil (base 2000)	14.1 Million	11.2 %
Brazil 2020 Plan Objective	11.1 Million	8.3%
Historic Growth Rate	8.1 Million	4.6%
Brazil Domestic Trips	308 million	5.1%

Sources : UNWTO, Ministry of Tourism, EcoBrasil

Now how will this growth translate to the nature – ecotourism segment and the Brazilian Amazon?

LOOKING FORWARD - TRENDS

Despite recovery in number of tourists in 2011, global tourism is still under the clouds of the global financial crisis. People are still traveling, but tend to be more sensitive to price and will therefore travel closer to home.

The macro-trends that were in place before the market retraction are still valid: market growth, greater segmentation, sustainability and digitalization. These macro tendencies are interrelated and can be verified in detail in major studies like: *The Travel & Tourism Competitiveness Report - 2007 – 2009 (Blanke e Chiesa)*; *ITB World Travel Trends Report –2009 (IPK International)*; *WTM Global Trends Reports 2009 (Euromonitor)*, *OECD Tourism Trends&Policies - 2010 e Travel Gold Rush/Oxford Economics -2010*). The trends, key aspects and possible responses are listed in table 8.

These trends do not paint a coherent picture and there are possible contradictions. A typical

example is concern for climate change versus the carbon emissions of long distance travel.

The domestic market in Brazil will also reflect the trends, but here a larger part of the market is emerging or new tourists. The more mature part of the market will be tempted to travel outside of Brazil.

If the long haul continues to outgrow regional tourism, tourist destinations and products that cater to wellbeing, new experiences and outdoor activities, should be able to profit from this.

The Brazilian Amazon, would get an extra boost from an easement of visa requirements for citizens of North America and Japan. For the European market, direct flights to the Amazon region would be helpful.

THE POTENTIAL OF THE BRAZILIAN AMAZON FOR ECOTOURISM

The Proecotur market study (BRASIL, 2010) tried to evaluate the potential market for the Brazilian Amazon. Using as a point of departure the market situation of 2005 and a long distance market volume of 54 million leisure trips from key markets, it put the potential market for the Amazon at 3 million, based on a survey of travelers and their degree of interest for visiting the Amazon (Table 9).

To put this into perspective, this number represents 45% of the tourist flow of Latin America in that year (2005) from 10 important long haul markets and 1 regional market. Foz de Iguaçu, the top nature tourism destination in Brazil, received 303 thousand long distance tourists (i.e not from Brazil or neighbouring countries) in 2009. This number is only 10% of the potential market identified for the Amazon.

Table 8 – International Macro Trends

Trend	Key Information	Effects and Responses
I – GROWTH		
Economic Crisis	<i>Short/medium term</i> Price adjustments, promotions, shorter itineraries, more cheap trips on offer.	Brazil trips are postponed
Growth and Long Distance	<i>Medium/Long term</i> Long distance grows faster	Repressed demand for Brazil will mean catch up growth
Supply	Stimulated by growing markets, new destinations and products enter the international market.	More competition. Destination and product differentiation key.
II – MORE COMPLEXITY		
Demographic Changes	Mature markets: aging population, “ <i>soft adventure</i> ”; 3 generation groups. Emerging markets: “newly affluent”, discovering the world, younger more adventurous.	Heterogeneous mix. Need to be able to communicate with different segments
Psychographic Changes	From looking, observing and taking pictures to being part of an experiences and interacting. Better informed and more demanding tourists	Need to consider interaction profile of products. Story telling.
Tailormade	More complex and flexible itineraries, smaller groups	Need to design itineraries in a modular form and invest in a “stock” of alternatives
Time Poverty	Growth of more “intense” holidays, rapid decision making	Good logistics, rapid response and ease of transaction
III SUSTAINABILITY		
Urban connect vs Outdoor disconnect	Reconnecting with nature (spiritual). Combating Nature-deficit-disorder. Shedding urban stress. Endorphine quest (feeling good) e adrenaline boost (adventure)	Smart itineraries, with attention to moments for imagination and adventure activities.
Authenticity	Less every-minute-planned itineraries, with space for planned for individual discoveries. Search for a “sense of place”, interacting with local community. Voluntourism, community tourism, learning new skills.	Possibilities to interact, contribute and practice.
No guilt travel	Tourist is more aware of his/her impacts. To avoid this “stress” looks for “guilt-free” trips. Will pay attention to certification and dedicated channels to help choosing the “right thing to do”	Importance of socio-environmental credentials of destinations, itineraries and products.
Climate Change	Travelling closer to home, alternative transport, carbon,	Potential to persuade the tourist to stay longer in a destination
IV DIGITILIZATION		
Internet Web 2.0	Friends and family will still inspire checking new destinations, but the information available online will be essential for deciding and detailed planning Before, during and after the trip, there is already digital interactivity between travelers and their friends Power of a brand is more ephemeral	<i>Website is your visiting card, mobile apps increasingly important</i> Digital presence and informative references in destination and review site, online media and blogs are key.
Data Base Marketing	Computer and internet resources permit more competent destination, attractions and product management	Monitoring and using results.
Buying Process	The modern consumer is easily distracted and buy transactions must be easy Mobile devices with WiFi and GPS are the new trend	<i>Website needs to be visible, easy to navigate and practical for booking</i> Apps for mobiles and lite version of website.
Travel Agencies	Tourism agencies will have to position themselves more as travel consultants.	Finding new ways to work with resellers.

Table 9 – Potential Tourism Market for the Amazon Region

Region of Origin	Total Long Haul (LH) Million	To South America Million	South America Share of LH %	Great Interest in Amazon Million	Amazon Potential Share of SA %
Europe ¹	19,1	3,2	17%	1,7	52%
North America ²	19,4	2,8	14%	1,1	39%
Asia ³	13,9	0,2	2%	0,1	43%
South America ⁴	1,3	0,3	23%	0,1	40%
TOTAL	53,7	6,6	12%	3,0	45%

Sourcee : IPK Consulting –Proecotur Market study

¹Germany, Spain, France, United Kingdom, Italy, Portugal;

²Canada, USA, ³ China e Japan, ⁴Argentina.

If we cross check the available data on emissive markets from selected countries, with the data collected by the Ministry of Tourism, it is clear that at the moment less than 1% of the long distance market is captured by nature tourism in the Amazon.

Table 10 show the number of long distance trips generated, as reported by the emissive countries and how many of those trips are to Brazil. Using the Brazilian data, we can than see, how many are motivated by nature tourism and how many of those actually go to the Amazon jungle lodges.

This shows that the North American market has the highest conversion rate for the Amazon and that the British market, despite its well known interest in nature tourism, visits the Brazilian Amazon much less.

This gap between potential and actual market could result in strong growth, but only within a context where Brazil and the Brazilian Amazon is competitive in terms of value for money. The top Amazon lodges of Peru, Ecuador and Bolivia are better priced than the top lodges of Brazil, at the moment.

Table 10 – Share of Amazon Destination in Long Distance Market of Selected Countries

Country	Long Distance Million	Brazil (000) Th	Share %	Motivation Nature Th	Share %	Manaus Jungle Lodges Th	Manaus / Nature %	Manaus/ Brazil %
USA	24	604	3%	30	5%	5.700	19%	0,9%
Spain	2	175	9%	27	15%	1.000	4%	0,6%
Italy	5	254	5%	25	10%	1.100	4%	0,4%
Germany	4	216	5%	24	11%	1.500	6%	0,7%
France	5	205	4%	21	10%	1.700	8%	0,8%
England	13	175	1%	14	8%	900	6%	0,5%
Total	53	1,6	3%	141	9%	12.000	9%	0,8%

Sources : Adapted from MTUR - Anuário Estatístico e Estudo de Demanda Internacional 2009 , AMAZONASTUR.

DISCUSSION AND CONCLUSIONS

In the case of the Brazilian Amazon, the use of available Brazil destination and Amazon gateway data, it was possible to arrive at reasonable estimates of the Brazilian Amazon market. The Tourism Motivation Pyramid is a useful concept to assess competitive position and what stands in the way between potential market and realized market.

The available estimates for the global ecotourism market are too general or too destination specific to apply. Generalized ecotourism growth rates should not be used. Growth should be seen within the context of the tourism life cycle and possible barriers in the Tourism Motivation Pyramid.

The Brazilian Amazon destination is still a niche market compared to more accessible nature destinations. The comparison of Tefé and Santarém to Manaus and Belém, show that accessibility is an important factor to be considered for assessing market size.

In terms of important statistics for ecotourism in Brazil and the Brazilian Amazon:

Currently nature tourism represents about 12% of international arrivals and about 3-4% of domestic trips. This represents a market of about 3 million tourists, based on 2009 data.

Jungle lodges in Manaus, by far the most important destination for ecotourism to the Brazilian Amazon receive less than 1% of foreign arrivals and less than 10% of those who are motivated by “nature/ecotourism/adventure”.

Secondary destinations like Tefé and Santarém receive a much smaller part of the main gateway flow.

When a good product has accessibility disadvantages it should invest in marketing that helps lower the perception of that barrier and also highlight why it is worth making an extra effort to visit.

The Brazilian Amazon product competes on a market where a wide range of tourism products from serious sustainable tourism to “greenwashed” tourism are on offer. Labels like ecotourism, adventure tourism, responsible tourism and geotourism are often used by marketers, but they are not clearly defined and end up confusing the tourist. The focus in marketing should be on evoking the experience and differentiating it from competitor destinations and products, not labeling it and copying competitors.

Available data indicate there is room for growth and destinations and products that position themselves well are at an advantage, once barriers to repressed demand are removed.

Future market studies should also include data for other Amazon countries (Peru, Ecuador, Colombia and Bolivia) to get a better picture of the whole market.

In terms of the importance of ecotourism it is also important to keep things in perspective. Ecotourism can make a big difference locally, but is only a tiny part of the ecosystem services offered by the Amazon Rainforest. Because of the large geographical area of the Amazon and the distance from main tourism generating markets in Brazil and internationally, it would require a lot of tourists to “save the Amazon through ecotourism” and also implicate in high carbon emissions. So therefore, ecotourism should be part of a well thought out sustainable economy.

This is important in the case of Tefé, where oil&gas investments are increasing and Santarém, which is also important for agriculture and forestry.

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ENVIRONMENTAL IMPACT ASSESSMENT OF UAKARI FLOATING LODGE USING INTERACTION MATRIXES.

AVALIAÇÃO DE IMPACTO AMBIENTAL DA POUSADA FLUTUANTE UACARI UTILIZANDO MATRIZES DE INTERAÇÃO.

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KEY WORDS:

Uakari Floating Lodge;
Environmental Impact Assessment;
Environmental Aspect;
Interaction Matrix;
Leopold Matrix.

ABSTRACT

Tourism impacts the environment. Therefore, the knowledge of mechanisms that allow doing an Environmental Impact Assessment (EIA) is critical. Among other methods we emphasize the Leopold Matrix, a kind of interaction matrix that allows clear visualization of the potential impact of a venture or project. This article aims to show the potential environmental impact of Uakari Floating Lodge, through an adaptation of the Leopold Matrix, evaluating the Magnitude and Importance of their environmental impacts. We found 28 environmental aspects in Uakari Lodge, being “generation of domestic wastewater” and “accumulation of used batteries” the most significant internal aspects, and “utilization of lubricating oil and fuel in motor boats rides” and “generation of gases from fuel combustion in boat rides” the most significant external aspects. All of them were identified as environmental aspects with potential for Direct (84.6%), Reversible (76.9%), Insignificant (46.2%) or Moderated (53.8%), and Local (100%) impacts. The results indicate the environmental aspects raised have low impact to the natural environment, considering the enterprise scale. However, we should find ways to mitigate their effects, once the Uakari Floating Lodge is located in a Protected area (Area).

PALAVRAS - CHAVE:

Pousada Flutuante Uacari;
Avaliação de Impacto Ambiental;
Aspecto Ambiental;
Matriz de Interação;
Matriz de Leopold.

RESUMO

O turismo é impactante ao ambiente. Por isso, é fundamental o conhecimento de mecanismos que permitem realizar uma Avaliação de Impacto Ambiental (AIA). Entre outros métodos, destaca-se a Matriz de Leopold, um tipo de matriz de interação que permite visualizar de forma clara o potencial de impacto de empreendimento/projeto em estudo. Este artigo teve por objetivo demonstrar o potencial de impacto ambiental da Pousada Flutuante Uacari, através da adaptação da Matriz de Leopold, com valoração de Magnitude e Importância de seus aspectos ambientais. No total, foram levantados 27 aspectos ambientais, sendo “geração de efluentes domésticos” e “acúmulo de baterias e pilhas usadas” os aspectos internos mais significativos, e “Utilização de óleos lubrificantes e combustível nos motores dos botes de passeio” e “geração de gases provenientes queima de combustíveis nos botes de passeio” os aspectos externos mais importantes. Todos eles foram identificados como aspectos ambientais com potencial de impacto Direto (84.6%), Reversíveis (76.9%), Insignificantes (46.2%) ou Moderados (53.8%), e Local (100%). Os resultados apontam que os aspectos ambientais levantados são pouco impactantes ao ambiente natural, visto a escala do empreendimento. Entretanto, deve-se buscar meios para mitigar seus efeitos, uma vez que a Pousada Uacari está localizada em uma Unidade de Conservação.

INTRODUCTION

Tourism, as any other economic activity, impacts the environment. The high consumption of fuels, electricity, food and water, the generation of solid waste and the emission of pollutants confirm tourism as an activity of potential environmental impact (PIRES, 2010).

The bibliography that approaches the environmental impacts involved in tourism is quite strong. In the survey carried out by Carr and Higham (2001) hundreds of studies can be found in this scope. Booth and Mackay (2007) present about 80 articles related to the environmental impacts of tourism. In the bibliographical surveys carried out by Twynam (1998), Sun and Walsh (1998); Baysan (2001); Pires et al., (2009); Buckley (1999) and Browns (2004) interesting reference about tourism and its impacts can be found.

Among the most common negative environmental impacts observed are:

- Relocation of population due to the disordered development of tourism, social conflict between locals and tourists during high season, increased competition in the local economy since tourism employs workers of other economic activities such as agriculture and fishing;
- Loss or degradation of habitat and natural landscapes, historical locations and monuments of cultural interest.
- Loss or imbalance of fauna and flora biodiversity, including areas of ecological interest.
- Reduction or shortage of quality water from public supplies to meet the demands of turistic enterprises.

- Sanitary problems due to the production of solid waste and the problematic of its disposal, and also the generation of residuary water (effluents), especially in protected areas.
- Increase of air and noise pollution due to crowded touristic facilities; increase of air and land traffic (emission of harmful atmospheric gases);
- Increased probability of fire occurrences caused by disorganized touristic activities; and
- Overload of services and infrastructure caused by an elevated number of tourists (ROWE, 2002; WOOD, 2002; KUSLER, 2006; BLACKSMITH, 2009).

As observed, tourism related impacts are numerous and pose as a threat to the natural environment when not controlled. Therefore, the creation of mechanisms capable of estimating the potential environmental impact caused by touristic activities becomes very important.

In this scope, the Environmental Impact Assessment (EIA) poses as a widely spread tool, potentially efficient in the prevention of environmental damage and in the promotion of sustainable development (SÁNCHEZ, 2006), with possible applications in tourism. The EIA is defined by RAMSAR CONVENTION SECRETARIAT (2007) as “a process of evaluation of the possible environmental impacts of a project or activity, considering socioeconomic, cultural and public health related impacts, whether they are advantageous or adverse”.

The EIA presents many benefits: higher protection for human health, sustainable use of natural

resources, reductions in cost and wasting of resources, reduction in risk of environmental disasters, improvement of the responsibility of leaderships, better project localizations, greater responsibility and transparency during the development process, better integration of projects in both social and environmental areas, reduction of environmental damages, more efficient projects in terms of understanding their financial and socioeconomic objectives, contribution to reach sustainability (ABAZA et al., 2004; CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY, 2011).

There are several methods of assessing environmental impact. Authors Lohani (1997), Keys et al. (2005), There Rovere (2001), Sanches (2006), and Almeida and Lins (2009) present the following:

- Spontaneous methodologies (Ad hoc), which are based on the empirical knowledge of a specific area;
- Check-list, which consists in the identification and enumeration of impacts based on a diagnose, carried out by specialists in physics, biotics and socioeconomic fields;
- Interaction matrixes, which are bidimensional techniques that relate action with environmental factors, consisting basically of identification methods;
- Interaction networks, which establish a sequence of environmental impacts based on a determined intervention, using a graphical method. It has the objective of relating enterprise activities with the consequent impacts;
- Quantitative methodologies, which associate costs to the qualitative considerations that

might be formulated in the impact assessment of a project. This method uses indicators of environmental quality expressed by graphics relating the conditions of certain environmental aspects to a condition of quality;

- Simulation models, which are mathematical models that represent the behavior of environmental parameters or the relations and interactions between causes and effects of determined actions;
- Overlay mapping, which consists in the production of thematic letters of environmental aspect, and once overlaid the maps can guide the studies and synthesize the environmental situation of a geographic area.

Among the presented methods, the interaction matrix is more easily interpreted, allowing greater understanding of the results. It presents qualitative and quantitative data at the same time, and supplies clear orientation on the environmental situation of a determined activity.

The Matrix of Leopold used in this paper provides a format for a comprehensive analysis to venture the investigator of the variety of interactions that can be involved in an activity, assisting in the identification of alternatives that can reduce impacts (LEOPOLD, 1971; HOWELLS; EDWARDS-JONES; MORGAN, 1998; DARBRA et al., 2005).

The intention of this article is to demonstrate the potential impacts to the natural environment in which the Uakari Floating Lodge (UFL) is located, by collecting and crossing its aspects and associated environmental impacts using the interaction matrix.

METHODOLOGY

Bibliographical material approaching tourism related environmental impacts, EIA methodologies and others have been consulted.

The object of study in this research is the Uakari Floating Lodge, located in the Mamirauá Sustainable Development Reserve (MSDR), considered to be Brazil's biggest protected area in flooded areas, and the only one completely inserted in an amazonian várzea flooded forest ecosystem (INSTITUTE..., 2010, p. 30). The activities in the Uakari Lodge are founded by Brazilian government's Community Based Tourism program, generating socioeconomical benefits for the MSDR inhabitants, distributing the generated revenue between the service providing communities. Moreover, it contributes for the conservation of natural resources, with minimum impact activities, considering that it is located in a preservation area (BORGES PEDRO, 2011).

To reach the proposed objective, matrixes were created based on the Leopold Matrix (LEOPOLD, 1971). As explained by Chaves (2005), the principle of this method consists in labeling all possible interactions between activities (environmental aspects) and environmental factors, and then establishing a scale (from 1 to 10) to measure the magnitude and the importance of each impact, and to identify it as positive or negative.

In this paper, Magnitude is comprehended as presented by Leopold (1971), who defines it as "the gravity, extension, or scale of an impact", in more general, wide and theoretical terms. For Importance the definition by the same author has been adopted, as being "the balance of the degree of importance of a particular activity on

the environmental factor in a specific situation of analysis".

The values labeled in the matrixes represent the impacts of the studied object (in this case, ecotourism), provoked by the activities and/or actions that are taken into consideration during the analysis (PIRES, 2009). The environmental characteristics marked in grey are considered to be more significant, in accordance with PIACA I. The environmental aspects in grey were considered more significant in accordance with PICCA I. The highlighted cells represent a possibility of interaction between the environmental characteristics and aspects. The weights established in the tables concern the magnitude and importance of each environmental aspect, defined through local observations and interviews with local enterprise managers. (Figure 1).

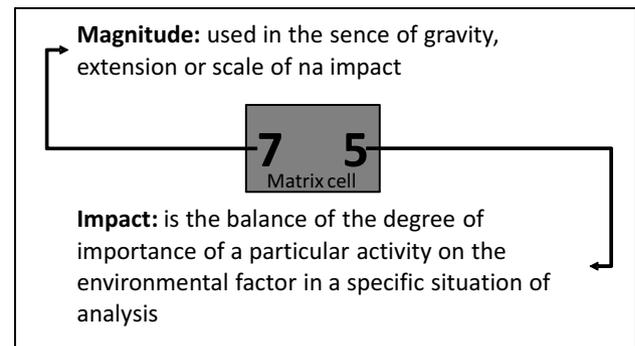


Figure 1 - Magnitude and Importance in the cells of the impact matrixes.

Before establishing assessment grades, it was necessary to select the most relevant environmental aspects. To achieve that, the average of internal and external interactions percentage was calculated and those which presented an above average value were selected.

The matrixes weights were established by 17 specialists who evaluated the environmental aspects and its impact potential in the different environmental characteristics considered to be more relevant, as follows: Two researchers evaluated “Water Quality of the Hydric Body”, five researchers evaluated the “Native Fauna”, four evaluated the “Landscape Resources”, three evaluated “Health and Security”, and three the “Air Quality” (Table 1). The final weight shown in the matrix represents the average balances made by the collaborating researchers.

In this paper only the environmental impacts of adverse nature were studied.

Table 1 - Specialties of the evaluating researchers in significant environmental characteristics.

Evaluated environmental characteristics	Specialty of the evaluating researchers
Water quality in the hydric body	Environmental Engineering
Native fauna	Zoology
	Ecology
	Biological Sciences
Landscape resources	Ecotourism and Environmental Management
	Biological Sciences
Health and Security	Environmental Engineering
	Biological Sciences
	Sociology
	Parasitology
Air quality	Civil and Electric Engineering
	Ecology
	Biological Sciences

RESULTS

Information regarding the internal environmental aspects of the Uakari Floating Lodge are presented in Table 2. In total, twenty-one aspects were collected and classified into 8 categories: A - effluent, B - solid waste, C - noise, D - oil and greases, E - chemical products, F - generation of energy, G - consumable water, and H - harmful synanthropic fauna.

In regards to internal and external aspects, there are 10 environmental characteristics with potential risks of being affected in any way by the following aspects: a. water quality in the hydric body; b. outflow of the water body; c. hydric availability; d. quality of the air; e. ground permeability; f. ground quality; g. native fauna; h; terrestrial flora; i. landscape resources; j. health and security.

The environmental characteristics affected by a bigger number of environmental aspects are: a. water quality in the hydric body, g. native fauna, i. landscape resources and j. health and security, presenting the index of Interaction Percentage of Aspects with Internal Environmental Characteristics (PIACA I) of 51%, 76%, 70% and 76%, respectively. The last three are affected by all categories of aspects. Although these are the mostly compromised characteristics, they are directly related to *water quality in the hydric body*, that presents a smaller index.

Amongst the environmental characteristics that present the smallest PIACA I levels are b. outflow of the water body (10%), c. hydric availability (14%), and e. ground permeability (10%). These characteristics are little influenced by the activities of the lodge, and therefore they do not demand action of short term mitigation of impacts. The

same applies to the characteristics related to the ground (e. and f. *characteristics*), for they are not expressive when compared to the others.

Among all environmental aspects mentioned, ten present high Percentage of Interaction of Environmental Characteristics with Internal Aspects (PICAA I), this means they interact with a higher number of environmental characteristics. Among them, the following stand out: 1. generation of domestic effluents, 2. Sludge production in the septic tank, 5. generation of recyclable solid waste, and 6. generation of organic solid waste, with PICAA I of 60%, 70%, 70% and 60%, respectively.

Of the less significant aspects, 21 present PICAA below its general average. Among them, 5 have PICCAI of 20% (aspects 3, 4, 9, 18 and 21). The smaller rate is related to aspect 17. Inadequate electric installations, with PICCA I of 10%. For the selection of more impacting aspects, this last item can be disregarded.

The matrix of External Environmental Aspects of the Uakari Lodge is shown in Table 3. In the survey, 7 environmental aspects were identified and classified in three categories. Amongst these aspects, three of them present significant Percentage of Interaction of Environmental Characteristics with External Aspects (PICCA E): 22. use of lubricant oils and fuel in the boats engines, 22. generation of gases proceeding from the fuel burning in the boats, and 25. tourist hikes, with PICCA E rates of 40%, 40% and 60% respectively.

The four environmental characteristics mostly affected by different aspects are: a. water quality

in the hydric body, d. quality of the air, g. native fauna, and i. landscape resources, with rates of Percentage of Interaction of Aspects with External Environmental Characteristics (PIACA E) in 43%, 57%, 100% and 86%, respectively. Amongst these, two characteristics stand out: "g", which is potentially affected by all external aspects, and "i", which comprehends all categories. These characteristics are also expressive in the internal aspects, and therefore deserve special attention.

Characteristics b. outflow of the water body and c. hydric availability are not impacted by any of the external environmental aspects (PIACA I = 0% for both). Thus, the necessity of further evaluation is disregarded.

Comparing the more significant environmental aspects, ten of them are from internal environment, and only three from external environment. That means the majority of environmental aspects of the Uakari Lodge is regarding its own infrastructure and/or activities.

Table 4 was generated from the selection of the significant internal aspects, which means only those that presented a PICCA I rate higher than the general average (37.1%). After the selection, were established weights of magnitude and importance for the internal aspects in accordance with the potentially affected environmental characteristic.

In the process of selection of aspects, categories "C - Noise" and "H - Harmful Synanthropic Fauna" were eliminated for not presenting aspects with PICCA I rates higher than the average, showing its impacts demand minor attention.

Table 2 - Matrix of internal environmental aspects regarding the structure of the UaKari Lodge.

CATEGORY OF INTERNAL ENVIRONMENTAL ASPECTS	Environmental characteristics Environmental aspects	a. Water quality in the hydric body	b. Outflow of the water body	c. Hydric availability	d. Quality of the air	e. Ground permeability	f. Ground quality	g. Native fauna	h. Terrestrial flora	i. Landscape resources	j. Health and Security	PICAA I - Percentage of Interaction of Environmental Characteristics with Internal Aspects (%)
		A - Effluents	1. Generation of domestic effluents									
	2. Sludge production in the septic tank											70
	3. Odors of the Sewage System											20
	4. Generation of gases such as CO ₂ and methane by anaerobic decomposition of the sewer											20
B - Solid waste	5. Generation of recyclable solid waste											70
	6. Generation of organic solid waste											60
	7. Generation of solid rejects (toilet, dust, remaining portions of construction sites such as wood, nails, etc...)											30.
	8. Accumulation of used batteries											50
C - Noise	9. Generation of noise by the energy generator											20
	10. Generation of noise in construction sights											30
D - Oils and greases	11. Generation of oil and greases in the retainer boxes											40
E - Chemical products	12. Use of chemicals for cleaning											30
	13. Use of chemicals for laundry											40
	14. Use of poison for pest control											30
F - Generation of Energy	15. Use of lubricant oils and fuels in the energy generator											50
	16. Generation of gases from the fuel burning in the generators											40
	17. Inadequate electric installations											10
G - Water for Consumption	18. Rain water collecting for consume and food production											20
	19. River water use											40
H - Harmful synanthropic fauna	20. Attraction of bats											30
	21. Attraction of undesirable insects such as roaches and flies											20
PIACA I - Percentage of Interaction of Aspects with Environmental Characteristics (%)		52	10	14	29	10	24	76	19	62	76	

Table 3 - Matrix for external environmental aspects related to the natural environment.

CATEGORY OF EXTERNAL ENVIRONMENTAL ASPECTS	Environmental characteristics	a. Water quality in the hydric body	b. Outflow of the water body	c. Hydric availability	d. Air quality	e. Soil permeability	f. Soil quality	g. Native fauna	h. Terrestrial flora	i. Landscape resources	j. Health and Security	PICAA E - Rate of Interaction of Environmental Characteristics by Aspect (%)
	Environmental aspects											
I - Fluvial transportation	1. Use of lubricant oils and fuel in the boats engines											40
	2. Generation of gases from the burning of fuel in the boats											40
	3. Boat traffic											10
J - Recreation in Natural Environment	4. Tourist hiking											60
	5. Tourist boat rides in the lake											30
K - Noise	6. Generation of noises by the boats											30
	7. Generation of noise by the tourists in the forest											30
PICAA E - Rate of Interaction of Aspects by Environmental Characteristics (%)		43	0	0	57	14	14	100	14	86	29	

Table 4 (matrix of internal environmental aspects) shows that the environmental aspects which present higher magnitude average rates are those: "1", "8" and "19" (7.8, 7.2 and 7.2 respectively). It is evident that the first two are more significant and match their average importance rates which are also the most elevated (4 and 4,6 respectively). From these results it is safe to conclude that these two aspects are the ones that present a higher potential of impact to the environmental characteristics, thus the necessity of establishing measures for environmental control.

Observing the average importance rates of the environmental characteristics, the most elevated are "i" and "j" (3,2 and 5,4), where the last one stands out. It is clear that almost every aspect related to characteristic "j" has above average rates. Therefore, we can point out this environmental characteristic as the most impacted, which demands mitigating effort.

Each environmental characteristic is more or less affected by different aspects. Characteristic "a" is more influenced by aspects "11", "13" and "15" than by others (Importance of 4,3, 4, and

4 respectively). It is important to highlight that aspect "1" (Generation of domestic effluents) is not among the most impacting aspects for characteristic "a" (Water quality of the hydric body). The aspects that less affect the quality of water are "16" and "19" having evaluation grades of 1,5 for both. Furthermore, environmental aspect "19" (Use of river water) can be considered as the less significant or impacting to the environment of the Lodge, since its evaluation grades and average of importance are the lowest in the matrix.

It is clear that characteristic "j" is peculiar. Its grade in evaluation of importance is the highest when compared to the rest of the matrix. Aspects "1", "6", "8" and "11" are far more impacting for "j" than for any other environmental characteristic. In aspect "8", the grade reaches 8,7, which represents high potential of impact, since no other grade in the matrix is so elevated.

To assess the potential impact of the external environmental aspects in the Uakari Lodge, a new matrix was structured and represented in Table 5.

Table 4 - Matrix of selected internal environmental aspects, with weights.

CATEGORY OF INTERNAL ENVIRONMENTAL ASPECTS	Environmental characteristics Environmental aspects	a. Water quality in the hydric body		g. Native fauna		i. Landscape resources		j. Health and Security		Average	
		M	I	M	I	M	I	M	I	M	I
		A - Effluents	1. Generation of domestic effluents	9	3	6,6	3,6	7	2,8	8,7	6,7
	2. Sludge production in the septic tank	8	3	4,2	1,8	4,5	1,8	7,7	5,3	6,1	3
B - Solid waste	5. Generation of recyclable solid waste	7,5	2.	4,5	2,4	6,3	3,5	5,3	3,7	6,1	2,9
	6. Generation of organic solid waste	7,5	2	5	2	6,8	3,5	9,3	5,7	7,1	3,3
	8. Accumulation of used batteries	9	3	5,2	2,4	5,8	4,3	9	8,7	7,2	4,6
D - Oils and greases	11. Generation of oil and greases in the retainer boxes	8,8	4,3	5,2	2,8	6,8	3,3	7,7	5,7	7,1	4
E - Chemical products	13. Use of chemicals for laundry	8	4	6	2,6	5,5	3,3	6,7	4	6,5	3,5
F - Generation of Energy	15. Use of lubricant oils and fuels in the energy generator	7,5	4	5,6	2,8	7	4	7,3	4,3	6,9	3,8
	16. Generation of gases from the fuel burning in the generators	4,5	1,5	6,4	2,6	7,3	4	7,3	4,3	6,4	3,1
G - Water for Consumption	19. River water use	10	1,5	5,2	1,6	5,5	1,5	8	5,3	7,2	2,5
Average		8	2,8	5,5	2,5	6,2	3,2	7,7	5,4		

Legend: M - Magnitude; I - Importance

Of the seven existing environmental aspects listed in Table 3, only three were considered significant for they represent PICCA E rates higher than the average (34,3%). They are the following: 22. Use of lubricant oils and fuel in the boats engines (PICCA E = 40%); 23. Generation of gases from the burning of fuel in the boats Tourist hikes (PICCA E = 60%).

Amongst the three categories of external environmental aspects, "K - Noise" was eliminated, since none of its aspects presented PICCA E are greater than average. The same occurred with this category in the assessment of Internal aspects. Therefore, this category is not considered a significant potential impact.

Category "I - Fluvial Transport" stands out for presenting the highest importance rate average. Aspect "22" has an importance rate average of 4,3, which makes it the most elevated.

Concerning the environmental characteristics, "d - Air quality" is more potentially impacted because it presents the highest importance rate (5.1), rate influenced by aspects "22" and "23", with

evaluation grades of 6.3 and 7.0 respectively. The last is the most elevated grade of importance in the matrix and, therefore, requires special attention for control measures and impact mitigation.

In the initial survey of the environmental characteristics, "b. Outflow of the water body" and "c. Hydric availability" presented PIACA E = 0 (Table 3). Which means these elements are not affected by any of the identified environmental aspects.

Environmental aspect "25. Tourist hikes" presented the lowest importance rate average (2.2), pointing its low potential of environmental impact. Evaluating the environmental characteristics, "a. Water quality of the hydric body" presents reduced importance rate average (2.2), indicating that the external environmental aspects have little influence in this element, despite being affected by "22" with a grade of importance of 4.

Table 6 shows the nature of the possible impacts of the Uakari Lodge. The following magnitudes are assessed: Impact Order; Reversibility; Degree of Permanence; Degree of Importance; e Amplitude.

Table 5 - Matrix of selected external environmental aspects, with weights.

CATEGORY OF EXTERNAL ENVIRONMENTAL ASPECTS	Environmental characteristics Environmental aspects	a. Water quality in the hydric body		d. Air quality		g. Native fauna		i. Landscape resources		Average	
		M	I	M	I	M	I	M	I	M	I
		I - Fluvial transportation	22. Use of lubricant oils and fuel in the boats engines	8,5	4	6,3	6,3	5,2	2,6	5,8	4,3
	23. Generation of gases from the burning of fuel in the boats	4	1,5	6,7	7	5,4	2,6	6,3	4	5,6	3,8
J - Recreation in Natural Environment	25. Tourist hiking	1	1	1,7	2.	5,8	3,4	4,8	2,5	3,3	2,2
Average		4,5	2,2	4,9	5,1	5,5	2,9	5,6	3,6		

Legend: M - Magnitude; I - Importance

Table 6 - Identification of the nature of the environmental impact, related to its aspects.

ASPECT		IMPACT ORDER		REVERSIBILITY		PERMANENCE DEGREE		IMPORTANCE DEGREE			AMPLITUDE		
		I	D	R	IR	T	P	IS	M	S	L	R	G
Internal	1. Generation of domestic effluents												
	2. Sludge production in the septic tank												
	5. Generation of recyclable solid waste												
	6. Generation of organic solid waste												
	8. Accumulation of used batteries												
	11. Generation of oil and greases in the retainer boxes												
	13. Use of chemicals for laundry												
	15. Use of lubricant oils and fuels in the energy generator												
	16. Generation of gases from the fuel burning in the generators												
	19. River water use												
External	22. Use of lubricant oils and fuel in the boats engines												
	23. Generation of gases from the burning of fuel in the boats												
	25. Tourist hiking												
Representativity (%)		15,4	84,6	76,9	23,1	92,3	7,7	46,2	53,8	0	100	0	0

Legend:
I Indirect **R** Reversible **T** Temporary **IS** Insignificant **S** Severe **L** Local
D Direct **IR** Irreversible **P** Permanent **M** Moderate **R** Regional **G** Global

An analysis of the order of impact shows that the majority of aspects have Direct impact potential (84,6%). Which means in case the possible impact comes about it would have direct action upon the related environmental characteristic. In case the domestic effluents were directly thrown in the hydric body receptor, for example, the quality of natural water would be directly altered.

Regarding Reversibility, 23,1% of the impacts related to the aspects are Irreversible, in contrast with the majority of them (76,9%) which are Reversible.

Only aspect “8. Accumulation of used batteries” has Permanent potential of impact, representing 7,7%. Both in the assessment matrix (Table 4) and in the impact nature (Table 6) this aspect stands out for its potential of impact.

None of the aspects have Severe potential. They are either Insignificant (46,2%) or Moderate (53,8%). It becomes clear that the activities in the Uakari Lodge have little negative influence in its surroundings, since the majority of aspects (92.3%) represent impacts with *Temporary Degree* of Permanence.

Another property is Amplitude, meaning its radius of action. They can be Local, Regional, or Global. In all the aspects (100% of them) the possible environmental impact is of Local scale. Whatever are the impacts caused by the daily activities in the Uakari Lodge, their reach will not surpass the surroundings or neighboring areas.

CONCLUSION

Analyzing the data presented in this work, the following conclusions are clear:

- The adaptation of the Leopold Matrix presented in this study is a useful tool for touristic enterprises. It allows clear detailing of potential environmental impacts. Besides providing support in the realization of an environmental impact study, the matrix also contributes to the elaboration of an Environmental Management System.
 - The results of importance show that the potential for environmental impact of the enterprise is low, since in most cases the environmental aspects raised present low importance rate average. Therefore, it is clear that the Uakari Lodge has a small scale of influence in terms of environmental impacts.
 - The aspects that were not selected for being considered less significant (they did not present an above average percentage of interaction) should not be neglected. The enterprise managers must take the necessary steps into reducing or eliminating the effects of these aspects because the enterprise is located within a protected area, and regardless of the magnitude of the impacts, they must be considered as an important matter.
- Priority should be given to the aspects and respective impacts which are considered more significant in order to reduce its negative effects more quickly.

Once the potential of environmental impacts of each aspect is identified, the Uakari Lodge must search solutions with qualified professionals so that more possible significant impacts are minimized.

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DOES ECOTOURISM ACTIVITY AFFECT PRIMATES IN MAMIRAUÁ RESERVE?

A ATIVIDADE DE ECOTURISMO NA RESERVA MAMIRAUÁ AFETA OS PRIMATAS?

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KEY WORDS:

Line transect;
Environmental impact;
Community collector.

ABSTRACT

Mamirauá Institute's Uakari Lodge maintains an ecotourism program, which includes monitoring primates on trails, with a view to evaluating the effects of ecotourism on these animals. The aim of this study was to assess if primate density is affected by ecotourism. Two trails of minimum use (low tourist visitation frequency) and two of intense use (high tourist visitation frequency) were covered using the line transect method. The monitored species were *Alouatta juara*, *Sapajus macrocephalus*, *Saimiri vanzolinii* and *Cacajao calvus calvus*. The data was analyzed using the software *DISTANCE* 6.0. The density variation was analyzed over the years by simple linear regression. The density between the categories was compared using the t-test. This verified a significant difference in the densities of *A. juara* ($t = -5.318$ DF = 6, $p = 0.0017$) and *S. macrocephalus* ($t = -4.601$, DF = 6, $p = 0.0036$) on the trail of intense use, which may be related to increased animal habituation to human presence, as a result of ecotourism.

PALAVRAS - CHAVE:

Transecção linear;
Impacto ambiental;
Coletor comunitário.

RESUMO

A Pousada Uacari do Instituto Mamirauá mantém um programa de ecoturismo que inclui o monitoramento de primatas nas trilhas com a finalidade de avaliar o efeito da atividade nestes animais. O objetivo deste trabalho foi avaliar se a densidade dos primatas é afetada pelo ecoturismo. Foram percorridas duas trilhas de uso mínimo (baixa frequência de visitação de turistas) e duas de uso intenso (alta frequência de visitação de turistas) pelo método de transecção linear. As espécies monitoradas foram *Alouatta juara*, *Sapajus macrocephalus*, *Saimiri vanzolinii* e *Cacajao calvus calvus*. Os dados foram analisados no programa *DISTANCE* 6.0. A variação da densidade ao longo dos anos foi analisada por regressão linear simples. A comparação da densidade entre as categorias de uso foi realizada pelo teste t. Verificou-se diferença significativa nas densidades de *A. juara* ($t = -5,318$; DF=6; $p=0,0017$) e *S. macrocephalus* ($t=-4,601$; DF=6; $p=0,0036$) na trilha de uso intenso, o que pode estar relacionado ao aumento na habituação dos animais à presença humana em decorrência do ecoturismo.

INTRODUCTION

Ecotourism can be described as “trips to natural areas to understand the cultural and natural history of the environment, without altering the ecosystem’s integrity, while creating economic opportunities so that nature conservation brings financial benefit to the local community” (THE INTERNATIONAL ECOTOURISM SOCIETY, 2011). The Mamirauá Institute, through Uakari Lodge, invested in a Community Based Tourism program, in the Mamirauá Sustainable Development Reserve (SDR), aiming to promote the conservation of natural resources and generate income for the local population (PERALTA, 2002).

The Lodge has the logistical capacity to host twenty tourists at a time, with an established capacity to support a maximum of one thousand tourists per year. The Lodge offers a variety of activities, such as canoe rides, visits to traditional communities, meeting with researchers, lectures and videos, interpretative trails and wildlife observation trails. What makes this project unique is that all services are carried out by the residents of local communities. However, like any human activity, ecotourism can cause environmental and social impacts, both positive and negative. The positive impacts include: 1. Increased conservation and preservation of natural areas, archaeological sites and historical monuments; 2. Creation of programs to protect flora and fauna; 3. Appreciation of cultural and artistic heritage; 4. Ethnic pride and improvement of local infrastructure and meeting basic needs. The negative impacts include: 1. Water, air, soil and noise pollution; 2. Degradation of the local flora and fauna; 3. Animal population reduction; 4. Possible change of values and traditional customs of local people when confronted with the lifestyles of the tourists (RUSCHMANN, 1997).

To assess environmental impacts, the Ecotourism Program includes ongoing monitoring of fauna observed on the trails, as well as control of the number of tourists on the interpretative and wildlife observation trails. One of the most common ways to assess the impact on fauna is to conduct a survey of abundances and densities of species occurring in the region of interest. This result can show if a population of a particular species is declining, increasing or remaining balanced over a period of time (CULLEN JR.; VALLADARES-PADUA, 1997).

Due to lack of experience monitoring tourist impact on Amazonian fauna, especially in floodplain areas, it was necessary to find a suitable monitoring method for the activities at Uakari Lodge and for the floodplain environment. The implementation of a census of arboreal vertebrates was proposed in 2005. Using the line transect method, the density and abundance of local fauna on six trails (transects) were estimated. Five species of primates were chosen (*Cacajao calvus calvus*, white uakari; *Saimiri vanzolinii*, black headed squirrel monkey; *Saimiri sciureus cassiquiarensis*, squirrel monkey; *Alouatta juara*, red howler monkey; *Sapajus macrocephalus*, large-headed capuchin) and two bird species from the Cracidae family (*Crax globulosa*, wattled curassow; *Mitu tuberosa*, razor-billed curassow) were targeted for monitoring (PAIM, 2005). The primates were selected for being the most sighted mammals on the trails while the cracids were selected for being hunting targets of local human populations (VALSECCHI, 2005).

Between 2006 and 2007, the method had to be reassessed, as it was considered inadequate for the local reality due to the large number of trails and sampled species. Of the previously selected species, only the primates were kept, while the

number of trails monitored was reduced to four: two intense use (high tourist visitation frequency) and two minimal use (low tourist visitation frequency) (STORNI et al., 2007).

The aim of this study was to investigate whether the density of primate populations has been affected in the different trail use categories, as a result of ecotourism activities promoted by Uakari Lodge.

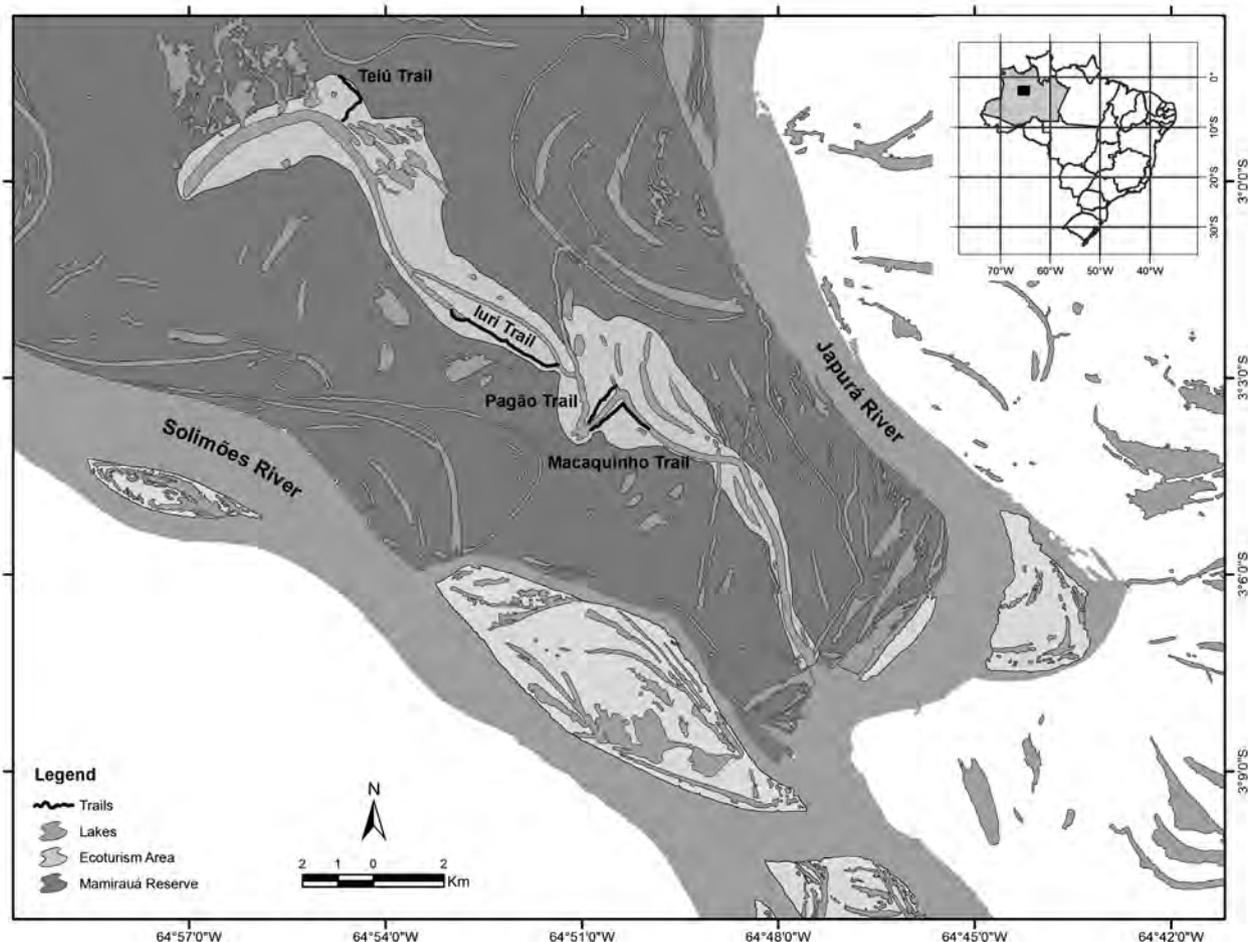
MATERIAL AND METHODS

The ecotourism management zone of the Mamirauá SDR is near the confluence of the Solimões and Japurá rivers, about 30 km from the

Tefé city, in Amazonas state. This area includes Paraná do Mamirauá and its margins, starting from the community of Boca do Mamirauá up to the end of Lake Mamirauá, totaling around 32 km² (03° 00'00" - 03° 07'12" S, 64° 57'01" - 64° 47'59" W) (Figure 1).

This study presents data from 2007 to 2010 collected on two trails of intense use (tourist visitation frequency equal to, or more than twice a week: Macaquinho, 2388 m; Pagão, 1471 m) and minimal use (no visitation at all or it occurs sporadically at intervals of at least three months: Teiú, 1760 m; Iuri, 3150 m) (Figure 1).

Figure 1: Location of trails in the Ecotourism area of Mamirauá Reserve.



The line transect methodology was used (BUCKLAND et al., 1993; THOMAS et al., 1998). In this method, the observers (community collectors or local guides properly trained and qualified by researchers) identify the first animal sighted (before fleeing) and measure the perpendicular distance (shortest distance from the animal to the transection centre) with a tape measure.

All the trails were surveyed for six months of each year: three months during the wet season (April-June), using a canoe, and three months during the dry season (September-November) on foot. The monitoring was conducted between 7:00am and 10:00am and between 3:30pm and 6:00pm (STORNI et al., 2007).

Data was analyzed using the software DISTANCE 6.0 (BUCKLAND et al., 1993). It was tested and selected as the best model (detection function and adjustment agreement), starting from the lowest AIC value (Akaike Information Criterion) and CV (Coefficient of Variation). The density value of each species was calculated in each year for both trail use categories.

A simple linear regression was performed to analyze the variation trends of the species' densities over the years. A comparison of primate densities between both trail use categories was performed using the t-test. Data normality was previously tested using the Lilliefors test. The analyses were done using the software BioEstat 5.0 with a significance level of 5% for all tests.

RESULTS

Throughout the 811.2 kilometers covered, 1448 records were obtained from groups (or social units), including a sufficient number of sightings of *A. juara*, *S. macrocephalus*, *S. vanzolinii* and *C.*

c. calvus for density analysis, in accordance with the recommendations by the software DISTANCE 6.0 (BUCKLAND et al., 1993). However, an insufficient number of sightings was obtained for the other three species (*Saimiri sciureus cassiquiaensis*, *Crax globulosa* and *Mitu tuberosa*).

With the exception of *S. sciureus cassiquiaensis*, all species included in the monitoring were recorded on the four trails. The monitoring activity suggests that *S. sciureus cassiquiaensis* were restricted to the Pagão trail region. Few recordings were made in other areas (Macaquinho, n = 1; Iuiri, n = 4) and these were small groups (sub-groups) of up to 10 individuals (5.6 ± 5.0). The curassows were the only ones that were not recorded in each of the years. *Mitu tuberosa* was not recorded on the Pagão trail in 2009, while *C. globulosa* was not recorded on Pagão and Macaquinho in 2007 and 2009, on Pagão in 2008, and in none of the areas in 2010. However, records outside of the period and monitoring sites indicate that the species are present in all areas.

Saimiri vanzolinii was the species which had the highest overall density in each of the years, followed by *A. juara*, *S. macrocephalus* and *C. c. calvus*. Though densities of the four species varied among the years, they do not show a trend throughout the study (Table 1).

Alouatta juara and *S. macrocephalus* presented greater densities on intense use trails, whereas the densities of *S. vanzolinii* and *C. c. calvus* presented no significant differences between years or use categories (Figure 2). There was a significant difference in the densities of *A. juara* and *S. macrocephalus* among the different trail use categories between 2007 and 2010 (Table 2).

Table 1 - Densities, confidence intervals (CI), linear regression and t-test values of the species monitored in the different use categories.

Species	Use category	2007	2008	2009	2010	R ²	P
<i>Alouatta juara</i>	Minimal	19.911	15.863	15.524	20.695	0.026	0.844
	CI	(4.010 – 98.846)	(4.839 – 52.000)	(1.822 – 149.870)	(5.165 – 82.920)		
	Intense	42.162	27.795	34.949	35.656	0.074	0.724
	CI	(18.487 – 96.158)	(2.785 – 277.404)	(12.490 – 97.789)	(7.961 – 159.692)		
<i>Cacajao calvus calvus</i>	Minimal	19.378	7.083	23.484	24.569	0.265	0.486
	CI	(13.590 – 27.630)	(0.917 – 54.695)	(9.645 – 57.184)	(10.014 – 60.279)		
	Intense	14.611	6.995	7.584	24.041	0.22	0.532
	CI	(3.630 – 58.812)	(0.099 – 493.668)	(1.066 – 53.942)	(10.267 – 56.292)		
<i>Sapajus macrocephalus</i>	Minimal	10.722	10.668	8.549	12.523	0.068	0.744
	CI	(2.960 – 38.837)	(6.705 – 16.975)	(2.809 – 26.016)	(7.656 – 20.485)		
	Intense	29.229	19.164	21.072	19.321	0.567	0.246
	CI	(18.090 – 47.227)	(13.465 – 27.275)	(13.301 – 33.384)	(0.434 – 859.295)		
<i>Saimiri vanzolinii</i>	Minimal	63.015	60.654	57.846	80.865	0.397	0.372
	CI	(50.239 – 79.042)	(42.620 – 86.319)	(40.123 – 83.397)	(18.659 – 350.450)		
	Intense	89.058	69.319	58.851	109.418	0.086	0.71
	CI	(21.724 – 365.099)	(39.460 – 121.772)	(21.495 – 161.132)	(62.976 – 190.109)		

Figure 2 - Species density in the different trail use categories throughout the sample period.

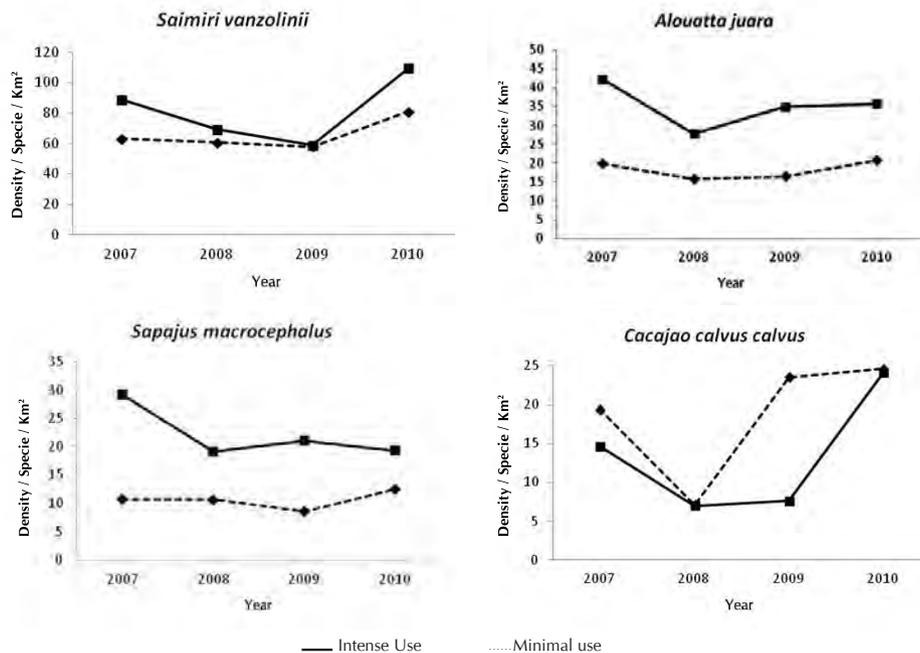


Table 2 - Comparative analysis results between densities recorded on the trails of intense use and minimal use. T-test values shown by species (*significant difference).

Species	t	gl	p
<i>Alouatta juara</i>	-5.318	6	0.0017*
<i>Sapajus macrocephalus</i>	-4.601	6	0.0036*
<i>Cacajao calvus calvus</i>	0.942	6	0.3824
<i>Saimiri vanzolinii</i>	-1.303	6	0.2400

DISCUSSION

The fact that no significant differences were found in the density of *C. c. calvus* and *S. vanzolinii* throughout the study may suggest that the activities undertaken by the Uakari Lodge are not affecting these species. However, *A. juara* and *S. macrocephalus* showed higher densities on intense use trails, indicating the possibility that these primates are habituated to human presence, as a result of visiting tourists. It is probable that this constant visiting process on intense use trails increases the detectability of individuals of these two species, as they do not run away from observers.

Due to interspecific differences (or intergeneric) in the habituation time and reaction of primates to human presence (WILLIAMSON; FEISTNER, 2003), it is possible that *S. vanzolinii* and *C. c. calvus* are also being habituated. From the start of the monitoring activity, *Saimiri vanzolinii* showed no fugitive behaviour, reacting instead with vocalizations and behaviours that suggest curiosity, and spending more time close to monitors and visitors. *C. c. calvus* showed a different response from the start

of monitoring, where individuals exhibited escape behaviour as soon as visitors approached.

Despite the Uakari Lodge encouraging and prioritizing low impact and not allowing tourists to approach the animals, habituation (unintentionally) can cause problems for the population, such as reduced reproductive success and even immunosuppression, resulting in animal illness and death (WOODFORD et al., 2002). In addition, regular contact with humans can cause alterations in primate behaviour, creating changes in population dynamics (migration) and impairing reproduction (WILLIAMSON; FEISTNER, 2003).

Other factors that may influence primate habituation are previous experiences with humans, especially hunting (WILLIAMSON; FEISTNER, 2003). According to Lopes et al. (2012), *A. juara* showed a susceptibility to hunting rate of 9.2 (on a scale of 0 to 10), in a community near Uakari Lodge. *Sapajus macrocephalus* presented a rate of 5.4 for the same region, while *C. c. calvus* and *S. vanzolinii* had rates of 0 and 1.3, respectively. The figures indicate that the latter two species are not hunted for food and are rarely captured or kept as pets.

CONCLUSIONS

Despite the density variations of *A. juara* and *S. macrocephalus* on intense use trails, possibly indicating habituation of the groups on Ecotourism trails, visitation rates can be considered low, especially if compared to the habituation period observed in primate behaviour studies, where human presence is daily (WILLIAMSON; FEISTNER, 2003). We believe that the visitation frequency proposed by the Mamirauá Community Based Tourism Program, as well as the guidance given to tourists, is adequate. Mamirauá visitors do

not get too close to the animals, nor offer them food, as at other tourist sites.

During monitoring, it was also observed that all recorded species still show signs of flight behaviour, maintaining alarm vocalizations, *displays* and other such characteristic behaviours, when perceiving noises or sudden movements, caused by data collectors or tourists. However, changes in the frequency of these behaviours were not quantified in this study.

In spite of the ecotourism area being a specially managed zone where hunting is prohibited, the animals can still find themselves displaced in areas of community use. This movement can occur through daily, seasonal or migratory displacement. However, the maintenance of densities throughout the years, and the hypothesis generated about the existing habituation process, are indications that the monitored species are not under hunting pressure or any other processes that would imply population reduction in the managed ecotourism area in Mamirauá SDR.

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BIRDWATCHING IN THE MAMIRAUÁ LAKE AS AN APPEAL TO
ECOTOURISTS/BIRDWATCHERS.
OBSERVAÇÃO DE AVES NO LAGO MAMIRAUÁ COMO ATRATIVO PARA
ECOTURISTAS/BIRDWATCHERS.

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KEY WORDS:

Sustainable Development Reserve;

Uakari Lodge;

Amazon;

Varzea Forest.

ABSTRACT

The Mamirauá Sustainable Development Reserve fits the profile of a good destination for birdwatching, because it has high species diversity, bilingual guides, updated bird lists, field guides and adequate infrastructure. In this paper we present the bird species observed during a regular type of tourist activity held in Uakari Lodge and also relate the richness and diversity of birds to fluctuations in water level during several months. The study was conducted between June 2009 and September 2011, and it took a total of 68 boat trips, 480 ecotourists, adding up to a total of 238 hours. 134 bird species were recorded, which corresponds to 37% of the number of species that occurs in the Mamirauá SDR. Large-billed Tern (*Phaetusa simplex*) and Striated Heron (*Butorides striata*) were seen at all the trips. Yellow-rumped Cacique (*Cacicus cela*) and Black-collared Hawk (*Busarellus nigricolis*) were observed 62 times. Horned Screamer (*Anhima cornuta*) and Hoatzin (*Opisthocomus hoazin*) came right after, with 61 sightings. The distribution of observations of attractive species really provide the more informed ecotourist some real entertainment, as to which would be the best time of year to visit the Mamirauá SDR.

PALAVRAS-CHAVE:

Reserva de Desenvolvimento

Sustentável;

Pousada Uacari;

Amazônia;

Floresta de Várzea.

RESUMO

A Reserva de Desenvolvimento Sustentável Mamirauá se enquadra no perfil de um bom destino para observação de aves, pois possui elevada riqueza de espécies, guias bilíngues, listas atualizadas, guias de campo e infraestrutura adequada. No presente trabalho procuramos apresentar as espécies de aves observadas durante uma atividade turística regular realizada na Pousada Uacari e relacionar a riqueza e diversidade da avifauna com as flutuações do nível da água durante os meses. O estudo foi realizado entre junho de 2009 e setembro de 2011, em 68 passeios de barco, feitos com 480 ecoturistas, num total de 238 horas. Ao todo foram registradas 134 espécies de aves, totalizando 37% do número de espécies que ocorrem na RDS Mamirauá. Trinta-réis-grande (*Phaetusa simplex*) e socozinho (*Butorides striata*) foram avistados em todas as saídas a campo. Xexéu (*Cacicus cela*) e gavião-belo (*Busarellus nigricolis*) foram observados 62 vezes. Anhuma (*Anhima cornuta*) e cigana (*Opisthocomus hoazin*) vieram na sequência, com 61 avistamentos. A distribuição das observações de espécies atrativas ilustra ao ecoturista interessado em ver alguma delas a melhor época do ano para visitar a RDS Mamirauá.

INTRODUCTION

Birdwatching is one of the most expanding branches of ecotourism in the world (FIGUEIREDO, 2003). Birdwatchers is the group of animal observers that has gathered more followers on the planet nowadays (MOURÃO, 2004).

It is considered a low-impact environmental tourist activity, being also educational and sustainable, not to mention the plus of involving the local populations (FARIAS; CASTILHO, 2007). It mobilizes approximately 80 million people around the world (SANTOS, 2006), from which 70 million are from the USA alone and about 1 million are from the UK (PIVATTO; SABINO, 2005). In Brazil, it's less than 1% of the Brazilian population practice birdwatching - about 15.000 people (Pers. Com. Alyson V. de Melo).

The Mamirauá Sustainable Development Reserve (Mamirauá SDR) fits the profile of a great destination site for birdwatching, because it contains all the important characteristics described by Mourão (1999), such as high species diversity, bilingual guides, updated bird lists, special field guides and adequate infrastructure (PERALTA et al., 2010).

Since 1998 there has been an ecotourism program at the Mamirauá SDR which promotes environment preservation as well as generation of income to local communities (PERALTA, 2002). Birdwatching activities are restricted to the Ecotourism Special Management Zone, an area created in order to reduce pressure over natural resources and which also regulates tourist activities at the Mamirauá SDR (IDSM, 2010).

One of the main attractions and reasons for such tourist appeal is that at Mamirauá SDR is the rich and easy-to-see fauna (PERALTA, 2002). The várzeas at the reserve contain a rich variety of vertebrates, and endemism rates are high (AYRES; JOHNS, 1987, apud PERALTA, 2002).

This essay contains several bird species observed during a regular tourist activity at the Uakari Lodge; along with the relationship between the richness of the bird fauna and fluctuations of water level throughout the months.

MATERIAL AND METHODS

Study area

The Mamirauá Sustainable Development Reserve is located in the Amazonas state's mid-west area (03°08'S, 64°45'W and 02°36'S, 67°13'W), near the city of Tefé. It covers 1,124,000 hectares of seasonally flooded forest (várzea), limited by the Solimões, Japurá and Auati-Paraná rivers. This ecosystem represents 200,000 km², or around 2% of all the Amazon Forest (JUNK, 1983). The weather is tropical humid, with an average annual rainfall of 2350 mm (AYRES, 1993).

The aquatic environment at the Mamirauá SDR is marked by a great seasonal water level variation. The rain season starts in November, causing the forest to flood in March and from that on up until the beginning of May, while the dry season starts in mid July, and then up until September. It rains most intensely from December to March, and the driest period is from August to October (IDSM, 2009). The area suffers periodic floods due to water level variation, which peaks at 10 to 14 meters. At this peak, all the Mamirauá SDR is covered with water (IDSM, 2010).

The ecotourism area is located at the confluence of the Japurá and Solimões rivers and covers an area of 35 km² of Mamirauá SDR's territory. In this area, lies the Mamirauá lake, about 10 km long, but only 400 m wide (Figure 1). A low bushy vegetation, intertwined with secondary and exuberant forests cover the river margins territory (AYRES, 1993).

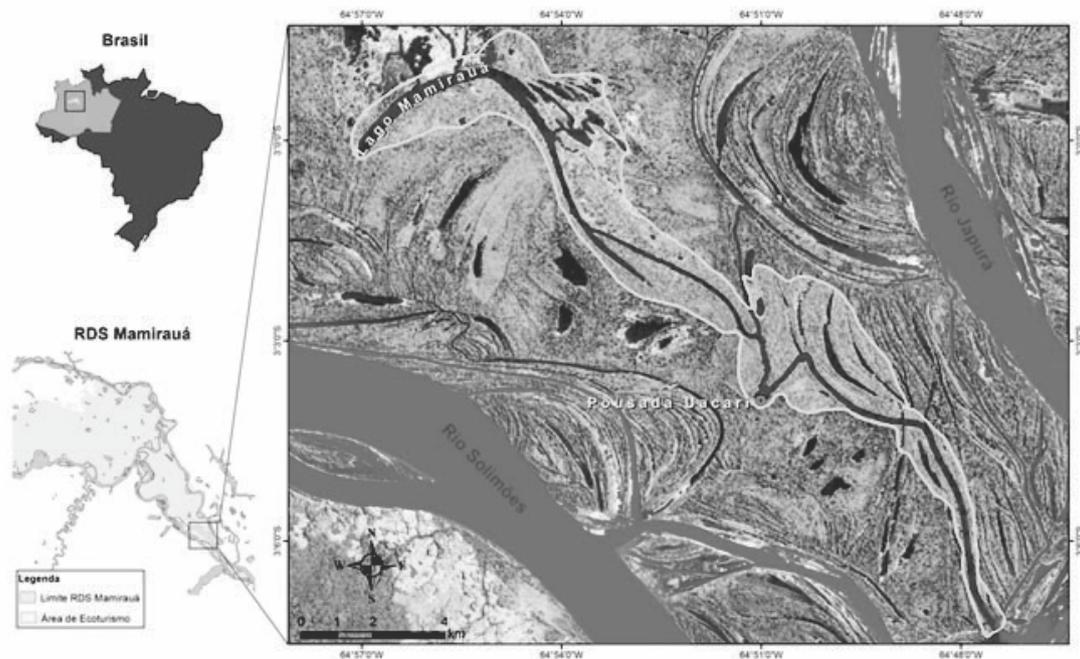


Figure 1 - Especial Ecotourism Handling Zone, Mamirauá SDR.

Data collection

Studying of the birds is comprised of quality samples obtained during the boat trip, along with the regular tourist visitations at the Mamirauá SDR. The entire journey is made aboard a wooden motor boat (20 or 15 hp), with capacity for about 11 people, including the pilot, local guide and naturalist guide. The observations were made by naturalist guides, with binoculars, rarely with the help of the local guide,

The trip started at Uakari Lodge, at around 3:30 pm, with observations being noted from that moment on, excluding the birds along the lodge surroundings.

The water track started at a channel (from the lodge) which grants access to the Mamirauá

Lake (03°06'55"S e 64°47'50"W), generally with a longer stop at the lake's entrance, for a brief explanation, and another stop at the end of the lake, for appreciation of the sunset, adding up to the journey a total of 38.5 km there and back. The way back to the lodge, at dusk and beginning of the night, was also part of data collection, which ended at 07:00 pm;

All birds observed, or heard, were reported, even the species that had been previously noted. For the record, air space was also considered, which is noted here as the zone above the tallest vegetations, where birds carry through with their flights. Movement was registered (in flight, standing or inside of the water) and also stratus (below, in the canopy, or above of the canopy) wherever the first individual of a species was observed. When it

was not possible to identify the species, the genus was noted. Taxonomy followed the Brazilian Committee of Ornithological Registers (2011).

Since the research was conducted along with the tourist activities, the search for birds was not exclusive, and whenever something considered interesting was observed (i.e. a group of monkeys), the boat would stop for observations and photos. The same occurred for any animal, plants or any situation in which the tourist desired to observe calmly. Therefore the boat not only did not sail in constant speed, it also didn't keep the same distance from the edge of the forest all the time.

Some birds had been lost at moments of talking/ explanations to the tourists, due to the noise from the engine and/or speed of the boat. Therefore, the central idea was the observation of species on a regular tour, along with heterogeneous tourist groups, where some liked birds more than others. With this, it was made possible to have singular register of what can be observed in this type of tour at any and each time of the year.

The observations had been separated per month and the months were divided according to the water level. When there are two popular names for the same cited species, the first one is the official name, in accordance to the CBRO (2011) and the second is the name by which the bird is known in the region.

RESULTS AND DISCUSSIONS

Data collection started in June 2009 and it went on until September 2011, adding to a total of 25 months, 68 samplings, a total of 238,5 hours, and the presence of 480 visitors. There were no

observations in February nor in March 2010, and in March 2011. 134 bird species have been observed (Attachment) and this number did not become stable near the date of the last monitoring (Figure 2).

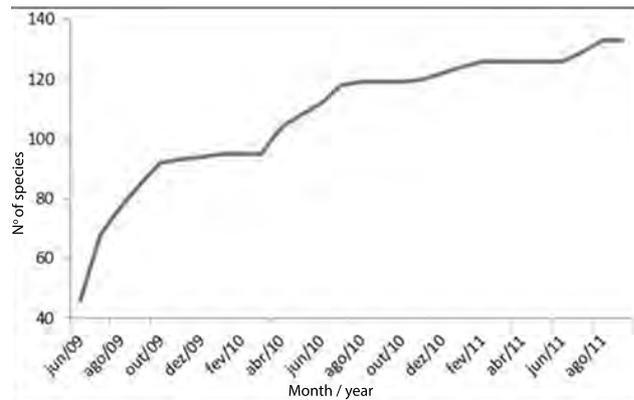


Figure 2 - Record of bird species number during the study.

The observations, restricted to Mamirauá Lake, limited the number of species seen. Most species observed lives near aquatic environments, along forest edges or is aquatic. However, high richness in species is observed, a total of 37% of 361 species that occur in the Mamirauá SDR.

The possibility of observation of each species depends on factors such as ecology and species behavior, which include the areas that the animal frequents, the migration in accordance with the water level, visibility, and luck.

The species Large-billed Tern (*Phaetusa simplex*) and Striated Heron (*Butorides striata*) had been sighted in all trips, but others, such as the Mealy Parrot (*Amazona farinosa*) and the Cream-colored Woodpecker (*Celeus flavus*), were seen only once.

Amongst the species observed during the research, the Yellow-rumped Cacique (*Cacicus cela*) and the

Black-collared Hawk (*Busarellus nigricolis*) had the most number of observations, adding a total of 62 times. Horned Screamer (*Anhima cornuta*) and Hoatzin (*Opisthocomus hoazin*) come right after, being spotted 61 times.

Observation of these four species was possible throughout all the months.

20 species were highlighted as having strong tourist appeal, with a minimum of 20% observations.

Horned Screamer (*Anhima cornuta*), one of the most observed species way along the Mamirauá Lake. It has great association with aquatic environments, especially lakes full of macrophytes, where it feeds and reproduces (SICK, 1997).

Great Egret (*Ardea alba*), very common in the Mamirauá SDR and observed throughout the year. However, they are even more frequent and extraordinary in quantity during the low water period, when the food supply is greater.

Neotropic Cormorant (*Phalacrocorax brasilianus*) calls visitors' attention during the dry season, when they congregate by the thousands in Mamirauá Lake region. This period of the year is the time of highest abundance for aquatic birds, because the fish are trapped into small pools of water or in shallow water.

The Hoatzin (*Opisthocomus hoazin*), as well as the Horned Screamer, are species observed throughout the year (Figure 3). They living on the margins of lakes and lowland rivers, where they feed and build their nests. It is a very noisy bird which makes its observation easy. During the drought, the Hoatzin is almost sure to be spotted.

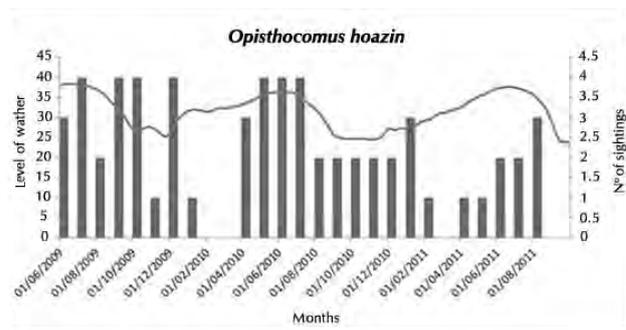


Figure 3 - Seasonality of the Hoatzin in the Mamirauá lake.

Wattled Jacana (*Jacana jacana*), a quite common species in the edges of the Mamirauá Lake. With very prominent color is even more attractive during the dry season, when it is possible to see hundreds of these birds together.

Purple Gallinule (*Porphyrio martinica*) is a specie that occurs around the canals and lakes of the Mamirauá SDR and is found frequently throughout the Mamirauá Lake. Its shining colors really call the visitors' attention.

Osprey (*Pandion haliaetus*) was observed mainly in the months of flooding (Figure 4). It is a northern migratory bird, appearing in the Southern Hemisphere during the spring and the summer, from the drought to the middle of the flooding in the Amazon (SICK, 1997). Thus, months of greater sightings are from October to February.

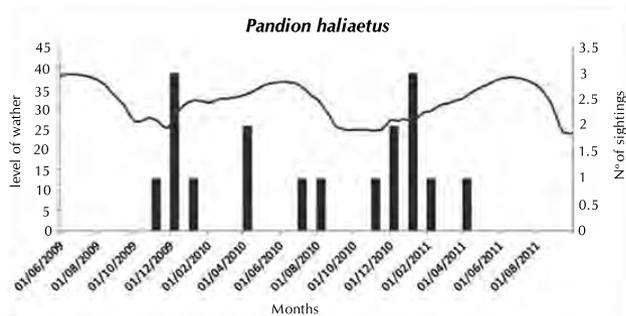


Figure 4 - Seasonality of the Osprey in the Mamirauá Lake.

Black-collared Hawk (*Busarellus nigricolis*) is a species that lives in strong association with aquatic or flooded environments, very common along rivers and lakes (SICK, 1997), therefore along the margins of the canal and at the Mamirauá Lake.

Sunbittern (*Eurypyga helias*) was observed mainly in the receding waters and in the drought months (Figure 5). The species is associated with the bushes alongside rivers, but it is also usually found in beaches and dry areas.

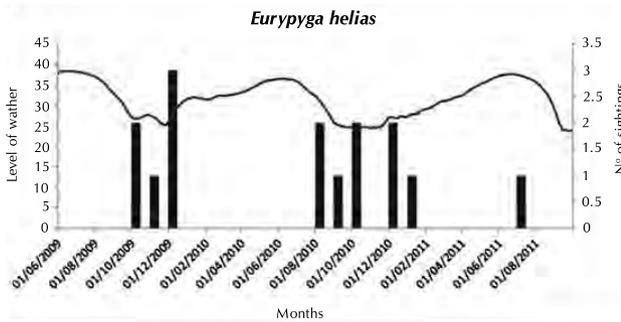


Figure 5 - Seasonality of the Sunbittern in the Mamirauá Lake.

Black Skimmer (*Rynchops niger*) a migratory species (DEGRAAF; RAPPOLE, 1995) appeared during the ebbs and droughts (Figure 6), feeding off of fish and other small animals living near the water surface. In the Mamirauá Lake area, it is easy to obtain food during the driest periods, and this period is their nesting period. They always lay their eggs in river beaches.

Tui Parakeet (*Brotogeris sanctithomae*) was observed throughout the whole year, but sightings peaked three times during the floodings in 2009 and 2010. The peaks observed during the flood are due to maturation of *mungunba* fruits (*Pseudobombax munguba*), a tree typical of water streams and one of the birds favorites during the high waters.

Short-tailed Parrot (*Graydidascalus brachyurus*) peaked three times during drought, flooding and high waters. It is a psittaciform directly related to varzea environments and very common along the Mamirauá SDR

Scarlet Macaw (*Ara macao*) was mostly spotted during the floods in 2009 and 2011 and in the flooding in 2010 (Figure 7), probably due to increased availability of fruits. It is the bird that occupies the highest forest stratus and it is quite commonly seen in flight.

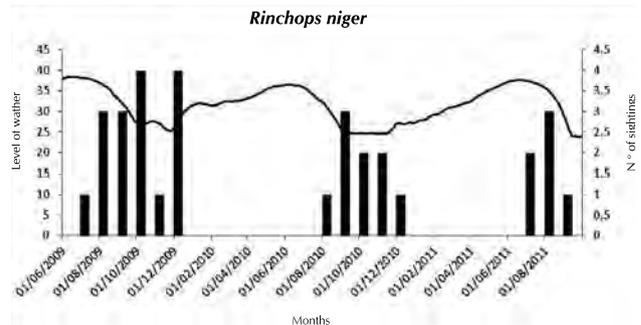


Figure 6 - Seasonality of the Black Skimmer in the Mamirauá Lake.



Picture 7 - Seasonality of the Scarlet Macaw in the Mamirauá Lake.

Festive Parrot (*Amazona festiva*) also had a steady number of observations. It is a bird directly related to varzea environments and quite common along the Mamirauá SDR.

Scarlet-crowned Barbet (*Capito aurovirens*) was sighted during an entire year (Figure 8). It is found both in the forest, and in its borders, associated to varzea areas, and, despite not being one of the most common birds at the Mamirauá SDR, it can be seen with some frequency in the area along the Mamirauá Lake.

White-throated Toucan (*Ramphastos tucanus*) was spotted in different periods of the year, peaking during the 2009 and 2011 flooding (Figure 9). This bird inhabits different habitats at the Mamirauá SDR, but it is not a very common species, although it is possible to observe it during all periods of the year.

Bare-necked Fruitcrow (*Gymnoderus foetidus*) was noted mainly during the flooding, and the first months of the ebb flow, when water level is still high. (Figure 10), probably due to the larger availability of fruits during this period. (SNOW, 1982).

Red-capped Cardinal (*Paroaria gularis*) there were 3 moments of peak sightings, during the drought, the flooding and the high waters. It is closely related to water streams, but, since it is a small bird, its observation depends a little on the distance it is to this environment. Nevertheless, this is a regular bird.

Yellow-rumped Cacique (*Cacicus cela*) is a bird found in practically any area of the Mamirauá SDR, and most of its nests are found near lakes and rivers, therefore, easy to be seen.

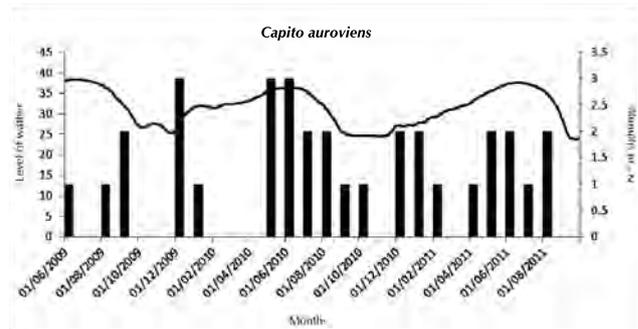


Figure 8 - Seasonality of the Scarlet-crowned Barbet in Mamirauá Lake.

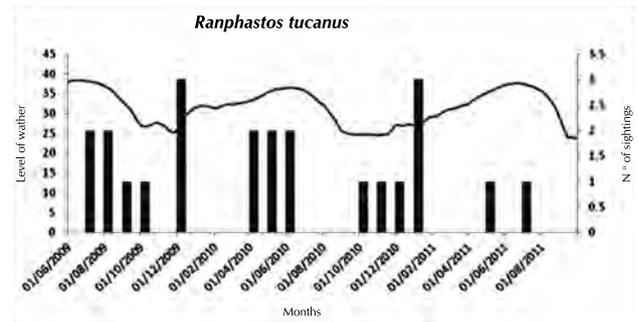


Figure 9 - Seasonality of the White-throated Toucan in the Mamirauá Lake.

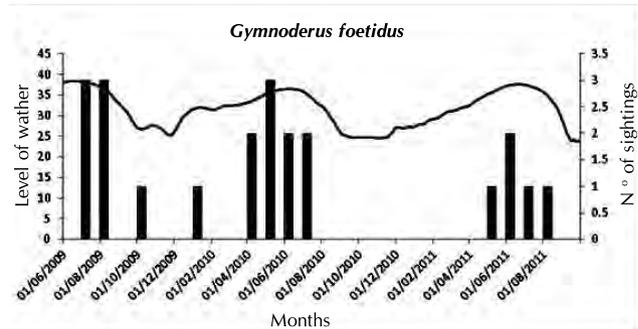


Figure 10 - Seasonality of the Bare-necked Fruitcrow in the Mamirauá Lake

Yellow-hooded Blackbird (*Chrysomus icterocephalus*) is a very attractive bird, due to its colors, and for flying around in flocks that indeed call the attention of visitors. During the beginning of the flooding, they follow the fluctuating vegetations, in search for seeds, and often flock right in front of the Uakari lodge.

The distribution of those 20 species observed informs to an interested ecotourist when is the best time of year to visit the Uakari Lodge is.

Among the recorded birds along the Mamirauá Lake, Bernardon; Nassar (2011) mentioned some species considered to be more attractive to the birdwatchers, such as: Horned Screamer, Razor-billed Curassow (*Pauxi tuberosa*), Wattled Curassow (*Crax globulosa*), Agami Heron (*Agamia agami*), Purple Gallinule, Sungrebe (*Heliornis fulica*), Scarlet Macaw, Festive Parrot, Hoatzin, White-eared Jacamar (*Galbalcyrhynchus leucotis*), Scarlet-crowned Barbet, White-throated Toucan, Long-billed Woodcreeper (*Nasica longirostris*), and Yellow-hooded Blackbird.

The bird monitoring along the Mamirauá SDR Special Ecotourism Management Zone is important in order to assess the possible impact such activities may have on the birds, along with the fact that the Uakari Lodge is located inside a preservation area where threatened species occur. Besides, standardized bird fauna studies during the ecotourism activities are yet another attraction to visitors at the Reserve (BERNARDON; NASSAR, 2011).

“The Mamirauá SDR protects globally threatened species, such as the Wattled Curassow and the Harpy Eagle (*Harpia harpyja*) and is a stop for migrating species” (BERNARDON; NASSAR, 2011).

The first was spotted only four times during the study and the second was not recorded during this study, but it had been photographed by a researcher in the field.

CONCLUSION

The Mamirauá SDR has an incredible potential for birdwatching activities. The motor boat sail is only one of the options for sighting, and still, it has been proved very productive in terms of capturing the richness and species diversity. Besides, distribution and abundance of some species vary according to seasons, as well as the pulse of the flooding in the region.

This paper focused only in a restricted area of the reserve, and with the participation of non-specialized birdwatching tourists and yet, showed very interesting results. Thus, if there's any effort in a broader divulgation to attract birdwatchers as well as a diversification in the activities, visitors may see plenty of the species that occur in the Mamirauá SDR.

ACKNOWLEDGMENTS

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ATTACHMENT

Birds of Mamirauá Lake, Mamirauá SDR, Amazonas

TAXON	POPULAR NAME	NAME IN ENGLISH
Tinamiformes		
Tinamidae		
<i>Crypturellus undulatus</i>	jaó	Undulated Tinamou
Anseriformes		
Anhimidae		
<i>Anhima cornuta</i>	Anhuma or alencorne	Horned Screamer
Anatidae		
<i>Dendrocygna autumnalis</i>	asa-branca	Black-bellied Whistling-Duck
<i>Cairina moschata</i>	pato-do-mato	Muscovy Duck
Galliformes		
Cracidae		
<i>Pauxi tuberosa</i>	mutum-cavalo	Razor-billed Curassow
<i>Crax globulosa</i>	mutum-de-fava or mutum-piurí	Wattled Curassow
Suliformes		
Phalacrocoracidae		
<i>Phalacrocorax brasilianus</i>	Biguá or mergulhão	Neotropic Cormorant
Anhingidae		
<i>Anhinga anhinga</i>	biguatinga	Anhinga
Pelecaniformes		
Ardeidae		
<i>Tigrisoma lineatum</i>	socó-boi	Rufescent Tiger-Heron
<i>Agamia agami</i>	garça-da-mata or socó-azul	Agami Heron
<i>Cochlearius cochlearius</i>	arapapá	Boat-billed Heron
<i>Nycticorax nycticorax</i>	savacu	Black-crowned Night-Heron
<i>Butorides striata</i>	socozinho or socoí	Striated Heron
<i>Bubulcus ibis</i>	garça-vaqueira	Cattle Egret
<i>Ardea cocoi</i>	garça-moura	Cocoi Heron
<i>Ardea alba</i>	garça-branca-grande	Great Egret
<i>Pilherodius pileatus</i>	garça-real	Capped Heron
<i>Egretta thula</i>	garça-branca-pequena	Snowy Egret
Threskiornithidae		
<i>Mesembrinibis cayennensis</i>	coró-coró	Green Ibis

Continua

Continuação

Cathartiformes		
Cathartidae		
<i>Cathartes aura</i>	urubu-de-cabeça-vermelha	Turkey Vulture
<i>Cathartes burrovianus</i>	urubu-de-cabeça-amarela	Lesser Yellow-headed Vulture
<i>Cathartes melambrotus</i>	urubu-da-mata	Greater Yellow-headed Vulture
<i>Coragyps atratus</i>	urubu-de-cabeça-preta	Black Vulture
Accipitriformes		
Pandionidae		
<i>Pandion haliaetus</i>	águia-pescadora or águia-caipira	Osprey
Accipitridae		
<i>Chondrohierax uncinatus</i>	caracoleiro	Hook-billed Kite
<i>Ictinia plumbea</i>	sovi	Plumbeous Kite
<i>Busarellus nigricolis</i>	gavião-belo or gavião-panema	Black-collared Hawk
<i>Rostrhamus sociabilis</i>	gavião-caramujeiro	Snail Kite
<i>Helicolestes hamatus</i>	gavião-do-igapó	Slender-billed Kite
<i>Buteogallus schistaceus</i>	gavião-azul	Slate-colored Hawk
<i>Urubitinga urubitinga</i>	gavião-preto	Great Black-Hawk
<i>Rupornis magnirostris</i>	gavião-carijó	Roadside Hawk
Falconiformes		
Falconidae		
<i>Milvago chimachima</i>	carrapateiro	Yellow-headed Caracara
<i>Herpetotheres cachinnans</i>	acauã	Laughing Falcon
<i>Falco deiroleucus</i>	falcão-de-peito-laranja	Orange-breasted Falcon
Eurypygiformes		
Eurypyidae		
<i>Eurypyga helias</i>	pavãozinho-do-pará or pavãozinho	Sunbittern
Gruiformes		
Aramidae		
<i>Aramus guarauna</i>	carão	Limpkin
Rallidae		
<i>Aramides cajanea</i>	saracura-três-potes	Gray-necked Wood-Rail
<i>Porphyrio martinica</i>	frango-d'água-azul	Purple Gallinule
Heliornithidae		
<i>Heliornis fulica</i>	picaparra or patinha-do-igapó	Sungrebe
Scolopacidae		

Continua

Continuação

<i>Tringa solitaria</i>	maçarico-solitário	Solitary Sandpiper
Jacaniidae		
<i>Jacana jacana</i>	jaçanã	Wattled Jacana
Sternidae		
<i>Sternula superciliaris</i>	trinta-réis-anão	Yellow-billed Tern
<i>Phaetusa simplex</i>	trinta-réis-grande or gaivota	Large-billed Tern
Rynchopidae		
<i>Rynchops niger</i>	talha-mar or corta-água	Black Skimmer
Columbiformes		
Columbidae		
<i>Patagioenas cayennensis</i>	pomba-galega	Pale-vented Pigeon
<i>Patagioenas plumbea</i>	pomba-amargosa	Plumbeous Pigeon
<i>Patagioenas subvinacea</i>	pomba-botafogo	Ruddy Pigeon
<i>Leptotila rufaxilla</i>	juriti-gemeadeira	Gray-fronted Dove
Psittaciformes		
Psittacidae		
<i>Ara ararauna</i>	arara-canindé	Blue-and-yellow Macaw
<i>Ara macao</i>	Araracanga or arara-vermelha	Scarlet Macaw
<i>Ara severus</i>	maracanã-guaçu	Chestnut-fronted Macaw
<i>Aratinga leucophthalma</i>	periquitão-maracanã	White-eyed Parakeet
<i>Forpus xanthopterygius</i>	tuim	Blue-winged Parrotlet
<i>Brotogeris sanctithomae</i>	periquito-testinha	Tui Parakeet
<i>Graydidascalus brachyurus</i>	curica-verde or curica	Short-tailed Parrot
<i>Amazona festiva</i>	papagaio-da-várzea or papa-cacau	Festive Parrot
<i>Amazona farinosa</i>	papagaio-moleiro	Mealy Parrot
Opisthocomiformes		
Opisthocomidae		
<i>Opisthocomus hoazin</i>	Cigana	Hoatzin
Cuculiformes		
Cuculidae		
<i>Piaya cayana</i>	alma-de-gato	Squirrel Cuckoo
<i>Coccyzus melacoryphus</i>	papa-lagarta-acanelado	Dark-billed Cuckoo
<i>Crotophaga major</i>	anu-coroca	Greater Ani
<i>Crotophaga ani</i>	anu-preto	Smooth-billed Ani
<i>Tapera naevia</i>	saci	Striped Cuckoo

Continua

Continuação

Strigiformes		
Strigidae		
<i>Glaucidium brasilianum</i>	caburé	Ferruginous Pygmy-Owl
Caprimulgiformes		
Nyctibiidae		
<i>Nyctibius grandis</i>	mãe-da-lua-gigante	Great Potoo
<i>Nyctibius griseus</i>	mãe-da-lua	Common Potoo
Caprimulgidae		
<i>Hydropsalis leucopyga</i>	bacurau-de-cauda-barrada	Band-tailed Nighthawk
<i>Hydropsalis albicollis</i>	bacurau	Pauraque
<i>Hydropsalis climacocerca</i>	acurana	Ladder-tailed Nightjar
<i>Chordeiles minor</i>	bacurau-norte-americano	Common Nighthawk
Apodiformes		
Apodidae		
<i>Chaetura cinereiventris</i>	andorinhão-de-sobre-cinzento	Gray-rumped Swift
<i>Chaetura brachyura</i>	andorinhão-de-rabo-curto	Short-tailed Swift
Trochilidae		
<i>Anthracothorax nigricollis</i>	beija-flor-de-veste-preta	Black-throated Mango
Trogoniformes		
Trogonidae		
<i>Trogon melanurus</i>	surucuá-de-cauda-preta	Black-tailed Trogon
<i>Trogon curucui</i>	surucuá-de-barriga-vermelha	Blue-crowned Trogon
Coraciiformes		
Alcedinidae		
<i>Megaceryle torquata</i>	martim-pescador-grande	Ringed Kingfisher
<i>Chloroceryle amazona</i>	martim-pescador-verde	Amazon Kingfisher
<i>Chloroceryle americana</i>	martim-pescador-pequeno	Green Kingfisher
Galbuliformes		
Galbulidae		
<i>Galbalcyrhynchus leucotis</i>	ariramba-vermelha	White-eared Jacamar
<i>Galbula tombacea</i>	ariramba-de-barba-branca	White-chinned Jacamar
<i>Jacamerops aureus</i>	jacamaraçu	Great Jacamar
Bucconidae		
<i>Monasa nigrifrons</i>	chora-chuva-preto	Black-fronted Nunbird

Continua

Continuação

Piciformes		
Capitonidae		
<i>Capito aurovirens</i>	capitão-de-coroa, capitão-do-mato or uru	Scarlet-crowned Barbet
Ramphastidae		
<i>Ramphastos tucanus</i>	tucano-grande-de-papo-branco or tucano-assoviador	White-throated Toucan
<i>Ramphastos vitellinus</i>	tucano-de-bico-preto	Channel-billed Toucan
<i>Pteroglossus inscriptus</i>	araçari-miudinho-de-bico-riscado	Lettered Aracari
<i>Pteroglossus castanotis</i>	araçari-castanho	Chestnut-eared Aracari
Picidae		
<i>Melanerpes cruentatus</i>	benedito-de-testa-vermelha	Yellow-tufted Woodpecker
<i>Celeus flavus</i>	pica-pau-amarelo	Cream-colored Woodpecker
<i>Campephilus melanoleucos</i>	pica-pau-de-topete-vermelho	Crimson-crested Woodpecker
Passeriformes		
Thamnophilidae		
<i>Thamnophilus doliatus</i>	choca-barrada	Barred Antshrike
Dendrocolaptidae		
<i>Campylorhamphus trochilirostris</i>	arapaçu-beija-flor	Red-billed Scythebill
<i>Nasica longirostris</i>	arapaçu-de-bico-comprido	Long-billed Woodcreeper
Furnariidae		
<i>Certhiaxis cinnamomeus</i>	curutié	Yellow-chinned Spinetail
<i>Certhiaxis mustelinus</i>	joão-da-canarana	Red-and-white Spinetail
<i>Synallaxis gujanensis</i>	joão-teneném-becuá	Plain-crowned Spinetail
<i>Cranioleuca vulpina</i>	arredio-do-rio	Rusty-backed Spinetail
Tityridae		
<i>Tityra semifasciata</i>	anambé-branco-de-máscara-negra	Masked Tityra
Cotingidae		
<i>Gymnoderus foetidus</i>	anambé-pombo	Bare-necked Fruitcrow
Tyrannidae		
<i>Myiopagis gaimardii</i>	maria-pechim	Forest Elaenia
<i>Attila bolivianus</i>	bate-pára	Dull-capped Attila
<i>Legatus leucophaeus</i>	bem-te-vi-pirata	Piratic Flycatcher
<i>Myiarchus ferrox</i>	maria-cavaleira	Short-crested Flycatcher
<i>Pitangus sulphuratus</i>	bem-te-vi	Great Kiskadee

Continua

Continuação

<i>Philohydor lictor</i>	bentevizinho-do-brejo	Lesser Kiskadee
<i>Myiodynastes maculatus</i>	bem-te-vi-rajado	Streaked Flycatcher
<i>Megarynchus pitangua</i>	neinei	Boat-billed Flycatcher
<i>Myiozetetes similis</i>	bentevizinho-de-penacho-vermelho	Social Flycatcher
<i>Tyrannus melancholicus</i>	suiriri	Tropical Kingbird
<i>Tyrannus savana</i>	tesourinha	Fork-tailed Flycatcher
<i>Arundinicola leucocephala</i>	freirinha	White-headed Marsh Tyrant
Hirundinidae		
<i>Stelgidopteryx ruficollis</i>	andorinha-serradora	Southern Rough-winged Swallow
<i>Progne subis</i>	andorinha-azul	Purple Martin
<i>Tachycineta albiventer</i>	andorinha-do-rio	White-winged Swallow
<i>Riparia riparia</i>	andorinha-do-barranco	Bank Swallow
<i>Hirundo rustica</i>	andorinha-de-bando	Barn Swallow
Troglodytidae		
<i>Campylorhynchus turdinus</i>	catatau	Thrush-like Wren
<i>Cantorchilus leucotis</i>	garrinchão-de-barriga-vermelha	Buff-breasted Wren
Donacobiidae		
<i>Donacobius atricapilla</i>	japacanim	Black-capped Donacobius
Thraupidae		
<i>Tangara mexicana</i>	saíra-de-bando	Turquoise Tanager
<i>Paroaria gularis</i>	cardeal-da-amazônia, cardeal-de-cabeça-vermelha or tangará	Red-capped Cardinal
Emberizidae		
<i>Ammodramus aurifrons</i>	cigarrinha-do-campo	Yellow-browed Sparrow
<i>Sicalis columbiana</i>	canário-do-amazonas	Orange-fronted Yellow-Finch
<i>Sporophila americana</i>	coleiro-do-norte	Wing-barred Seedeater
<i>Sporophila lineola</i>	bigodinho	Lined Seedeater
<i>Sporophila castaneiventris</i>	caboclinho-de-peito-castanho	Chestnut-bellied Seedeater
Icteridae		
<i>Psarocolius angustifrons</i>	japu-pardo	Russet-backed Oropendola
<i>Psarocolius decumanus</i>	japu	Crested Oropendola
<i>Cacicus cela</i>	Xexéu or japiim	Yellow-rumped Cacique
<i>Chrysomus icterocephalus</i>	irataúá-pequeno or tangará-de-cabeça-amarela	Yellow-hooded Blackbird
<i>Molothrus oryzivorus</i>	iraúna-grande	Giant Cowbird

Continua

Continuação

<i>Sturnella militaris</i>	polícia-inglesa-do-norte	Red-breasted Blackbird
Fringillidae		
<i>Euphonia chlorotica</i>	fim-fim	Purple-throated Euphonia
Number of orders	22	
Number of families	49	
Number of species	134	

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REPERCUSSIONS OF THE 2010 EXTREME DROUGHT ON ECOTOURISM MANAGEMENT
AT THE MAMIRAUÁ SDR.

REPERCUSSÕES DA SECA EXTREMA DE 2010 NO MANEJO DA ATIVIDADE DE
ECOTURISMO DA RDS MAMIRAUÁ.

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KEY WORDS:

Ecotourism;
Sustainable Tourism;
Amazon;
Uakari Floating Lodge;
Mamirauá Sustainable Development Reserve.

ABSTRACT

The environmental seasonality in the Mamirauá Sustainable Development Reserve (MSDR) gives ecotourism management unique characteristics, both in terms of the availability of ecotourism attractions as well as logistical, operational and economic challenges. The extreme drought in 2010 exemplified an unusual effect on ecotourism activity in the MSDR. In this study, the repercussions of this natural event on ecotourism management were investigated through an analysis of operational costs, visitor satisfaction levels, density of primates on the trails and visitor numbers to the Reserve. The results suggest that, among the indicators evaluated, fuel and some visitor satisfaction items were more sensitive to the rigor of the 2010 drought. Furthermore, there are indications that the event has contributed to the decline in visitor numbers compared to previous droughts.

PALAVRAS-CHAVE:

Ecoturismo;
Turismo Sustentável;
Amazônia;
Pousada Flutuante Uacari;
Reserva de Desenvolvimento Sustentável Mamirauá.

RESUMO

A sazonalidade do ambiente na Reserva de Desenvolvimento Sustentável Mamirauá (RDSM) imprime características singulares ao manejo do ecoturismo, tanto em termos da disponibilidade de atrativos ecoturísticos quanto com relação aos desafios logísticos, operacionais e econômicos da atividade. A seca extrema de 2010 representou um fato atípico para a atividade de ecoturismo na RDSM. Neste trabalho foram investigadas as repercussões deste evento natural no manejo da atividade por meio da análise dos custos operacionais, dos índices de satisfação do visitante, do índice densidade de primatas nas trilhas e da demanda de visitantes à Reserva. Os resultados sugerem que dentre os indicadores avaliados, o combustível e alguns itens de satisfação de visitantes se mostraram mais sensíveis à rigorosidade da seca de 2010. Ademais, há indícios de que o evento tenha influenciado no declínio do número de visitantes em comparação a secas anteriores.

INTRODUCTION

Tourism is particularly sensitive to extreme natural events (CIOCCIO; MICHAEL, 2007), in that such incidents can directly impact an activity with different intensities, both with respect to supply (destination) and to demand (visitor). In the specific case of ecotourism, developed mostly by small enterprises and in remote natural areas, vulnerability to events of this nature can be greater and can even hurt the viability of the venture.

When the Mamirauá Sustainable Development Reserve (MSDR) was being developed, and still operating as the Mamirauá Ecological Station in 1990, researchers and academics, along with the local population, proposed the implementation of management activities that would combine the conservation of natural resources with improving the lives of the local population. One of the strategies adopted was the encouragement of community-based ecotourism, which aims to promote the conservation of natural resources while improving the quality of life for the local population (PERALTA, 2008). The municipality of Tefé, which is about 550 km from the capital of the state of Amazonas, is the gateway for ecotourists who visit the Uakari Floating Lodge, a community-based ecotourism enterprise located in the MSDR, near the confluence of the Japurá and Solimões rivers. Currently, eight communities participate in the planning, management and offering of tourism services.

For visitors traveling to Mamirauá Reserve, the main motivating factors for travel are: a) easy observation of Amazon fauna; b) becoming acquainted with the ways of life of local populations; c) learning about the research and conservation efforts carried out in the Reserve and d) visiting a more remote

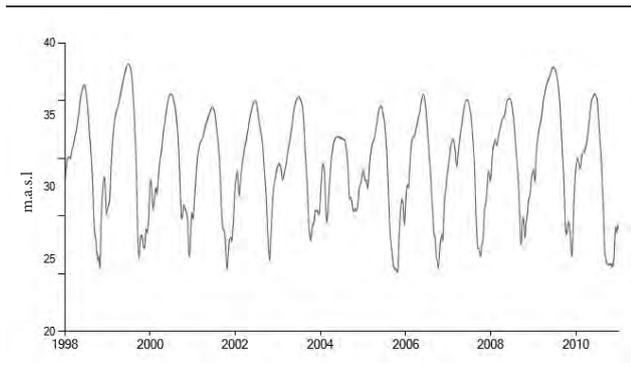
and preserved area of the Amazon biome, far from the traditional tourist circuits (OZORIO et al., 2012).

The activities developed in the ecotourism packages include: motorized canoe tours, paddle canoe tours in flooded forest areas, trail tours, traditional fishing (optional), overnight stays in a little bush house, night tours, visits to local communities, meetings with researchers and lectures about the Mamirauá Institute.

Variation in water levels is an inherent characteristic of the Middle Solimões region. The abundance and seasonality of rainfall in the Andean region causes an annual, regular and monomodal fluctuation in the water level of the Amazon River, with amplitudes that exceed 13 metres (RAMALHO et al., 2009). This variation gives the region unique scenic characteristics and unusual wildlife-watching opportunities. At the same time, ecotourism tours are influenced by this environmental seasonality and the nature of the activities varies depending on the water level. In the drought period, ecotourists visit the trails to observe the flora and fauna, while during the flood period, the flooded forest is visited by paddle canoe (OZORIO et al., 2012).

This variation in water level can increase the challenges of ecotourism management in the MSDR, both from an economic and operational point of view, affecting the enterprise and the nearby urban centres, both of which impact the success of ecotourism activities. In 2010, the second lowest level of flooding (24.49 M.a.s.¹) was recorded in the MSDR since the start of fluviometric monitoring (MISD, 2011) (Figure 1)

¹ Mestres above sea level



(Source: Mamirauá Institute for Sustainable Development, 2012)

Figure 1 - Water levels in the MSDR between 1998 and 2010

A sharp decline in the water level, as seen in 2010, can hamper or lessen the quality of the activities developed for ecotourists, which in turn can negatively impact their evaluation of their experience during the visit. An example of this is related to activities aimed at observing wildlife, which is the principle element of ecotourism in the Sustainable Development Reserve.

Mamirauá is the ideal place for observing fauna, including “charismatic” species like the white uakari monkey, the black caiman, the *pirarucu* fish and the pink river dolphin, located in remote, breathtaking landscapes in the Amazon (PERALTA, 2002). If the extreme variation in water levels adversely affects wildlife sightings, the visitor may perceive the ecotourism experience as one of lesser quality. Thus, this study aims to evaluate the negative impact of the 2010 drought on ecotourism management in the MSDR, in order to measure the susceptibility of the activity to extreme natural events, and thereby generate support to outline strategies to minimize the impact in case such events happen more frequently.

MATERIAL AND METHODS

The first step in the methodology adopted for this study was the selection of indicators that would allow for the assessment of the possible impacts of the 2010 drought on ecotourism management in the MSDR. To achieve this, the following indicators were chosen: operational costs of the activity, visitor satisfaction ratings, density of a primate species [black-headed squirrel monkey (*Saimiri vanzolinii*)], visitor influx and tour package cancellations. All indicators refer to the drought period, which occurs between September and December, in the Middle Solimões region. Table 1 gathers the chosen indicators with their respective units of measurement, their period of analysis, as well as the time frame chosen for each one.

In the indicators related to operational costs, the amount spent on each item was divided by the number of visitors for the period². The percentage difference between years was measured, as well as the year over year percentage change. A similar methodology was applied to the visitor satisfaction rating and to visitor influx. Regarding primate density on the trails, the black-headed squirrel monkey (*S. vanzolinii*) was used as an indicator because it is a species with restricted distribution (AYRES, 1985; PAIM, 2008), vulnerable to extinction (PAIM, 2008; SILVA JR.; QUEIROZ, 2008; PAIM; QUEIROZ, 2009; IUCN, 2010), and considered one of the important ecotourism attractions in the MSDR due to its endemism. The species densities were calculated using the Distance 6.0 program. Subsequently, the percentage change of the densities over the years was measured.

² For comparison purposes, since it is about variable costs - which vary according to the number of visitors.

Table 1: Summary of the indicators analyzed.

Indicators		Possible impact on ecotourism management	Calculation	Period analyzed (month)	Time frame
Operational costs	Fuel	An extreme drought can increase operational costs and jeopardize the enterprise	R\$/No. of visitors	Sept to Dec	2006 to 2010
	Food		R\$/No. of visitors	Sept to Dec	2006 to 2010
	Services provided		R\$/No. of visitors	Sept to Dec	2006 to 2010
Visitor satisfaction	Transfers	An extreme drought can have a negative influence on the evaluation of an experience by an ecotourist	Rating from 0 to 5 ¹	Jul to Dec	2006 to 2010
	Wildlife viewing		Rating from 0 to 5	Jul to Dec	2006 to 2010
	Tours		Rating from 0 to 5	Jul to Dec	2006 to 2010
	Overall evaluation of the visit		Rating from 0 to 5	Jul to Dec	2006 to 2010
Primate density	<i>Saimiri vanzolinii</i>	An extreme drought can lessen primate ² sightings	Animals/km ²	Sept to Dec	2007 to 2010
Tourist numbers	Visitor influx	An extreme drought can lessen visitor influx to the enterprise	No. of people	Sept to Dec	2006 to 2010
	Tourist package cancellations		No. of cancellations	Sept to Dec	2009 and 2010 ³

¹ Where 0=very bad; 1=bad; 2=normal, 3= good, 4=very good and 5= excellent.

² An important ecotourism attraction in the MSDR

³ There is no data available for prior years.

RESULTS AND DISCUSSION

The analysis of operational costs indicates that all three cost components increased in the 2010 drought season (Table 2). However, when analyzing the year over year percentage change, a clear difference was identified for the fuel item (Table 3).

The purchase of fuel for Uakari Lodge is made through a bidding process and the contracted price in 2010 did not change due to the drought. However, there was a substantial increment in

fuel consumption because the venture's supply logistics became more complex during this period of extreme drought. Distances were greater at the peak of the drought and many spots became inaccessible, resulting in a substantial part of the supplies (such as food, fuel, etc.) being transported using the Lodge's own vessels, since the boats that normally support this effort were not able to reach their final destination.

However, it cannot be ruled out that the increase in fuel consumption could also have been related to inefficient operations.

Table 2 - Annual percentage difference of the indicators used to evaluate the impacts of the drought.

Indicators		2006	2007	2008	2009	2010
Operational costs	Fuel	169	149(-12%)	133 (-10%)	126(-5%)	195 (55%)
	Food	155	124 (-20%)	174 (41%)	218 (25%)	266 (22%)
	Services provided	108	150 (39%)	132 (-12%)	143 (8%)	170 (19%)
	Total	432	423 (-2%)	439 (4%)	487 (11%)	631 (30%)
NCPI ¹		3.14 %	4.46 %	5.90 %	4.31 %	5.91 %
Visitor satisfaction	Transfer	4.27	4.29(1%)	4.58 (7%)	4.38 (-4%)	3.96 (-9%)
	Wildlife viewing	4.36	4.46 (2%)	4.38 (-2%)	4.39 (0%)	4.20 (-4%)
	Activities	4.31	4.52 (5%)	4.38 (-3%)	4.39 (0%)	4.28 (-2%)
	Trail tours	4.20	4.32 (3%)	4.17 (-3%)	4.17 (0%)	4.10 (-2%)
	Canoe tours	4.51	4.52 (0%)	4.52 (0%)	4.63 (2%)	4.28 (-8%)
	Overall evaluation	4.50	4.69 (4%)	4.54 (-3%)	4.54 (0%)	4.36 (-4%)
Primate density	<i>Saimiri vanzolinii</i>	-	21.199	21.996 (4%)	16.40 (-25%)	28.678 (75%)
Tourist numbers	Visitor influx	184 ²	261 (42%)	233 (-11%)	227 (-3%)	178 (-22%)
	Cancellations	N.A.	N.A.	N.A.	8	48
Value USD/R\$ Average (2nd semester) ³		2.06	1.71	1.90	1.74	1.66

¹ NCPI - National Consumer Price Index (IBGE - Brazilian Institute of Geography and Statistics).

² 2006 was an atypical year, due to the closure of the Tefé airport. This episode led to a considerable decline in visitors for that year.

³ www.oanda.com

Table 3 - Percentage change between periods.

Indicators		Percentage change (in %)		
		From 2006/2007 to 2007/2008	From 2007/2008 to 2008/2009	From 2008/2009 to 2009/2010
Operational costs	Fuel	2	5	60
	Food	61	-16	-3
	Services provided	-51	20	11
	Total	6	7	19
Visitor satisfaction	Transfers	6	-11	-5
	Wildlife viewing	4	2	-4
	Activities	-8	3	-2
	Trail tours	-6	3	-2
	Canoe tours	0	2	-10
	Overall evaluation	-7	3	-4
Tourist numbers	Influx	-53	8	-19

The value fluctuations registered for food expenditure and services provided can be the result of other factors, such as inflation, management problems and changes in the venture's operational model.

The supply logistics for perishable and non-perishable items in Uakari Lodge can also be affected by the drought. Among the perishable items, only fish and some fruit are produced in Tefé. Foods like chicken and some greens and vegetables are transported by boat from Manaus to Tefé. During the drought period, however, the supply of fish increases, consequently decreasing the price. Therefore, even considering that items coming from Manaus increase in price, one of the major contributors to food expense – fish - balance out this variation.

Non-perishable items are less susceptible to price variation because most of them are stored by local suppliers. However, it is important to point out that, if drought events become more frequent, and especially, long lasting, these items can be obtained the same way as those that cannot be stored in large quantities.

Regarding values for services provided, normally changes are not observed during these climatic events. However, it may be necessary to contract additional service providers, depending on the demand for the transportation of supplies, such as fuel and food, as well as other tourist needs.

With respect to visitor satisfaction ratings, a decline was recorded in all of the ratings analyzed (Figure 2).

The impact of the drought was most noticeable for the "canoe tours" and "wildlife observation" items (Table 3).

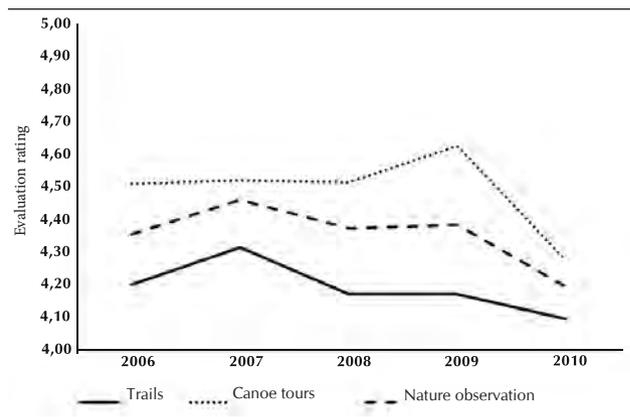


Figure 2 - Visitor satisfaction in the 2nd semester from 2006 to 2010.

Canoeing activities were restricted to a few areas in the ecotourism zone during the drought period since access to the commonly used canals was blocked. This shortened the tours, and also reduced the variety of the areas visited.

The drought caused restricted access to Mamirauá Lake for one month, which contributed to the drop in the item 'wildlife viewing'. This item was impacted because Mamirauá Lake is one of the principle ecotourism attractions in the Reserve due to the abundance of caiman, fish and birds associated with aquatic environments. Moreover, during periods of drought, primates and sloths are also easily observed on the lakeshore.

Although the analysis shows no significant result for the transfer item, it is known that the impact existed since investments in boat upgrades had been made in the first half of 2010. Therefore, it can be confirmed that the negative variation found was due to the drought (and not to factors related to vessel quality). The low water levels strongly limited access to the ecotourism area, where the route Tefé-Lodge-Tefé which under normal conditions lasts 1 hour and 30 minutes, lasted on

average around two and a half hours. In addition, visitors needed to leave the vessel and walk for about 20 minutes on a makeshift trail.

Regarding the densities observed for the primate *S. vanzolinii*, a significant increase was noted for these on the ecotourism trails. The results showed larger values for the species in the drought of 2010, indicating that the severe drought did not affect their detection (Figure 3).

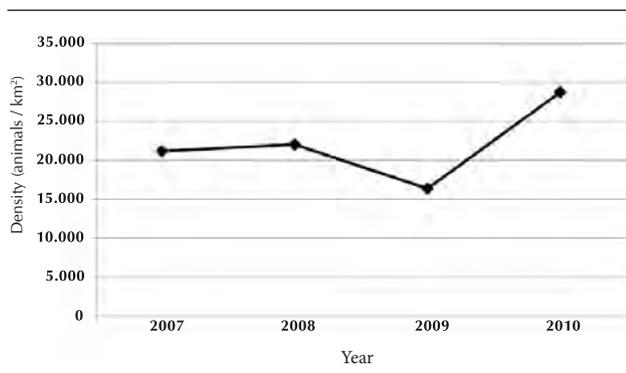


Figure 3 - Density of *Samiri vanzolinii* (Animals/km²) on ecotourism trails.

The densities of mammals, such as primates, may be influenced by a number of variables, both biotic and abiotic; however, these were not measured. It is possible that the extreme drought had affected the availability of resources in the study area for these primates, making groups more cohesive and consequently increasing the probability of individuals being detected.

In regards to tourist numbers over this period, it was not possible to analyze the variation because this aspect was heavily influenced by other external factors. The results show strong oscillations in the flow of tourists between all the years analyzed. This was due to the fact that the enterprise was going through a process of re-entering the market due to the closure of the airport in the city of Tefé

in 2006 and at the beginning of 2007. The low performance recorded for 2010 can also be related to an unfavourable environment for international tourism due to the overvaluation of the Real (see exchange in Table 2), and the global economic scenario that was already shaken by the beginning of the crisis in the Eurozone (JANÉR, 2011).

When analyzing the number of tour package cancellations - significantly higher when compared to 2009 - it can be inferred that the drought of 2010 contributed to this decline. Most of the cancellations were made by operators who had pre-reservations for the period. Thus, it is likely that the severe drought (well publicized by the media) discouraged travel agents from selling destinations located in more remote areas of the Amazon (like the Middle Solimões).

FINAL CONSIDERATIONS

The analysis suggests that the evaluated indicators were impacted in different ways by the extreme drought of 2010. With respect to operational costs, the incremental increase in fuel expense was evident while not affirmed for other items. The visitor satisfaction indicator showed more striking impacts on the items of wildlifeviewing, canoe tours and transfer service.

Regarding the primate density of *S. vanzolinii* on the ecotourism trails, the analyses do not indicate that the extreme drought of 2010 hampered the presence of squirrel monkeys.

Data also suggest that the 2010 drought may have contributed to some extent to the drop in visitor influx in the Reserve, possibly due to some tour operators feeling insecure about selling the destination. This is explained by the unusual number of tour package cancellations, precisely during the period of the extreme drought in 2010.

It can be affirmed that the isolation factor of Mamirauá consists of both a unique aspect in the ecotourism market (as it is one of the trip motivators for ecotourists) and a challenge with regards to the management of extreme events, such as the drought of 2010.

Therefore, the management team of the enterprise should be aware of the challenges inherent in events of this nature and outline in advance strategies that will minimize the economic and financial impacts which result from these events.

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ECOTOURISM AS AN INCENTIVE TO BIODIVERSITY CONSERVATION:
THE CASE OF UAKARI LODGE, AMAZONAS, BRAZIL.
ECOTURISMO COMO INCENTIVO À CONSERVAÇÃO DA BIODIVERSIDADE:
O CASO DA POUSADA UACARI, AMAZONAS, BRASIL.

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KEY WORDS:

Ecotourism;
Conservation;
Mamirauá Reserve;
Economic incentives.

ABSTRACT

By providing economic incentives to locals who live in protected areas, ecotourism has been seen as a strategy toward conservation of biodiversity. This paper provides a long-term case-study account of the attempts to associate generation of income and conservation goals in an ecotourism enterprise in a sustainable development reserve in the Brazilian Amazon. It investigates how ecotourism represented a motivation for the conservation of the Mamirauá Lake system. Using qualitative and quantitative data, the paper shows a linkage between tourism and the preservation of the lake. In the first years of its implementation tourism provided an incentive to stop *external* threats. But in relation to internal disputes, this linkage has proved to result in ambiguous outcomes. On one hand it has been a motivation for those who benefited from tourism to try and maintain the protection status of a lake which they saw as important for tourism. On the other hand, it has been the justification of those who wanted to change total protection status of the area.

PALAVRAS-CHAVE:

Ecoturismo;
Conservação;
Reserva Mamirauá;
Incentivos econômicos.

RESUMO

O ecoturismo tem sido visto como uma estratégia de conservação da biodiversidade por gerar incentivos econômicos. Neste trabalho investigamos por meio de um estudo de caso, as tentativas de associar geração de renda e conservação em um empreendimento de ecoturismo em uma RDS na Amazônia brasileira. Usando dados qualitativos e quantitativos, o artigo mostra uma associação entre turismo e a preservação do sistema de Lagos Mamirauá. Nos primeiros anos de sua implementação, o turismo foi um incentivo aos esforços locais contra ameaças de agentes externos. Com relação às disputas internas, a associação entre turismo e preservação teve resultados ambíguos. Por um lado foi uma motivação para aqueles que se beneficiaram com turismo a manter o status de proteção total do lago, que viam como importante para a manutenção da atividade. Por outro lado, a associação foi uma das justificativas para a mudança de categoria do lago por parte daqueles que não se consideravam beneficiados com o turismo.

INTRODUCTION

“Would it be better to have distributed this amount of money among local families?” This question was proposed by a consultant hired by an international aid agency¹ to evaluate its investments in an integrated conservation and development project (ICDP) in the Amazon: the Uakari Lodge. Although the question was posed ten years ago, in other terms it remains valid. Market-oriented mechanisms, such as ecotourism, work as incentive for locals to invest in biodiversity conservation? It was not a new dilemma for conservation professionals.

During the 1990's conservation strategies were focused on projects that integrated conservation and development. This was due to a shift in conservation paradigms that had, prior to that, tried to establish protected areas devoid of human presence (BARRETO FILHO, 2002). These had high social costs, dislocating human populations the world over, without significant results in terms of its conservation goals (HUTTON; ADAMS, MUROMBEDZI, 2005, WEST et al., 2006). Besides, most of the opportunity costs of the establishment of protected areas were bore by local peoples (GOSSLING, 1999). During those times there was ample acceptance of the need to include local people in the conservation equation - as the International Union for Conservation of Nature (IUCN) president had argued in 1992: “if local people do not support protected areas, then protected areas cannot last” (ADAMS et al. 2004). Tourism was one strategy in conservation and development projects: in 2002 the UN Environment Programme invested US\$ 7 billion in 320 tourism-related projects with 21 development agencies (ZEPPEL, 2006). More recently, however, critics

have portrayed conservation and development projects in general as under-achieving (KISS, 2004; CHAPIN, 2004), and have thus reenacted the old “parks *versus* sustainable use” debate.

Some have suggested that most of these projects were based in a flawed assumption that some financial investment and planning would be sufficient to promote good results in terms of poverty alleviation and conservation (MCSHANE ; WELLS, 2004). Others suggested their failures were due to the control of such projects in the hands of conservation professionals, who were not, allegedly, willing to establish a lasting and effective partnership with local communities (CHAPIN, 2004). One of the problems described in literature is that reviews of ICDPs fail to provide long-term accounts of their results and rush into conclusions that may prove to be, later, mistaken (BARAL; STERN; HEINEN, 2007). In addition to that, failure or success of these projects sometimes may not be measured in absolute terms, especially in regard to social contexts, which are dynamic and social attitudes, which are not homogenous among all people involved.

This paper provides a long-term account of the attempts to associate development and conservation goals in an ecotourism enterprise in a sustainable development reserve in the Brazilian Amazon. It investigates how ecotourism represented a motivation for the conservation of the area where it was implemented. The paper is divided into three sections: the first one reviews literature dedicated to the theme of the association between ecotourism and conservation and describes hypotheses that may explain the conditions under which these associations prevail. The second portion of the paper describes the social, political, and economic settings where the enterprise was implemented; the third section

¹ Department for International Development (DFID)

provides qualitative data that suggests different attitudes toward conservation within a determined timeframe and presents provisional conclusions on the theme.

ECOTOURISM: POVERTY ALLEVIATION AND BIODIVERSITY

Ecotourism is a fast growing segment of the tourism industry (IES 2008) that has been advocated as a market tool for conservation (GOSSLING, 1999; STRONZA, 2007). Definitions abound, but most of them emphasize three main elements that should be considered fundamental to all ecotourism enterprises: i) natural areas as destinations; ii) promotion of biodiversity conservation in those areas, and iii) socioeconomic benefits to local peoples (IES, 1994; BOO, 1992; HOONEY, 1999; KISS, 2004). Ecotourism practitioners expect correlations between generation of socioeconomic benefits to local populations and endorsement of conservation strategies in those natural areas where the projects are developed (Figure 1).

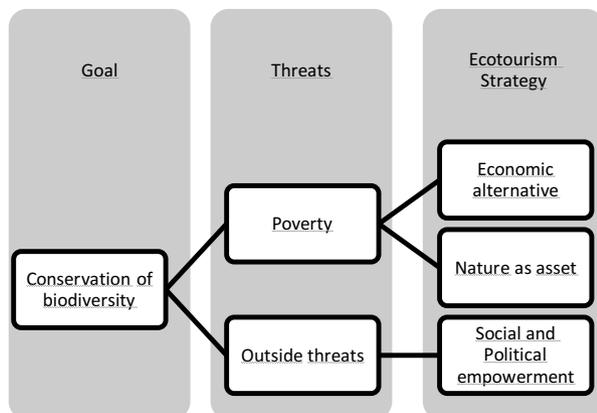


Figure 1 - Ecotourism as a strategy to counteract threats to biodiversity.

Integrated Conservation and Development Projects (ICDPs) main underlying assumption is that economic incentives are essential for nature conservation (WUNDER, 2000). ICDPs projects such as ecotourism are associated to the idea of sustainable development insofar as they are based in a premise that biodiversity degradation is closely related to poverty (AGRAWAL; REDFORD, 2006). Extreme poverty and biodiversity hot spots are coincident, concentrated in rural areas where livelihoods depend on natural capital (BARRET et al. 2011). Since it is believed poor people have no other alternative but to contribute to environmental degradation (BRUNDTLAND, 1987), ecotourism would be an alternative income and would work as an incentive toward biodiversity conservation not only because it relies on natural areas and their “watchable” species as its main asset base, but also because reduced poverty may allow local people to adopt a more long-term vision (WUNDER, 2000). When local communities benefit directly from biodiversity, they presumably have an incentive to stop external threats to it (BOOKBINDER; OSTROM; YOUNG, 1998). In addition to that ecotourism would help strengthen local efforts against outside threats to biodiversity by building skills and political empowerment of local communities (STRONZA; GORDILLO, 2008).

Some studies have not corroborated the hypotheses that with high economic benefits ecotourism would provide incentive to conservation (SALASFYK et al. 2001, STRONZA, 2007). Other variables, such as the distribution of benefits and synergies with other economic activities, also count (WILKINSON; PRATIWI, 1995; PERALTA, 2005). In fact, when economic benefits are high, but access opportunities are not evenly distributed, ecotourism may in fact exacerbate existing

resource conflicts due to a perception that costs of protection are bore collectively and its benefits individually. When this is the case, no matter how high economic benefits may be, it will not provide the expected linkage with conservation of the area. Some studies have shown that new income may indeed accelerate resource extraction by enabling local residents to purchase more labour and technology (BARRETT et al., 2001; FERRARO, 2001).

Besides that, results of ecotourism enterprises are difficult to be measured not only because most projects lack baseline data, but also because both biodiversity and poverty are multidimensional concepts that are difficult to be calculated. For one, biodiversity entails different components (genes, species, and ecosystems) and attributes (composition, structure, and function) (AGRAWAL ; REDFORD, 2006). Poverty, on its turn, is a concept that involves not only economic aspects, but also political and social ones, and is always culturally-sensitive. For Amartya Sen (2000), the utility of wealth is related to what type of personal goals it allows one to achieve – or how it enhances one’s capabilities to lead the type of life they have reason to value. Therefore, according to this perspective, income is an inadequate measure of development, and its sole use will only tell half of the tale.

Other problem faced by analysts is the difficulty in establishing causal mechanisms between ecotourism enterprises and conservation outcomes. Since both aspects may be interrelated to a variety of other variables, rather than that of ecotourism itself. Thus, although some association between income generation and conservation may exist, because it is indirect, showing it becomes a difficult task.

But a few studies have accomplished to deliver a causal analysis. Salasfky et al. (2001) for example, conducted analysis on the conditions under which an enterprise strategy would lead to conservation. Their findings showed a weak association between enterprise success and conservation success, but a strong association between local involvement (through management and ownership) in the enterprise and conservation success. Baral; Sternand; Heinen (2007) showed, after a ten year timeframe analysis, that ICDPs did promote shifts from institutional and economic development *foci* toward more conservation activities. They also argued that failure to devolve real power leads to diminishing participation as members lose interest. Coria and Calfucura (2012) have argued that success of ecotourism is dependent on three main factors: i) distribution of benefits, ii) community control over land and resources, and iii) power relations between stakeholders.

Besides that, other factors like human and social capital are fundamental in determining failure or success of these ventures. Lack of skills and experience in ecotourism planning, business and financial management, marketing, and the fact that partners (NGOs and businesses) take on these tasks, prevents the formation of human capital within communities (ZEPPEL, 2006). These paternalist roles played by stakeholders in development and management of ecotourism do not contribute to the long-term empowerment of local people or the autonomy of the enterprises (CORIA; CALFUCURA, 2012).

Social capital is also an important asset of communities that successfully develop ecotourism enterprises (STRONZA; GORDILLO, 2008). According to Putnam (1993) social capital may be understood as the set of networks, reciprocity

and trust that are present among members of a group (bonding) and between social groups (bridging). Social capital has a positive correlation to conservation governance (BRONDIZIO; OSTRON; YOUNG, 2009; FOLKE et al., 2005) because it allows group members to overcome collective action dilemmas (HARDIN, 1968; OLSON, 1999), which could otherwise prevent cooperation toward common goals. Aside from economic changes, ecotourism may also trigger other social effects that may either enhance or erode social capital – like new opportunities to network with outside peoples and organizations (STRONZA; GORDILLO, 2008) or social conflicts over distribution of resources. In order to counter internal and external threats to biodiversity, however, communities must have some social cohesion and strong leadership (both social and human capital). If ecotourism is to be a positive influence on these factors, community should guide its development from the feasibility stage through to its implementation (SCHEYVENS, 1999).

Lee (2012) conducted a study that aimed to assess the support of community residents for sustainable tourism development. His findings showed that increased involvement in decision-making processes and perceived benefits of tourism are fundamental to attain local support. For Stronza (2007) perceived benefits are more important than actual economic benefits, since her research showed willingness to be involved in ecotourism work, despite relatively minimal economic return. For Salasfky et al. (2001) non-cash benefits were also important to promote trust and cooperation between key stakeholders.

According to these studies, the conditions that allow association between ecotourism development and

conservation are not strictly economic, but include other aspects such as social capital, distribution of benefits, and local empowerment. What is important to note is that the perceived benefits of ecotourism development by local residents is key to the promotion of this association.

UAKARI LODGE: COMMUNITY-BASED ECOTOURISM DEVELOPMENT

Mamirauá Reserve: antecedents

The *Uakari* Lodge is an ecotourism enterprise located in the Mamirauá Reserve in the middle Solimões in Brazil, near Tefé, a town around 500 km away from the capital of the Amazonas state, Manaus. A population of about 9700 people, distributed in 181 communities, inhabits the area (MOURA et al., 2012). Communities are usually formed by households related by kinship. These settlements are politically grouped in *setores*, or sectors, that is, a set of communities located geographically near each other, which are politically involved and take collective decisions about the use of common resources. Communities must engage in sector activities such as participation of meetings and assemblies, and vigilance of their territory and resources. The whole of the Reserve is divided into 17 sectors.

The creation of the Mamirauá Reserve in 1990 was the result of an association between leaders of a popular social movement (called Preservation Movement) and a group of researchers who, during the eighties, combined efforts toward the common goal of protecting the area from commercial predatory fishing and logging (REIS, 2005; PERALTA, 2002). The Preservation Movement was first promoted by the local Catholic Church, which had in the previous decade, been involved in organizing locals in

politically independent communities. Prior to that, people were dependent on a debt-bondage system of patronage locally known as *aviamento* (LIMA-AYRES, 1992). When rural commerce declined and patrons moved to urban towns, settlements were scattered along rivers and channels. During the seventies, due to a rise in productivity of the fisheries industry and decline of stocks near urban cities, like Manaus and Itacoatiara, large vessels navigated upriver to deplete stocks on which these communities' livelihoods depended on (DERICKX, 1992). With the support of local Catholic Church, these communities created a management system, which divided lakes in different categories – preservation, subsistence and free lakes. The first two types were to be protected by members of the communities from exploitation of outsiders; the latter was allocated to the commercial fishing sector. As the Movement lacked legal basis, all preservation efforts like the zoning system, apprehension of poachers' materials, etc. were challenged by local political elites (REIS, 2005; PERALTA, 2002). The partnership with researchers for the creation of the Reserve in 1990, gave the protection of the area an official, legal status. The challenge afterwards was to create a strategy that would enable local peoples to inhabit the area and use its resources sustainably. A Non-Governmental Organization (NGO) was created in 1992 to manage human and financial resources dedicated to the implementation of the protected area – Sociedade Civil Mamirauá (SCM)² – which was granted co-management of the area by the Amazonas State.

During the early nineties researchers and local leaders set out to elaborate and agree upon a zoning system and set of norms for the use of

natural resources. In 1996, they achieved this objective, publishing a management plan. The zoning system destined a core area as a totally protected zone, where human settlements and use of natural resources were prohibited. Surrounding this core area a sustainable use zone, where most of the settlements were located and economic productive activities could be carried out. The assignment of a protection zone with restrictions for productive use was regarded as a cost for local communities, which would bear economic losses resulting from the restrictions imposed by the management plan (SCM, 1996). Thus, a set of alternative income activities were also proposed in the management plan, among them, fisheries management, forest management and ecotourism.

Economic activities which will, concomitantly, diverge the demand pressure on natural resources locally threatened, or maintain it under control, and, complementarily, raise household income (...) preferably of those inhabitants most affected by the limitations of the norms of use of this management plan (SCM, 1996).

An ecotourism enterprise was planned to be developed in Mamirauá sector, within the totally protected zone near the Mamirauá Lake – an area subject to pressure from large fishing vessels that would extract tons of fish at a time.

Mamirauá sector: sociopolitical and economic settings

Communities are local settlements of people related by kin, with about 10 households in average. They have been established with the support of the local Catholic Church. They usually comprise some basic infrastructure such as a community

² In 1999 another institution was created and later qualified as a public utility by the federal government: the Mamirauá Institute for Sustainable Development.

center, a church and school. Political leaders are elected and responsible for representing community interests. Local inhabitants are subject to a communal order that supposedly makes them observe collective decisions regarding the use of natural resources (LIMA-AYRES, 1992). Thus, even when no formal sanctions are applied, violators suffer some social censure.

Two communities have participated more intensively in the preservation movement during the eighties and the creation of the reserve in the nineties: Boca do Mamirauá and Vila Alencar. The two communities, although related by kin, have a history of political disputes. Most current disputes also convey family quarrels that date back to their first fission in the eighties.

Households' livelihoods are dependent on natural resources, especially fisheries, timber and high lands for agriculture (LIMA, 1997). Most of them perform a combination of these economic activities, depending on the season. Production is destined both to consumption and to market exchange. Income generation comes from sale of produce (especially fish and manioc flour) salaries and government income-transfers programs. Aggregate data shows that household monetary incomes have improved in the past fifteen years (PERALTA et al., 2009), but they are

still low compared to other rural areas in Brazil. Education and health indicators suggest low standards of living. Only 58% of the population older than 10 years old is able to read (MOURA et al. 2012) and, although the situation has improved in the last 15 years, high infant mortality rates still prevail in the area (35‰) (IDSM, 2010).

At the beginning of ecotourism developments, Mamirauá sector had seven communities with about 70 people in average, and about 500 people in total (IDSM, 2001). Nowadays, there are eleven communities with a total of about 750 people (IDSM, 2011). There was a growth of about 50% in the total population

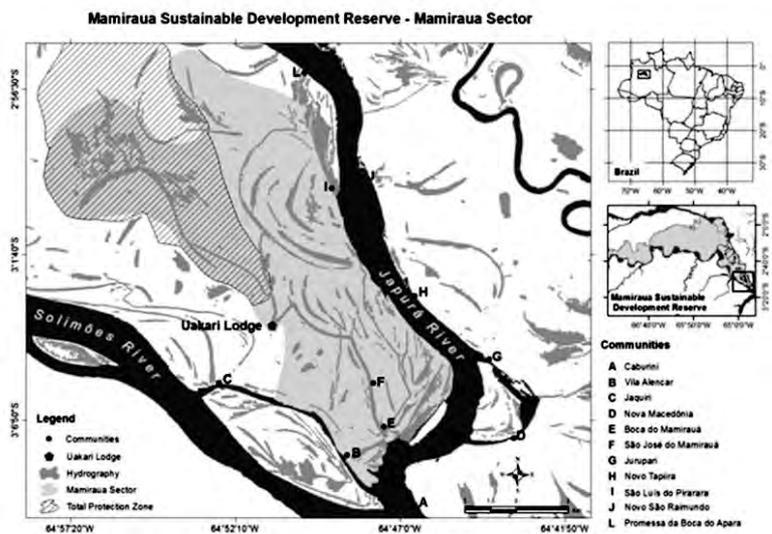


Figure 2 - Location of Mamirauá Sector Communities and Uakari Lodge.

of the area. These new settlements³ did not engage in the preservation movement as the ones previously mentioned and were not as involved with outreach activities developed by the Mamirauá Institute.

Uakari Lodge: tourism and conservation

Originally, it was thought that the ecotourism enterprise would be able to generate income and fund activities in the whole of

³ Sítio São José do Promessa, Jurupari, Novo São Raimundo.

the Reserve. After an economic feasibility study that proposed that an investment of US\$ 400,000.00, with maximum numbers at 1000 visitors, would generate an internal return rate of 16% in ten years, an international development agency - Department for International Development (DFID) - agreed to contribute to development funds as a catalyst for development of ecotourism. It was then realized that financial results of the enterprise would never be so bulky as to accomplish its first objectives, but would only be able to generate income to the seven communities in that sector. Nevertheless, the enterprise should provide support to the overall marketing and public relations of the Reserve and the NGO, thereby aid fundraising activities.

Enterprise was divided into three main phases: planning (1997-1999), development (1999-2002) and operation (2002 onwards). These were seen as cyclical, where monitoring of product and services in the operation stage also served as subsidies for further planning and new developments. A small group of three people within the NGO was responsible for ecotourism venture. Before development of the project, preliminary planning consultations took place with communities living in the Mamirauá sector. Although these consultations were very cautious not to raise false expectations (RIN, 1998), there was "some confusion over unrealistic expectations of job creation and the possibility of communities charging tourists for access to trails" (HARRISON; SHANKLAND, 1998). But local reactions were positive: communities contributed ideas for guiding, garden produce, and community visits. Local ecological knowledge was used to design infrastructure and product development. Albeit there was much community involvement, most of strategic planning and decision-making was carried

out by project staff. This was due to the belief that the Mamirauá sector communities needed further strengthening of its organization and leaderships to be able to participate effectively in the ecotourism development (HARRISON; SHANKLAND, 1998).

During the first two years the focus was on infrastructure and product development, training of and building on local skills, hosting spontaneous visitors and designing monitoring mechanisms. Besides that, continuous liaising with local communities was carried out in order to gain their support. Meetings were promoted between ecotourism staff and local communities in order to exchange results, challenges and prospects of the enterprise.

The initial development phase included hosting spontaneous visitors, so staff and local communities gained experience in running the operation (RIN, 1998; PERALTA, 2002). In addition to that, this experience proved to be fundamental to understanding market demands and designing a product which would attend to its expectations.

Some planned activities were not finalized during this stage. The organization management structure was not defined, some environmental permits were not attained and monitoring methods were not clear. In addition to that there was no clear definition regarding revenue-sharing until the end of 2002. As a report had put it, "asking the communities in Mamirauá sector to accept certain disruption now for uncertain rewards later is not likely to encourage strong local support for the ecotourism venture" (HARRISON; SHANKLAND, 1998, p. 27). Despite this uncertainty, enterprise development continued, albeit only two communities out of seven were actively engaged in the process of developing the initiative.

During this stage, only a few jobs were created and economic benefits were not too diffused. But community involvement was seen as key to the success of the venture, and most importantly, to providing linkage between ecotourism and conservation. The group sought to involve more communities (both in quantitative and qualitative terms) and the strategies were to offer more temporary jobs, buy more local products, promote tourist visits in local communities, and build on social capital by supporting local associations, as well as trying to create a sense of ownership of the venture. The result is that other two communities became more involved, and a total of four were actively engaged in the activity by the end of 2000, receiving the bulk of direct economic benefits and hosting visitors (Figure 3).

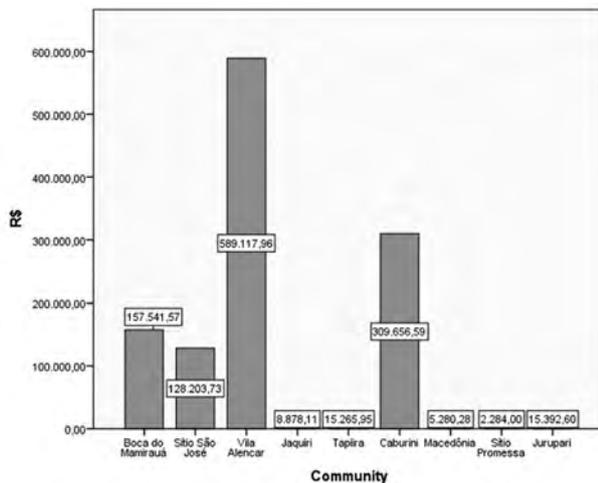


Figure 3 - Total income generated to local communities from tourism (1999-2011)

There was a common understanding that the more benefits were shared, more people would support not only the enterprise but adhere to the conservation goals of the project. Thus, more temporary jobs were created by developing a

rotation system where service providers would supply a group of guests at a time, and wait until all other service providers had a chance to work. But a problem ecotourism practitioners face is the fact that income from ecotourism is variable and dependent on external factors (such as foreign currency exchange rates, the ups and downs of a globalized economy, and the tourism infrastructure available). Thus, besides having the objective of distributing economic benefits, the rotation system was designed to prevent local dependency on tourism income, since it is a very unstable economic activity. The idea was to develop ecotourism as an alternative source of income that should not substitute more traditional activities such as agriculture and fishing.

It was clear though that locals lacked the professional skills needed to manage the lodge. There was a need to build on skills and capabilities. So a series of courses, training sessions and internships were designed to improve management and services. But more long-term training programmes could not be undertaken, mainly due to restrictions in terms of time available to staff, and the fact that these courses were not offered locally, but only in larger towns such as Manaus. Other problem was the lack of formal education of employees and temporary staff, which had in average four years of low-quality schooling. So although, there was success in developing skills in guiding tours, hotel housekeeping, and other services in general, locals still lack experience in marketing, product development and financial management. These have been provided by the institution that offered long-term technical assistance to the lodge.

In addition to that, other problems prevented the integration of more communities in the ecotourism enterprise – one of them was the lack of infrastructure for communication. Only three communities had means to establish contact with the Uakari Lodge via VHF radio (Boca do

Mamirauá, Vila Alencar, and Caburini ⁴), the others - located far from the lodge and with no radio communication system available - could not be contacted on a daily basis by lodge staff or the local association, and therefore were not able to provide services and goods to the lodge and did not receive much economic benefits from the tourism activity.

Over the years, most economic benefits coming from provision of goods and services were accessed by four communities (Figure 3). A Gini coefficient was used in order to provide a comparative measure of the degree of tourism income inequality among those people who had access to economic benefits. Low Gini coefficients indicate more equal distribution, while higher Gini coefficients indicate more unequal distribution (in a scale from 0 to 1). We considered income inequality between the population that had access to economic benefits from tourism over the years and compared inequality rates in different years. Our data has shown that in general the income is not concentrated in one part of the population, since the level of inequality is relatively low. Although we have to point out that Gini coefficients only consider that portion of the population which was able to access economic benefits and this varied over the years. The number of tourism beneficiaries in the sector ranged from 48 in 1999 to 120 in 2007 (see Table 2) in a population of about 380 adults. The most unequal distribution of benefits occurred in 1999 and 2003. A sharp drop in inequality occurred in 2004, year when a local person became responsible for the management of the lodge. After that, inequality rates ranged from 0,18 to 0,22 until rising to 0,28 in 2011.

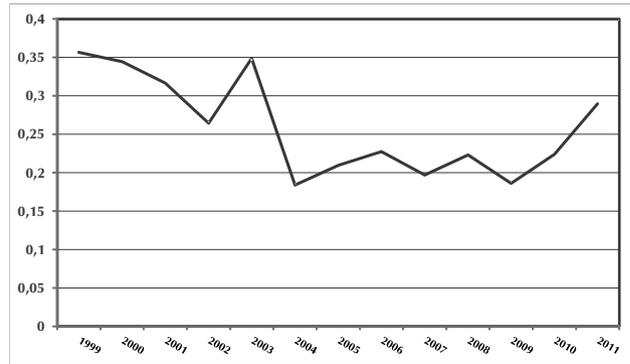


Figure 4 - Evolution of Gini coefficient indicating inequality in distribution of ecotourism income.

In order to involve more people in tourism and derive more support to the activity there was a need to clarify how other segments of local communities would also be involved and benefit. Economic transfers from the lodge to communities could be justified by different rationales: payments for compensation of disruption, royalties as payments for access to the area, or payments as profit shares, if communities were seen as proper investors (HARRISON; SHANKLAND, 1998). In 1999, in a general assembly involving all communities in the Reserve, representatives of the Mamirauá sector⁵ signaled which type of payments they wanted. They proposed an entry fee to be charged from both tourists and researchers entering the area, which should be reverted to its environmental protection and investments in local communities. The fee was not instituted, mainly because it was not accepted by SCM staff, which associated the idea to the lack of clarity regarding profits from the tourism venture (SCM Annual Assembly Report, 1999). But the proposal made two things clear – local leaders saw tourism as a source of funds for the protection of the area, and participation in

⁴ Sítio São José did not have a radio but was located in the way to the lodge, so it was possible to establish communication easily.

⁵ Environmental agents, sector coordinator, tourism employees.

decisions about community payments needed to be developed as soon as possible.

By 2001 an internal committee was created to discuss community payments. The NGO staff proposed a system of profit sharing following the rationale that communities were partners in the venture and should therefore share costs and benefits. Their initial idea was to establish a fund with 30% going for investment in communities' projects, 30% to environmental protection, 15% to environmental education, and 25% in further investment in the lodge. And only communities directly involved with tourism should benefit. After further discussions, the proposal finalized was 50% investments in the protection of the area and 50% investment on communities' projects. It was argued that environmental education should be an activity developed throughout the year and with other sources of funding. And an annual investment rate in the lodge's infrastructure should be put aside every year, before distributing benefits among communities. There was a common understanding that some of the Uakari lodge's main assets were the natural area and its abundance of resources, including charismatic species such as pink dolphins, primates and birds. Therefore, investments in the protection of the area would guarantee its sustainability in the long run. Besides that, those investments would also benefit communities, since they would represent protection of other important natural resources such as fisheries.

This proposal was presented to each one of the communities in Mamirauá Sector. Local leaders involved directly in the community-based protection system, were in favor of destining 50% of profit shares in the protection of the area. Since they were the most vocal and politically active leaders,

they helped to persuade those communities not in favor, which were not involved in the system, and, on the contrary, tended to transgress more frequently local management rules.

Communities also decided that they should share equally the remaining 50% of profits shares, which should be applied in projects that benefited the community collectively (Table 1). The Mamirauá Sector coordinator ⁶ suggested that the equal distribution of shares among the seven communities was a chance for those communities which did not collaborate with sector activities (vigilance, participation in sector meeting, etc.) to become more involved. He suggested that in the following year profits should be divided according to the level of community participation and level of compliance to local management rules (Ecotourism Program Report, 2002; PERALTA, 2005), and all communities agreed. The rules were relative to community participation in sector meetings, participation in environmental protection activities, respect to the norms of natural resource rules, and rules regarding ecotourism activities. A committee with one participant from each sector community was composed and responsible to evaluate communities' compliance to sector management rules.

The sector coordinator used this opportunity to assemble support from those communities which were not involved in organization at sector level. It was a means of strengthening the sector and drawing together other allies for the protection of the Mamirauá lake system. For leaders of communities least involved with the community-based protection system, profits coming from

⁶ A leader trained by the Catholic Church, who had been very active in the preservation movement and worked for the NGO and later for the Mamirauá Institute

Table 1 - Communities' decisions regarding Uakari Lodge's first profits shares in 2002.

Questions	Communities' answers
Who should decide about the destination of profits from the lodge?	Mamirauá Sector
How?	By the means of agreements among communities
Who should benefit from economic benefits?	All communities from the Mamirauá sector
How should economic benefits be divided?	In equal parts among communities
What would profits be invested in?	Local housing (Jaquiri);
	Construction of Community Centre (Boca do Mamirauá, Caburini, Nova Macedônia, Vila Alencar and Novo Tapiira);
	An engine to transport agricultural production (Sítio São José)

tourism served as justification for the protection of that area. As mentioned above, since local inhabitants are subject to a communal order that supposedly makes them observe collective decisions regarding the use of natural resources (LIMA-AYRES, 1992), the association between profits shares and the compliance to management rules, imposed new social censure to violators.

From 2002 onwards the lodge was fully operational, and marketing strategies started to be implemented. There was a 25% annual increase in arrivals from 2000 to 2005. But in the years 2006 and 2007 the local airport closed down, and this impacted operations. The gateway town to *Uakari Lodge* (Tefé) is not accessible by road, and many visitors would not use other transport options, like boat and speedboat, because they were too time

consuming. This resulted in a sharp decrease in guest numbers after 2005, which also impacted economic results over the years, and subsequently it hindered profit shares.

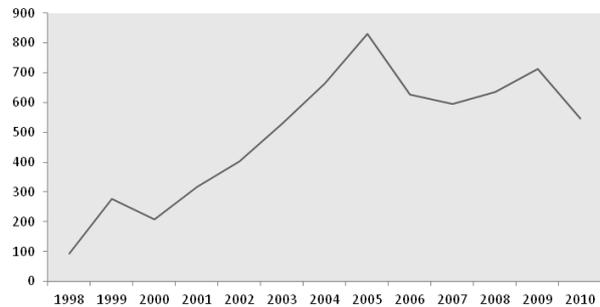


Figure 5: Uakari Lodge visitor numbers

The committee responsible for assessing community members' compliance to sector management rules only performed its role appropriately when there were profits to be shared. When there were none, the committee did not evaluate performance of communities regarding those rules. According to local leaders, the level of sector organization and attention to the sector management rules were related to the presence of economic profits shares from the tourism activity. Since there were no expectations of receiving shares in the years 2006 and 2007, people did not obey local management rules.

[Environmental agent]: Everyone erred! What happened was that everyone knew there would be no profits shares from ecotourism; so many people invaded the *ecotourism* area. People said that there a lot of poaching (*invasão*) because there were no profits. But I think that with or without profits, everyone has to obey the rules (Sector meeting, February, 2008).

After a few years of protection the Mamirauá Lake system had recovered stocks of economically-important fish such as pirarucu (*Arapaima gigas*) and tambaqui, (*Colossoma macropomum*). With the recovery, pressure on stocks from fishermen from nearby communities and towns followed. More efforts were needed to protect the lake system from poachers (*invasores*⁷), and this invariably fell on the shoulders of local environmental agents, albeit with a great deal of logistical and financial support from the Mamirauá Institute.

From 2005 onwards, a group from within the Mamirauá sector started negotiations to alter the Mamirauá Lake category from total protection to sustainable use, thereby claiming access to its fish stocks. An informal sector fishermen organization was created, and included many inhabitants from communities which had not previously participated in sector activities, like Novo São Raimundo, Sítio Promessa and São Luiz do Pirarara. Their argument for changing the protection category of the lake was based on the fact that for many years the lake had been exploited illegally by outsiders. At times they argued that the lake was overexploited by clandestine fishermen:

Community people evaluated that since the 9th of March 1990⁸ until 2008 - 18 years of preservation – every year fishermen invade the area. Once we drove out of this lake about 50 canoes of clandestine fishermen. This year of 2008 fish are very rare in the Mamirauá Lake, because many tons of fish were taken out by clandestine fishermen. There have been many expenses from the work partners, and few results. Now the

people are planning not to preserve any more fish for clandestine fishermen. They plan to negotiate the area in a way so it will not bring damage to Mamirauá Lake (Mamirauá Sector Meeting, 21/10/08).

Other times they argued that albeit much exploitation, the lake still had a lot of fish:

The inhabitants pointed out that [the Mamirauá lake] was fished along 20 years by clandestine fishermen, with different types of fishing, predatory, without norms, fishing small as well as large fish, and there is still fish in Mamirauá lake. The organized fishing [proposed by their group] will be controlled and managed according to the use norms, and respecting closed reproductive seasons. (Mamirauá Sector Meeting, 28/10/11)

Both arguments served to convey one message: they were “keeping for others to take” (*guardando para os outros levarem*), that is, for them their efforts for preserving the area were producing economic results to other people, not themselves. This argument was convincing many local people, since it was used by leaders and community environmental agents, people who were directly involved with the protection of the area over the years.

Nevertheless, not everyone agreed with such understanding. There was a group which actively opposed it – among them those who worked at Uakari lodge and associated the protection of the Mamirauá Lake to tourism (see below). In order to hinder attempts to change Mamirauá Lake’s category, they counter-argued that many people in the sector were receiving benefits from tourism, and they needed the area to remain preserved to attract tourists (“é o nosso atrativo”). At that time, the importance of maintaining the lake as a total

⁶ Those who extract natural resources without legal rights or local consent.

⁸ The date of the decree establishing the Mamirauá Ecological station.

preservation zone was not perceived locally in ecological terms, but in terms of its economic dividends. This was when the whole issue started to be put as a mere choice between using the lake for fishing or destining it to tourism activities. This was clearly reflected in one meeting agenda to discuss the issue: "Fishing or ecotourism".

In addition to that, the group argued against the inclusion of fishermen from communities which had not contributed to protection of the lake over the years. They claimed most fishermen from those communities were actually poachers (*invasores*), and they did not understand why local environmental agents and their own sector leader could agree with them reaping benefits, having bore none of the costs of protection.

[Names of sector coordinator and environmental agent] carried out an illegitimate fishing activity on 14th of September, 2005 in lakes Mamirauá, Teiú, Jacitara, Levir and Mamirauá channel, with 52 fishermen [...]. *We are worried because it is an untouchable area, for preservation of the ecotourism area, where many inhabitants are working in favor of preservation and not destruction of this area. Some environmental agents do not agree with this second fishing. Mamirauá sector has seven communities and they [fishermen organization] are presenting eight communities, and most of these fishermen are poachers, some of them are [names] and others from Tapiira, São Raimundo. We do not accept this fishing in our area (it is our [tourist] attraction). 17/09/2005 (Signed 13 people: four from Boca do Mamirauá, eight from Sítio São José and one from Vila Alencar) (free translation).*

For many years, the two groups struggled over the issue, without resolving it. Fishermen attempts to fish in Mamirauá lake were counteracted by

lodge employees who followed their organization closely, participating in their meetings and keeping track of all fishing trips and collective decisions. But in 2008, fishermen assembled more support to their claim justifying that ecotourism benefitted the community collectively (through profits shares) but was not economically important to local families (see below). This was clearly not the case of those communities that had received the bulk of economic benefits throughout the years⁹ (Figure 3). But it was the case of communities in the Japurá River, which had never had much economic benefits from providing goods and services to *Uakari Lodge* (see Figure. 3). Those communities had in fact less income than the ones involved in tourism activities. Data from an economic survey carried out in 2011 showed there was indeed a 34% difference in household incomes between those communities that worked with tourism and those who did not. The fishermen group was in fact formed mainly by people from those communities.

With this area destined to research, ecotourism and others, we confirm that we had much economic damage. Only now we have found out that we have been rowing all the years against our fishing initiatives. Today we are aware, according to our knowledge, that this [fishing in the protected zone] will not have any impact, it will only bring more benefits and generate more income to the family. We concluded that income from ecotourism is important, but it does benefit families, it benefits communities in common, while there are families in need of its own income for a healthy social living. We are willing, together with all from the

⁹ In 2008, around 120 people received direct economic benefits from tourism (see table X).

sector, to negotiate the area of Mamirauá lake, *leaving other area for preservation*, maintaining respect of all in the sector, fish only according to rules, with no exaggerate exploitation, and only in the right periods of time. The area that goes from the entrance of Mamirauá Lake to *Volta do Pagão*. We request Mamirauá Lake for subsistence. And we ask the support of everyone from the sector in this assembly. 21/10/2008.

The Mamirauá Institute opposed the modification on the lake protection status. Its technicians tried to show the importance of maintaining a total preservation lake in a *pirarucu* management system. An argument promptly integrated by the fishermen, who proposed to exchange lake Mamirauá for another one (Jacitara). For them, if fishing was carried out according to management rules – respecting the closed season, the minimum size of fish and a fishing quota - it would not cause any impacts. But researchers considered that Mamirauá lake system was of ecological importance to the whole of the Reserve and opposed its substitution, since other lakes did not have the characteristics required for a preservation lake, such as depth and connectivity. But as the statement above shows, local fishermen saw the preservation of the Lake not as a part of the Reserve's zoning system that had been previously approved by residents themselves, but as an area that was categorized as preservation to be destined to research activities and ecotourism. Besides, they were stating that destining the area to those activities had resulted in *economic damages*.

Furthermore, fishermen were trying to show that protection had not been effective because there were not enough human or financial resources available, since the State was not able to provide such resources. Even though the protection of

the area was supported by Mamirauá Institute, they maintained that protection was a result of the contribution of local people who had been voluntarily involved over the years, but with the long-term purpose of obtaining economic benefits in return. But, by their evaluation, until then, only clandestine fishermen were really benefitting from the protection of the area, and if there was the possibility to manage *pirarucu* fish in Mamirauá Lake, locals would engage more in protection and refrain from exploiting the area illegally.

In 2009, with all of these arguments, fishermen requested the change in Mamirauá Lake conservation status at the annual General Assembly. Since it was understood that this was a change in the zoning system of the Reserve's management plan, they were advised to request this modification from the Reserve Deliberative Council¹⁰, which they did so in 2010 and 2011, when the Council finally approved the alteration in the protection status of Mamirauá Lake. In May 2012, a small group of residents from Mamirauá sector took to the council their views opposing fishermen initiatives, arguing not only for the importance of the lake to tourism, but also to the maintenance of the area as a breeding ground. Making it clear that the change in the status of the lake was not consensual among locals.

Despite all that, a fishing quota of five tons was granted by the state agency¹¹ organization responsible for the management of the area. In September 2012, a group of around 40 fishermen

¹⁰ The Deliberative Council is the main decision-making forum responsible for the major issues regarding the use, management and protection of the area.

¹¹ Centro Estadual de Unidades de Conservação – CEUC.

carried out a commercial fishing expedition taking out around 27 tons of tambaqui (*Colossoma macropomum*) from the lake in four days, which resulted in a total gross revenue of R\$ 180.000,00¹². Due to alleged irregularities in the fishing expedition, the group of fishermen was later fined by another state agency¹³.

Table 2 - Mamirauá Sector incomes generated by Uakari Lodge and management decisions regarding the use of the area.

Year	N tourism beneficiaries	Income from tourism ¹	Average income per person	Uakari lodge profits shares	Management decisions regarding the use of the area
1999	48	R\$ 16.429	R\$ 342	-	Communities requested entrance fees from tourists and researchers at General Assembly
2000	50	R\$ 19.449	R\$ 389	-	
2001	43	R\$ 20.357	R\$ 473	-	
2002	69	R\$ 35.808	R\$ 519	R\$ 35.000	Equal distribution of profits among seven communities
2003	82	R\$ 43.254	R\$ 527	R\$ 60.000	Sector leaders define management rules that include participation in protection and sector organization. Profits shares according to compliance to sector rules
2004	93	R\$ 105.099	R\$ 1.130	R\$ 65.000	Sector defined new total protection zone surrounding Uakari lodge (Volta do Pagão)
2005	102	R\$ 129.406	R\$ 1.269	-	Informal foundation of local fishers' organization. Illegal fishing in the total protection zone.
2006	103	R\$ 104.242	R\$ 1.012	-	Local fishers requested part of the total protection zone in sector meeting. Local tourism association gained support to deny access.
2007	120	R\$ 121.298	R\$ 1.011	R\$ 27.240	
2008	116	R\$ 151.083	R\$ 1.302	R\$ 30.574	Fishermen gathered more local support to change the protection status of Mamirauá Lake
2009	118	R\$ 171.691	R\$ 1.455	-	Communities requested Mamirauá Lake for fishing at General Assembly
2010	120	R\$ 162.143	R\$ 1.351	-	Communities requested Mamirauá Lake for fishing at Reserve Council
2011	112	R\$ 151.452	R\$ 1.352	-	Reserve Council agreed to change the category of Mamirauá lake from total protection to commercialization
2012					Commercial fishing of around 27 tons of tambaqui (<i>Colossoma macropomum</i>) in Mamirauá Lake

¹ Mamirauá Sector total income generated from provision of services and goods to Uakari Lodge.

¹² Gross income and not net revenues coming from fishing.

¹³ Instituto de Proteção Ambiental do Amazonas – IPAAM.

Conclusions

Gross revenues from fishing on its first year of operation have shown to be larger than those coming from tourism along the years. Tourism highest net direct revenues were of R\$ 171.691, (see Table 2) in the year 2009. According to locals, this has attracted more interest in fishing in Mamirauá Lake, and may change the balance of power between those who support and those who do not support the fishing initiative, though this remains to be confirmed in the next few years.

The linkage between tourism and the preservation of the lake did occur in this case study. In the first years of its implementation tourism provided an incentive to stop *external* threats. But in relation to internal disputes, this linkage has proved to result in ambiguous outcomes. On one hand it has been a motivation for those who benefited from tourism to try and maintain the protection status of a lake which they saw as important for tourism. On the other hand, it has been the justification of those who wanted to change total protection status of the area, since they related the protection of lake to tourism and did not see the activity as profitable to themselves, they justified destining the lake to other ends rather than preservation.

To those communities that had no access to direct benefits, when communal benefits did not flow, incentive to maintain the preservation status of the lake diminished. Communal participation in benefits should be seen as part of the costs of the enterprise to gain support from local communities since the very beginning, and should not have been

only associated to the profits, since profits shares are much riskier. This had already been signaled by local communities back in 1999, when they claimed the right to charge entry fees into the area from tourists.

The case study also corroborates to the assumption that perceived benefits are more important than actual ones (STRONZA, 2007). In this case, even though the number of beneficiaries did grow over the years reaching a maximum of 120 people in 2007, or about a third of the sector adult residents, many people did not recognize the economic importance of the activity. Besides, this study has shown that privately appropriated benefits were perceived by locals as more important than collective ones. This was actually used as argument against the relative importance of tourism: *"income from ecotourism is important, but it does benefit families, it benefits communities in common"*.

Although economic benefits have not been too high over the years (average per person income was of R\$933; std. dev. R\$420), especially due to the fact that visitor numbers were impacted by the closure of the airport, the income that tourism did provide was important to locals. This is shown by the fact that there was a 34% difference in average income between communities with and without ecotourism involvement.

However, there was a concentration of benefits in only four communities out of eleven. So the study also shows that when tourism generates important economic benefits, but access opportunities are restricted, the activity exacerbates already existing resource conflicts due to a local perception that costs of protection are collective, but benefits are concentrated. A finding analogous to that of Coria and Calfucura (2012), who argue that inequitable distribution of benefits within the

community discourages participation and creates or exacerbates divisions.

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COMMUNITY-BASED ECOTOURISM IN THE MAMIRAUÁ RESERVE: EVALUATION OF PRODUCT QUALITY AND REFLECTIONS REGARDING THE ECONOMIC AND FINANCIAL FEASIBILITY OF THE ACTIVITY.

ECOTURISMO DE BASE COMUNITÁRIA NA RDS MAMIRAUÁ: AVALIAÇÃO DA QUALIDADE DO PRODUTO E REFLEXÕES ACERCA DA VIABILIDADE ECONÔMICO-FINANCEIRA DA ATIVIDADE.

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ABSTRACT

An ecotourism product should, among other things, offer a quality experience for the visitor and improve the quality of life of the one who is visited. This study evaluated the quality of community-based ecotourism at the Uakari Floating Lodge, and analyzed the economic and financial performance of the enterprise, generating reflections regarding the economic impact achieved and the intangible benefits associated with initiatives of this nature. The timeframe for the analysis was nine years (2002 to 2010). The evaluation of product quality was based upon the perceptions of the visitor and generally revealed high levels of quality. Moreover, a comparison with the competition yielded satisfactory results, indicating that the product can compete internationally on quality. From the perspective of financial return on investment, after a promising start, performance was not satisfactory over the nine-year period. An analysis has been conducted on the impact of two external factors and one internal factor, which have negatively impacted performance: the closure of the municipal airport for nine months, large exchange rate fluctuations and a pricing policy that could have been more conservative. Enterprises like the Uakari Lodge (located in remote areas with a differentiated management model) have certain vulnerabilities and this study reinforces the necessity of these initiatives to be better prepared for the risks inherent in this activity. Using simulations, it is possible to show that, if the municipal airport had not been closed or the Dollar had not suffered such a steep devaluation, financial viability would have been reached. Equally, the study shows that inappropriate adjustments in daily rates played a part in contributing to inadequate financial performance. On the other hand, when analyzing the initiative from a macro-economic point of view, it becomes evident that the activity established itself as an important economic alternative for the local communities and that the financial resources generated by the project had a strong multiplier effect. The analysis found that, for each R\$1.00 contributed by investors, R\$4.72 was generated in the regional economy. Equally, the wide variety of intangible environmental, social and economic benefits, validate the socio-environmental focus of the project and its contribution as a tool for the conservation of natural resources. Another point that merits attention relates to the existence of a consolidated system for monitoring results, which allows for the initiative to socialize lessons learned with academia, not-for-profit organizations and government. The findings of the study will contribute to more efficient planning for the transfer of management of the enterprise to the local communities.

KEY WORDS:

Ecotourism;

Community-based tourism;

Uakari Floating Lodge;

Mamirauá Sustainable Development Reserve;

Economic feasibility.

RESUMO

Um produto de ecoturismo deve, entre outros, oferecer qualidade de experiência para o visitante e melhoria de qualidade de vida para o visitado. Este estudo avaliou a qualidade do produto de ecoturismo de base comunitária Pousada Flutuante Uacari, bem como analisou o desempenho econômico-financeiro do empreendimento, gerando reflexões acerca do impacto econômico gerado e dos benefícios intangíveis associados a iniciativas desta natureza. O horizonte temporal contemplado na análise foi de 09 anos (2002 a 2010). A avaliação da qualidade do produto utilizou como base a percepção do visitante e revelou, em linhas gerais, níveis altos de qualidade. Ademais, a comparação com a concorrência mostrou resultados satisfatórios, indicando que o produto é competitivo internacionalmente no quesito qualidade. Do ponto de vista financeiro, sob a ótica de retorno financeiro no investimento, o desempenho depois de um começo promissor, não foi satisfatório no período de 09 anos. São analisados os impactos de dois fatores externos e um fator interno, que impactaram negativamente no desempenho: o fechamento do aeroporto municipal por 09 meses, a flutuação grande do câmbio e uma política de preços que poderia ter sido mais cautelosa. Empreendimentos como a Pousada Uacari (localizados em áreas remotas e com modelo de gestão diferenciado) tem suas vulnerabilidades e o estudo reforça para a necessidade destas iniciativas se prepararem melhor para os riscos inerentes à atividade. Através de simulações é possível mostrar que se o fechamento do aeroporto municipal não tivesse ocorrido ou se a desvalorização do dólar não tivesse sido tão acentuada, a viabilidade financeira teria sido alcançada. Igualmente, o estudo mostra que ajustes inapropriados no tarifário tiveram sua parcela de contribuição para este desempenho financeiro. Por outro lado, quando analisada a iniciativa por um viés macro-econômico, ficou evidente que a atividade se estabeleceu como uma importante alternativa econômica às comunidades locais e que movimentação econômica gerada pelo projeto teve um forte efeito multiplicador. A análise constatou que para cada R\$ 1,00 investido pelos financiadores, foi gerado R\$ 4,72 para a economia regional. Igualmente, a grande variedade de benefícios intangíveis de caráter ambiental, social e econômico comprova o enfoque socioambiental do projeto e a sua contribuição como ferramenta para a conservação dos recursos naturais. Outro ponto que merece destaque trata-se da existência de um consolidado sistema de monitoramento dos resultados, que permite que a iniciativa socialize as lições aprendidas com a academia, terceiro setor e governo. Os resultados encontrados no estudo contribuirão para se planejar com mais eficiência a transferência da gestão do empreendimento para as comunidades locais.

PALAVRAS-CHAVE:

Ecoturismo;

Amazônia,

Pousada Flutuante Uacari;

Reserva de Desenvolvimento Sustentável
Mamirauá;

Viabilidade econômico-financeira.

INTRODUCTION

In recent decades, community-based tourism (CBT) has been defended as one of the ways to develop tourist activities in a responsible manner, reconciling the conservation of natural resources with the socio-economic development of the destinations. The term is used widely in literature^{1, 2} and generally covers initiatives that promote an alternative model to conventional tourism, where the central concern with involving the communities is the mainstay of the activity itself.

Starting in the '90s, innumerable projects of this nature emerged which, in the majority of cases, were supported by the not-for-profit sector and run by donations from cooperation agencies. However, throughout this period, many studies identified problems that were apparently common to the majority of these initiatives, including: lack of monitoring and lack of quantification of real benefits for the communities (GOODWIN; SANTILI, 2009); lack of the most appropriate focus based on demand and insertion into the local tourism production chain (Epler Wood 1998); lack of a business plan and a clear view of potential threats for this kind of activity (CBI, 2009).

Therefore, it is not surprising that Mitchell and Muckosy (2008) have identified an average occupancy rate of only 5% for community establishments. Mielke (2011), upon evaluating

the activities of CBT in Brazil³, also found problems with market access and identified a lack of monitoring systems in these enterprises, making the results difficult to control and evaluate. In the Mamirauá Sustainable Development Reserve in the Brazilian Amazon, the Uakari Floating Lodge is one of the pioneering projects of this genre in Brazil. The enterprise has been in full⁴ operation since 2002 and utilizes a model of shared management between the Mamirauá Institute for Sustainable Development (MISD) and the communities in the Mamirauá Reserve.

In order to support the decision to invest in the Uakari Floating Lodge, a business plan was developed, as well as a strategy for introducing the enterprise into the market. Moreover, indicators were pre-established to monitor the socio-economic, environmental, and market performance of the initiative over the years.

However, the fact that the enterprise took these important pre-steps does not mean that the entire business would not face mishaps. Initiatives like the Uakari Floating Lodge – located in remote areas and with a differentiated management model - are sensitive to risk factors, both external⁵ and internal. Among the most significant external factors that the enterprise lived through were the interruption in flight access to the municipality and exchange rate fluctuations. The problem of access – which occurred during a time of significant growth for the enterprise – was caused

¹ A form of tourism that local communities have substantial involvement in and control over. Ecotourism's development and management, and a major proportion of the benefits remain within the community (DENMAN, 2001).

² Tourism initiatives that are owned by one or more communities, or run as a joint venture with the private sector with equitable community participation, as a means of using natural resources in a sustainable manner to improve their standard of living in an economic and viable way (Department of Tourism Botswana)

³ Those who received support from the Ministério do Turismo (Tourism Ministry) through the support bid for CBT.

⁴ From 1999 to 2001, the enterprise was functioning as a 'soft opening', responding to spontaneous demand.

⁵ External factors usually affect demand, and as such, the enterprise does not have the capacity to intervene.

by the closure of the Tefé ⁶ municipal airport, resulting in a significant decrease in demand and thus compromising the enterprise's cash flow. The exchange rate, with its large fluctuations, was also a significant risk factor since it resulted in an overvaluation of the Brazilian Real – turning Brazil into an expensive international long distance destination – and negatively impacting demand for the enterprise. Equally, managerial decisions were made that adjusted the price of the product in inopportune moments, creating risks of an internal nature.

The purpose of this study is to share lessons learned and to contribute to the discussion regarding the performance of CBT initiatives. This document evaluates the results of the Uakari Floating Lodge during the period between 2002 and 2010, by analyzing the quality of the product (from the perspective of the visitor) and by measuring the economic and financial performance of the enterprise. Moreover, the evaluation attempts to measure the impact of certain risk factors on initiatives of this nature, as well as to generate reflections regarding intangible benefits associated with enterprises with similar characteristics.

MATERIAL AND METHODS

Evaluation of product quality (point of view of the ecotourist)

In order to evaluate the quality of ecotourism services, data was analyzed from the period 2002 to 2011, collected using a questionnaire that is filled out by guests of the enterprise and which includes multiple choice and open-ended

questions. The principal indicators evaluated were: food, transportation, lodging, activities, guides, information availability, cleanliness and an overall evaluation of the visit. The visitors qualified the services mentioned using a scale of 1 through 5, where: 1 is terrible; 2 is normal; 3 is good; 4 is very good and 5 is excellent.

The questionnaire also collects qualitative information, using a space reserved for suggestions, criticisms and/or complaints. To analyze this information, the comments from the period 2009 to 2011 were grouped and categorized according to operating sector.

With the objective of comparing the quality of the services offered by the Uakari Floating Lodge to other competing initiatives in the ecotourism market (Pan-Amazon and Pantanal), queries were made to the site tripadvisor.com. [Tripadvisor.com](http://tripadvisor.com) is a site that helps visitors searching for information about travelling. It is the largest site of its genre in the world, with more than 60 million hits per month ⁷. On this site, visitors can make independent and voluntary evaluations ⁸ of the destinations they have visited and participate in discussion forums. With these evaluations, the destinations receive a grading that allows interested travelers to make comparisons between the places they want to visit.

[Tripadvisor](http://tripadvisor.com) is a very highly used tool and is useful for not only visitors themselves but for the managers of the enterprises evaluated, since an evaluation written after a trip has been taken tends to have more details than an evaluation done

⁶ The garbage dump located near the airport was putting airplane takeoffs and landings at risk due to the presence of vultures. So, for security reasons, the airport was closed for nine months.

⁷ For more information about the site: www.tripadvisor.com/pages/about_us.html.

⁸ Visitors evaluate the following criteria: price, cleanliness, services, location, rooms and sleep quality.

while the guest is at the destination. Tripadvisor is not an exact measurement since evaluations are made by only some visitors, but the advantage is that it allows for comparison with other enterprises. Criticisms have been made regarding the trustworthiness of some evaluations⁹, but in the case of Uakari Floating Lodge, no evaluations have been identified as suspect.

Economic and financial performance

Data from the period 2002 through 2010 were analyzed to evaluate the economic and financial performance of the ecotourism activity with two distinct focuses. The first aims to determine if the commercial enterprise is viable from a financial point of view. This study uses investment analysis techniques and shows what the return on investment is, compared to the return offered by the market. In this study, the techniques used were the NPV (Net Present Value)¹⁰ and the IRR (Internal Rate of Return)¹¹.

In the financial analysis, two scenarios were considered

- a) partial investment: does not include investments coming from donations (external to the enterprise's cash flow);
- b) full investment: includes total resources invested in the enterprise (internal and external).

⁹ There are accusations in the tourist trade that some enterprises influence guests to make positive evaluations, thus diminishing their spontaneity. There are also accusations of false evaluations done with the intent to harm other enterprises.

¹⁰ The NPV considers the value of money over time and aims to verify if the cash balance will be profitable when brought to current values. This technique identifies the minimal return that a project should obtain so that its market value does not change (BORDEAUX-RÉGO, 2008).

¹¹ The IRR measures the proportional return by the business in a determined period of time (monthly or annually). Therefore, an individual investor can compare the resulting IRR of a project with the rate of return offered by other market investments in order to decide to accept or refuse a project. (BORDEAUX-RÉGO, 2008)

With the objective of knowing the level of impact of several factors (two external and one internal) on the financial performance of the Uakari Floating Lodge during the period, the following three simulations were conducted. They were related to two external factors and one internal, all of which are important for sales performance.

- Simulation 1 (external factor): What would the financial performance of the enterprise have been if the Tefé airport had not closed in 2006¹²?
- Simulation 2 (external factor): What would the financial performance of the enterprise have been if the devaluation of the Dollar had been less pronounced?¹³
- Simulation 3 (internal factor): What would the financial performance of the enterprise have been if more care had been taken with the pricing policy of the enterprise¹⁴?

The second focus measures the contribution of the enterprise to the economic well-being of the region under consideration. The analysis is carried out from the standpoint of society as a whole (region or country) and not just from the point of view of the owner of the infrastructure, as is done in a financial analysis (European Commission, 2003). The analysis is drawn from a source that considers all costs and benefits over time in order to obtain the net effects on the economy as a whole, adjusting for distortions and social and environmental externalities (Harb et al 2007).

¹² The airport closed two different times between 2006 and 2007 (for a total of nine months).

¹³ 75% of demand for the enterprise is international (COELHO; OZORIO, 2010), and therefore, sensitive to exchange rate variation. The long-distance domestic market is also affected since Brazilians are travelling more abroad.

¹⁴ The impact of price variations was considered to identify their level of influence (managerial decisions) on the financial performance of the enterprise.

In order to calculate economic feasibility, the economic IRR (economic internal rate of return) and economic NPV (economic net present value) ¹⁵ were used. Additionally, the economic impact generated by the initiative in the regional economy was measured, as were the intangible benefits of the project.

RESULTS AND DISCUSSION

Evaluation of product quality

Monitoring product quality through services provided is an essential element in the management of an ecotourism operation, with the key objective to understand the opinion of the visitor who uses these services. Figures 1, 2 and 3 reveal quantitative information regarding the perception of ecotourists about the services of the Uakari Floating Lodge. Scores above the green line (>4) represent high levels of quality.

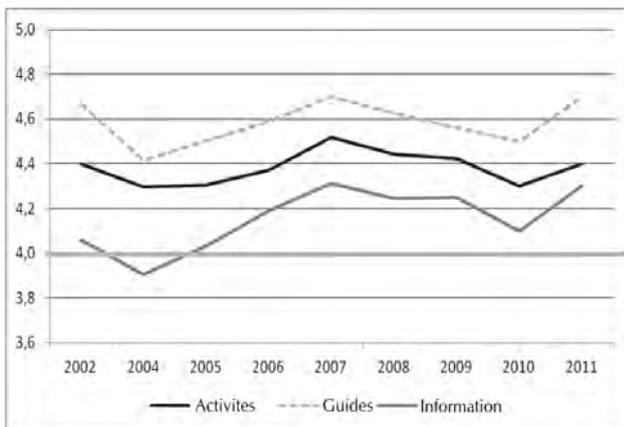


Figure 1 - Visitor satisfaction related to the indicators: activities, guides and information.

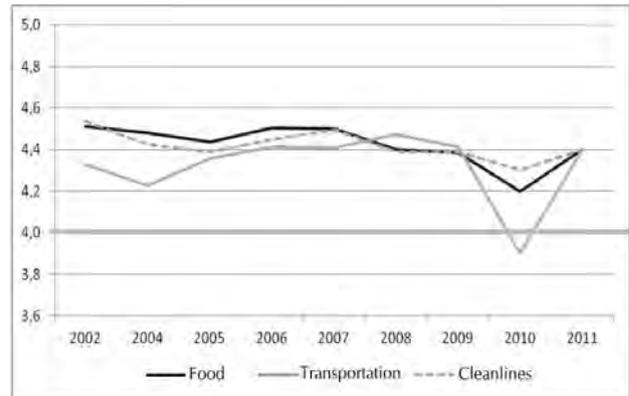


Figure 2 - Visitor satisfaction related to the indicators: food, transportation and cleanliness.

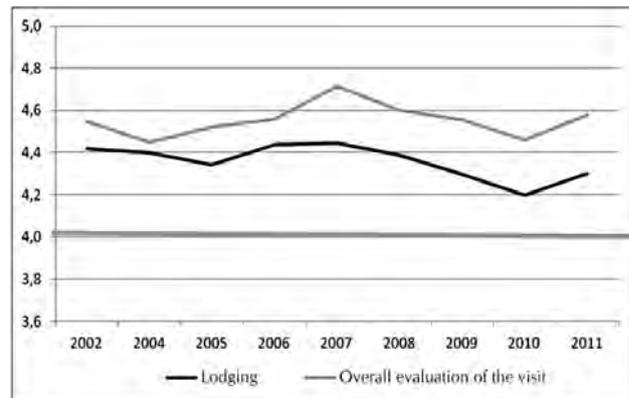


Figure 3 - Visitor satisfaction related to the indicators: lodging and overall evaluation of the visit.

In general terms, the analyses suggest high levels of visitor satisfaction (Figures 1, 2 and 3), considering that nearly all items evaluated were always graded above 4 (very good) over the years, with the exception of the items *information* (3.9 in 2004) and *transportation* (3.9 in 2010) ¹⁶.

¹⁵ These indicators were calculated using the same cash flows from the company; however, transfers made to Reserve communities for the purchase of products, payment of services and surpluses, and resources transferred to support research were not considered as costs to the enterprise.

¹⁶ The reduction in the evaluation for transportation in 2010 is related to the period of extreme drought during this year. The low level of water seriously limited access to the ecotourism area, where the round trip Tefé – Lodge –Tefé, which under normal conditions takes 1 hour and 30 minutes, increased to 2 hours and 30 minutes. Moreover, visitors needed to leave the boat and walk for 20 minutes on a makeshift trail (OZORIO et al., 2012).

However, even though the general results indicate high product quality, the graphs reveal a drop in the level of satisfaction over the period 2008 to 2010 in nearly all of the items analyzed. This decline can be explained in the following way:

The closure of the airport between 2006 and 2007 led to a significant drop in revenue for the enterprise¹⁷, which compromised cash flow and created financial restrictions, preventing the completion of maintenance projects and other necessary investments in 2007 and 2008 (OZORIO; JANÉR, 2012). This scenario resulted in a cumulative effect of problems related to the deterioration of infrastructure, which in turn contributed to the visitor having a reduced perception of quality. It is interesting to note that a pronounced reduction in the item *lodging* supports this argument, along with the information in the qualitative analyses (Table 1 and Figure 4).

Furthermore, from 2009 to 2010 there was an adjustment in rates for the Uakari Floating Lodge¹⁸ that, taken together with the lack of improvements in infrastructure, impacted the level of visitor satisfaction. However, other factors that are related to the results of this period cannot be discarded, such as: abrupt transitions in the enterprise's management and insufficient investment in training. With the objective to better understand visitors' opinions, a qualitative analysis was conducted. Table 1 displays comments that appeared with a frequency equal to or more than 5 times in each of the years analyzed (2009, 2010 and 2011), and divides them into operational sectors.

Table 1 - Categorization of most frequent comments in the years 2009, 2010 and 2011.

	2009	2010	2011
Cleanliness	Cleaner bathrooms (≤10) Flies in the restaurant were a problem. (≤10)	Empty the bathroom wastebaskets (≤5) Change bath and face towels more frequently (≤5)	
Guides / Information	Guides need better English skills (> 10) More communication of research projects (≤10) Improvements to slide show (≤10)	I would have found it much more interesting if the Guides spoke better English(> 10) We would have liked to hear more about particular aspects of nature. (≤5)	Local guides should speak English (> 10)
Infrastructure / Equipment	Bathrooms need refurbishing (> 10) Investment in upkeep and repairs in the lodges (> 10) Rooms need more maintenance (> 10) Ceiling needs to be refurbished (> 10)	Put a ceiling fan in the dining room (≤5) Rooms need better maintenance (≤5)	Reading light in the rooms (≤10) Fans in the dining hall and in the rooms (≤10) Make binoculars available (≤10) Hot water in the bathroom (≤10)
Activities	Get up earlier to see the animals coming out (≤10) More time in the community to participate more in the life of the local people (≤10) Organize evening activities better (≤10) Move the research presentation to the evening (≤10) Include more physical activities in the packages (> 10) More variety in activities (> 10)		
Commercialization / Marketing	Offer to organize flights to the city of Tefé(≤10) Include on the website reservation page a list of what tourists should bring (≤10) Improve website information on how to get to Tefé(≤10) Improve Lodge checkout times (≤10)		
Food	It would be nice to have eggs for breakfast. (≤10) Offer a wider variety of food (≤10)		
Minimal impact	Provide soaps and shampoos that do not damage the environment. (≤10)		

¹⁷For more details, see the chapter on economic and financial performance.

¹⁸See the chapter on economic and financial performance.

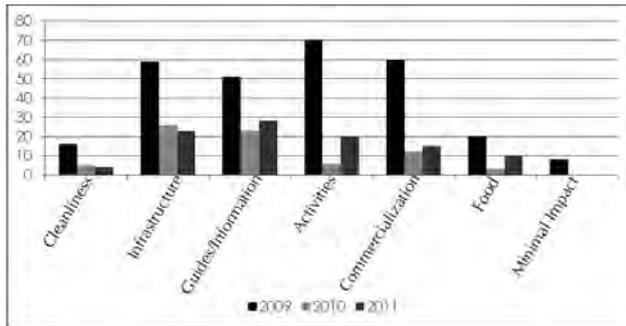


Figure 4 - Total number of comments per sector by year.

It should be noted that the most frequent complaints made by guests in 2009 were related to upkeep of the infrastructure, the fact that the guides do not speak English and the lack of variety of activities. In this year, there were also a lot of comments regarding the commercialization of the enterprise. In 2010 and 2011, the frequency of these complaints diminished significantly, but these operational sectors continue to be the most critical (especially English and infrastructure), as can be seen in Figure 4.

In general, considering the entire period analyzed (2002 to 2011), the quantitative analysis graphs (Figures 1, 2 and 3) reveal high levels of service quality. However, the analysis made it possible to identify a reduction trend in these levels between 2008 and 2010, but starting in 2011 they returned to a pattern of growth.

On the other hand, the qualitative analysis (Table 1) revealed the most critical items in the operation for the years 2009, 2010 and 2011 and also showed a return to improvement in the quality of the product. However, it is necessary

to continue monitoring in the years that follow so that the management of the enterprise can certify that this return to growth is being established as a trend.

Competitive analysis

The exercise of evaluating the quality of an ecotourism product should also take into account competition in the marketplace. The number of ecotourism enterprises in the Pan-Amazon region has grown significantly in the last 10 years, a fact that requires that the managers of these enterprises be aware of the strength of competition.

Table 2 presents information extracted from the tripadvisor.com site and shows the ranking of Uakari Floating Lodge in relation to 16 potential competitors in the Pan-Amazon and the Pantanal regions. The results show that the performance of the enterprise has been satisfactory from the point of the view of visitors, since the rating is 9.6, sharing fourth rank with three other enterprises. It is worth noting that the analysis includes enterprises with distinct identities, including: businesses, shared management, (not-for-profit sector and communities) and integrated community management. The jungle hotels Napo Wildlife Centre (Ecuador), Albergue Chalalán (Bolivia), Kapawi (Ecuador) and Yachana Lodge (Ecuador) – which have management models similar to that of Uakari Floating Lodge – achieved third, fourth and seventh place rankings, respectively.

Economic and financial performance

Table 3 presents the economic and financial performance indicators of the enterprise for the period 2002 through 2010.

Table 2 - Ranking of the Uakari Floating Lodge and its competitors from the travel site TRIP Advisor. September 2011.

Ranking	Ec lodge	Overall Average	No. of Evaluations	Location
1	Barranco alto	10	60	Southern Pantanal
2	Embiara lodge	9.9	19	Southern Pantanal
3	Napo wildlife Centre	9.8	80	Ecuadorian Amazon
4	Chalalan	9.6	27	Bolivian Amazon
4	Cristalino	9.6	16	Brazilian Amazon
4	Pacaya Samiria	9.6	18	Peruvian Amazon
4	Uakari Lodge	9.6	23	Brazilian Amazon
5	Anavilhanas	9.5	98	Brazilian Amazon
6	Pousada Aguapé	9.3	13	Southern Pantanal
7	Kapawi	9.1	26	Ecuadorian Amazon
7	Yachana lodge	9.1	19	Ecuadorian Amazon
8	Juma lodge	8.9	30	Brazilian Amazon
9	La Selva	8.8	44	Ecuadorian Amazon
10	Fazenda San Francisco	8.7	8	Southern Pantanal
11	Ariaú	8	85	Brazilian Amazon
12	Araras lodge	7.9	27	Northern Pantanal
13	Amazon ecolodge	7.3	51	Brazilian Amazon

Table 3 - Economic and financial performance metrics of the enterprise from 2002 through 2010

Scenario	2002 – 2010	Visitors	Revenue	NPV	IRR	NPVE	IRRE
Real	a) With partial investment	5,578	R\$ 5,208,265	R\$ (177,860)	-1%	R\$ 757,705	33%
	b) With full investment	5,578	R\$ 5,208,265	R\$ (522,859)	NA	R\$ 412,706	20%
Simulation 1	Without airport closure and with partial investment	7,615	R\$ 7,414,921	R\$ 602,972	22%	-	-
	Without airport closure and with full investment	7,615	R\$ 7,414,921	R\$ 257,972	14%	-	-
Simulation 2	Dollar at R\$2.3 with partial investment	5,578	R\$ 5,923,508	R\$ 221,903	15%	-	-
	Dólar at R\$2.3 with full investment	5,578	R\$ 5,923,508	R\$ (123,093)	5%	-	-
Simulation 3	With partial investment	5,578	R\$ 5,432,428	R\$ (20,259)	7%	-	-
	With full investment	5,578	R\$ 5,432,428	R\$ (365,259)	-12%	-	-

Financial evaluation

With respect to the context of table 3, the analysis with partial investment shows a negative NPV of R\$ 177,860.00 and an IRR of -1%. These values indicate that, from a purely financial point of view, the investment was not profitable during the period analyzed (9 years), or in other words, a longer timeframe would be necessary for this activity to become viable.

Regarding the simulations – in which the objective was to measure the impact of the risk factors on the financial performance of the enterprise – the results were interesting. Simulation 1 suggests that if the Tefé airport had not been closed in 2006, the enterprise would have been financially viable, either with partial investment (NPV R\$ 602,972 and IRR 22%) or with full investment (NPV R\$ 257,972 and IRR 14%).

Figure 5 compares the traffic at the Manaus and Tefé airports and clearly shows the reduction in traffic in the city of Tefé during 2006 and 2007, due to the closure of its airport. This directly impacted tourist demand for the Mamirauá Reserve as can be seen in Figure 6, which compares growth in demand for jungle hotels in the state of Amazonas with the increase in the number of ecotourists in Mamirauá.

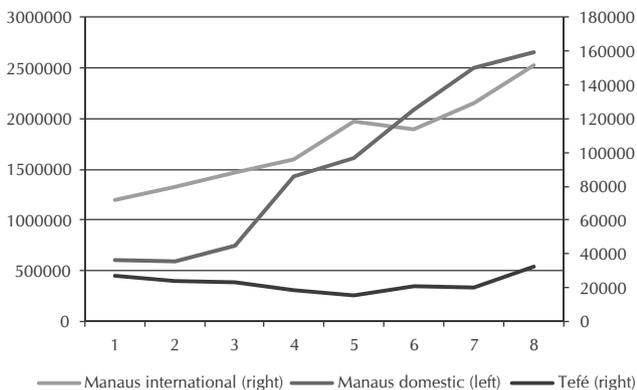


Figure 5 - Airport Traffic in Manaus and Tefé. Source: INFRAERO (2010)

The flow of visitors, which had been growing at an average annual rate of 27% in the period of 2001 to 2005, fell by 24% in 2006, and continued to be unstable until 2010. This situation negatively impacted “word of mouth marketing” (especially among travel operators) that existed regarding access to the Mamirauá Sustainable Development Reserve, creating uncertainty among tourism operators (COELHO; OZORIO, 2010).

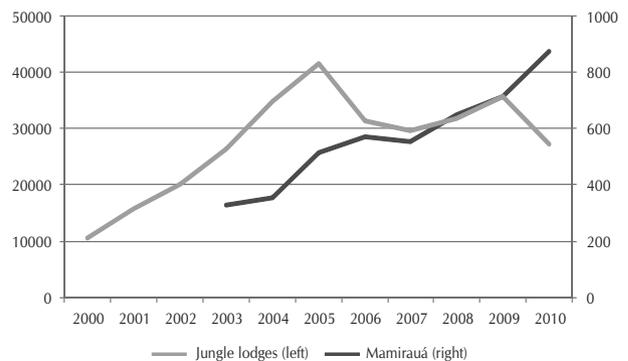


Figure 6 - Demand for hotels in the Amazon Jungle and in Mamirauá. Source: Amazonastur and MISD.

Table 4 suggests that, if the mishap with the airport had not happened, Mamirauá would have reached or arrived very close to the number of 1000 visitors (per year) in 2008. This conclusion makes sense since Mamirauá was experiencing a period of continuous growth until 2005, greater than the average for jungle hotels in the Amazon. Therefore, while the simulation uses growth rates that are more modest than the real growth rates for the jungle hotels in the state of Amazonas, it is clear that the Uakari Floating Lodge would have reached 1000 visitors per year.

This decline in demand resulted in a 30% reduction in revenue for the initiative in 2006, and since recovery was slow, this resulted in a reduced capacity for the enterprise to make investments and maintain the facility in the years that followed (OZORIO; JANÉR, 2012).

Table 4 - Growth of demand without airport closure (simulation).
Source: Amazonastur and MSDI.

Simulation	2006	2007	2008	2009	2010
Jungle hotels (real growth)	11%	-3%	18%	10%	22%
Mamirauá (simulated growth)	15%	-5%	10%	10%	10%
Mamirauá simulated number of visitors	555	906	997	1097	1200

Regarding the simulation related to exchange rate variation (devaluation of the Dollar), the results reveal that if the Dollar had remained stable at R\$ 2.30 during the period between 2005 and 2010, the Uakari Floating Lodge would have been financially viable, with a NPV of R\$ 221,903 and an IRR of 15% in the partial investment scenario. In the case of full investment, the NPV would have been negative (R\$ -123,093) and the IRR would have fallen to 5%, showing that the enterprise would not have been viable during the time period analyzed.

Even though there was an international economic crisis, the Brazilian economy remained strong, which made Brazil an expensive destination (overvaluation of the Real), and combined with less confidence and lower purchasing power of foreign tourists, international influx into the country remained stagnant during the period of 2005 to 2009 (JANÉR, 2011).

Table 5 - Variation of average annual exchange rate in the period 2002-2010. Source: Central Bank

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Average annual exchange rate (USD\$/R\$)	2.97	3.12	2.93	2.44	1.16	1.91	1.79	1.92	1.74
Variation (in %)	-	5%	-6%	-17%	-11%	-12%	-6%	7%	5%

The third analyzed simulation is related to the pricing policy adopted by the management of the enterprise. The objective was to identify what would have happened if the rate alterations had not been as pronounced as they were from 2005 to 2006 and from 2009 to 2010 (see Table 6). This simulation resulted in a negative NPV of 20,259 and an IRR of 7%.

Table 6 - Annual variation of average price in the period 2002 - 2010. Source: OZORIO and JANÉR, 2012.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Price (in USD\$)	360	360	350	355	485	540	590	590	750
Variation (in %)	-	0%	3%	1%	37%	11%	9%	0%	27%

A pricing policy is critical when the exchange rate fluctuates a lot. If the price increases had been more gradual, the results would have been more satisfactory. There is evidence that the visitor thought that the prices were high during the years when the rates were significantly increased.

Therefore, from a financial perspective, considering the Uakari Floating Lodge strictly as a commercial enterprise (which expects profitability and a return on investment), the results suggest that the initiative was not financially viable in the period analyzed (9 years). The evaluation indicates that the enterprise needs a longer timeframe to be viable, or in other words, it would be viable in the long term. This reality related to the timeframe for return on investment has also been identified in other remotely located ecotourism enterprises with differentiated management models (community companies, community-company joint ventures). Harb et al 2007, when evaluating the financial performance of Albergue Chalalán, located in the Bolivian Amazon, used 25 years as a timeframe (1999 to 2024), and projections (estimates) were made between 2008 and 2024. In another study

carried out by the community company Mapajo de Ecoturismo Indígena (Mapajo Indigenous Ecotourism, Panama), Diaz et al. used an analysis timeframe of 15 years in their methodology.

The simulations carried out in this study contributed to clarifying the level of impact that certain risk factors (external and internal) represent for small businesses like the Uakari Floating Lodge. Through the simulation, it became clear that the temporary aerial access limitation (closure of the airport for nine months) constituted the largest impact factor for the feasibility of the initiative, and that this happened at a time when Brazil was becoming expensive due to the continued devaluation of the Dollar. The combination of these two factors presented a tough financial test for the enterprise, which had to deal with a significant reduction in its financial reserve. This limited the capacity of the company to invest in improvements, impacting the quality of the product to a certain extent. This reduction in demand and financial reserve led management of the enterprise to increase rates, which proved to be incompatible with the circumstances of the moment (level of product quality, market situation), therefore making it more difficult to reposition the initiative in the marketplace.

Economic evaluation

In order to determine the contribution of the Uakari Floating Lodge to the economic well-being of the community in which it is located, it is equally important to analyze the performance of the initiative from an economic perspective. The economic evaluation resulted in a NPVE of R\$757,705 and an IRRE of 33% for the scenario of partial investment, and when full investment was considered, economic NPV became R\$ 412,706

and economic IRR 20%. This shows that the project was efficient from an economic point of view and that the financing provided by the investors had a positive impact on the local economy. Calculations show that the resources transferred to the local economy¹⁹ represent approximately 35% of the total costs of the enterprise. This is evidence of the initiative's social nature.

Estimate of the regional economic activity

The launching of an enterprise like the Uakari Floating Lodge generates economic activity that goes beyond the borders of the region where the enterprise is located. In addition to generating revenue for the communities in the Mamirauá Sector, the initiative stimulates the economies of the municipalities surrounding the enterprise and contributes to generating economic benefits on a regional scale, especially for tourism intermediaries (travel agencies and operators) and airline companies. In order to estimate the economic impact of the enterprise, estimates were made regarding the benefits transferred to the individual participants of the Mamirauá ecotourism production chain.

Communities of the Mamirauá Reserve

The direct economic benefits of ecotourism activities for the communities are generated through services provided, sales of products and the distribution of surpluses. However, in reality the total is actually greater since certain things like handmade crafts, tips for employees and laundry expenses are not included on the books.

¹⁹ This is considered the Mamirauá Sector, Mamirauá Reserve. The Mamirauá Reserve is politically divided into sectors.

In an attempt to arrive at a figure for total direct revenue generated in the Mamirauá Sector, estimates were used for those items not on the books. Regarding sales of handmade crafts in the communities, the estimates were made with data from 2002 to 2005 (VASCONCELOS, 2007).

In this period, it was found that each ecotourist spent on average 15 Reais (R\$ 15) on purchases of handmade crafts. Therefore, it is estimated that, during the period analyzed, the revenue generated from handmade crafts in the Mamirauá Sector was around R\$ 80,000. Using data related to tips and laundry over a period of one year, values were projected for subsequent years. Thus, it is estimated that the revenue coming from these items would be approximately R\$ 112,000.

Table 8 combines both the direct measurable economic benefits and the estimate of those not formally accounted for. It is worth noting the significant increase in the number of families benefiting over the years. In 2009, for example, approximately 81 families benefited directly from ecotourism activities. It is estimated that, by the year 2010, the project had generated a total of R\$ 1,532,917 for the communities in the Mamirauá Sector.

An important impact of the revenue generated from ecotourism is related to family cash flow throughout the year. The local communities inhabit a floodplain area and depend on this environment for fishing, family farming, hunting and wood extraction. In the floodplain environment of the Solimões region, there is a variation in the water level that can be as much as 12 meters between the seasons of flood and drought, creating fluctuations in the monetary inflows that come from traditional economic activities. Therefore, ecotourism helps by providing these families with income when

their other activities are being affected by the seasonal effect.

It is important to note that ecotourism was not designed as a substitute for traditional activities like fishing and agriculture, but as an extra source of income (additional and alternative) for the local population (PERALTA, 2002). In order to achieve this while distributing the economic benefits generated as widely as possible, the Uakari Floating Lodge admits workers through a rotation system ²⁰. As such, the workers are organized into an association, which serves as the legal entity contracted by the enterprise (PERALTA, 2005).

According to PERALTA (2005), during the period from 1998 to 2005, average family purchasing power increased nearly 148% in one of the sampled communities that is directly involved in the CBT project. According to the researcher, of the total household income generated in this community in 2005, nearly 55% is related to ecotourism, principally through services provided.

Table 7 compares average family income generated by ecotourism activities with GDP per capita in the closest city (Alvarães, AM). Considering that income from ecotourism is partial, since the workers are only involved about 10 days per month, it can be concluded that the results are satisfactory related to income generation.

Table 7 - Comparison of income resulting from ecotourism with per capita GDP in Alvarães. Source: MSDI and IBGE

Comparison of income	2008	2009	2010
Average family income (on the books) resulting from ecotourism	R\$ 2,840	R\$ 2,136	R\$ 2,570
GDP per capita Alvarães	R\$ 3,697	R\$ 3,944	ND

²⁰ working an average of 10 days per month

However, it is necessary to take care that these communities do not become dependent on the activity. In 2008, Peralta pointed out that, although the activity had not been envisioned as a substitute for other traditional economic activities, with the increase in income generated through ecotourism activities, the opportunity cost of agricultural activities increased. As a result, there was a decrease in the production of flour for family consumption on the part of younger families.

Table 8 - Estimate of income generated for communities through services, sale of products (fish and fruit), surpluses, tips and laundry services.

Year	Economic Benefits	Families	Average annual income from ecotourism per family ¹
1998	R\$ 1,672.61	17	R\$ 98.39
1999	R\$ 17,207.03	29	R\$ 593.35
2000	R\$ 20,936.95	33	R\$ 634.45
2001	R\$ 20,144.63	27	R\$ 746.10
2002	R\$ 68,868.00	25	R\$ 2,754.72
2003	R\$ 99,277.85	31	R\$ 3,202.51
2004	R\$ 184,479.59	34	R\$ 5,425.87
2005	R\$ 129,856.41	40	R\$ 3,246.41
2006	R\$ 104,241.66	42	R\$ 2,481.94
2007	R\$ 121,465.00	40	R\$ 3,036.63
2008	R\$ 204,455.55	72	R\$ 2,839.66
2009	R\$ 173,020.85	81	R\$ 2,136.06
2010	R\$ 195,290.48	76	R\$ 2,569.61
Total direct benefits (on the books)	R\$ 1,340.916		
Total direct benefits (not on the books - estimate)	R\$ 192,000		
Total	R\$ 1,532,917		

¹Does not represent total family income, but only income coming from ecotourism.

Municipalities of Alvarães and Uarini

During the period of 2002 to 2010, the Uakari Floating Lodge's activities generated average direct economic activity of approximately R\$ 33,000 per

year in the municipality of Alvarães ²¹, through the purchase of fish, agricultural products and rendering of services. At the same time, the municipality of Uarini ²² received an average annual amount of R\$ 17,200 through the payment of municipal service taxes (ISS).

Municipality of Tefé

Tefé is a key municipality for the region and it is where part of the services and suppliers used by the enterprise are concentrated. It has been calculated that the Uakari Floating Lodge generated for the city of Tefé approximately R\$ 2,560,000 between 2002 and 2010 through the purchase of food products, maintenance materials, fuel, salaries and other services. However, the total amount is greater since some visitors spend at least one night in the city of Tefé, spending money on hotels and restaurants in the municipality. If 10% of the visitors spent at least one night in Tefé and spent on average R\$ 150.00, the enterprise's estimated total annual economic activity (average) in the municipality would be approximately R\$ 293,000.

It is important to note that most of the ecotourists that visit the region come only to see the Mamirauá Reserve, which is due to the lack of alternative tourist activities in the municipality. As a result, each visitor spends less time in the region, and consequently, the average amount of money spent in the city is less.

²¹ The municipality of Alvarães is the closest to the enterprise (approximately 30 minutes by motorboat).

²² The enterprise is registered in the municipality of Uarini, Amazonas.

Mamirauá Institute Stores

Ecotourists that visit the Uakari Floating Lodge purchase products in the shops of Mamirauá Institute. It is estimated that each ecotourist spends R\$34.00 (based on information from 2011); therefore, the income generated by the stores through sales to ecotourists reached R\$ 190,000 in the period of 2002 to 2010.

Airline companies and travel operators

Access to the Tefé region requires an aerial connection from Manaus. Therefore, another sector that benefits from the existence of the enterprise is transportation. Considering that 90% of visitors arrive in Tefé by plane, it can be estimated that the average economic activity generated through the sale of tickets for the Manaus-Tefé-Manaus route is approximately R\$ 265,000 per year²³. The other 10% that arrive by boat spend on average R\$ 18,000 per year. It is important to note that this additional trip (Manaus-Tefé-Manaus) results in the majority of these visitors staying a night in Manaus, and therefore, spending money on taxis, hotels and food. However, these amounts will not be estimated in this study.

Another sector that benefits from the Uakari Floating Lodge is that of the tourism intermediaries (travel agencies and operators). It has been calculated that they receive an average of R\$ 37,000 per year through the payment of commissions. This amount does not include an estimate of the income generated by additional services that these operators offer to visitors of the Uakari Floating Lodge (flights, hotels, transfers, tours in Manaus, etc.).

Considerations regarding economic impact

Based on this study, it is possible to measure the economic impact that an initiative of this nature has on the regional economy. The analysis conducted indicates that for each R\$1.00 invested in the Uakari Floating Lodge, this ecotourism initiative generates regional economic activity of at least R\$ 4.72 (see Table 9). These results demonstrate the multiplier effect that an enterprise of this nature has and how the benefits have regional reach.

Table 9 - Relationship of investment to economic activity generated until 2010.

Total of investments in the Uakari Floating Lodge	R\$ 1.776.238,54	For each R\$ 1.00 invested the ecotourism generated...
Income generated in the Reserve	R\$ 1.160.574	R\$ 0,93
Income generated in the MISD store	R\$ 190,000	R\$ 0.11
Income generated in surrounding municipalities	R\$ 3,347,951	R\$ 1.88
Income generated by airline companies and agencies	R\$ 2,690,647	R\$ 1.51
Federal taxes, charges, and bank fees	R\$ 474,542	R\$ 0.27
Total economic activity generated	R\$ 8,363,714	R\$ 4.72

It is important to note that the external resources invested in the startup of the initiative came from international cooperation organizations and from the Brazilian government itself. From the beginning, it was understood that the objective of this investment was to foment an economic alternative. Thus, the analysis proves that, from an economic point of view, the invested resources obtained a significant return for the local society.

Furthermore, it should be noted that this analysis only deals with quantifiable economic benefits. There is also a series of other benefits that are more complex to measure but that need to be considered in projects with a socio-environmental focus, since they too generate important intangible benefits.

²³ A total of R\$ 2,367,000 from 2002 through 2010

Intangible benefits

Since it was established, the Uakari Floating Lodge has positioned itself as a unique enterprise, where traditional commercial logic carries lower weight than its other objectives. Therefore, when an evaluation of the results of a project of this nature is carried out, it is fundamental to consider the universe of benefits generated by the existence of the undertaking. There are techniques available that make it possible to assign an economic value to the socio-environmental benefits generated and thereby include them in the analysis of the feasibility of the project. This study does not quantify these externalities, but seeks to generate reflection regarding the reach of the impacts of an enterprise of this nature.

Ecotourism activities in Mamirauá are possible because of the conserved natural resources in the area, primarily the abundant fauna and the lush landscapes of the floodplain. Over the 13 years that ecotourism activities have existed in the Mamirauá Sector, they have contributed to an increase in the populations of key species in the area (caimans, *pirarucus*, jaguars, monkeys, etc.); to the reduction of invasions due to the increased presence of surveillance in the region²⁴; and to the creation of norms and mechanisms to stimulate conservation of natural resources in the area.

There is evidence that ecotourism in Mamirauá is contributing to the dissemination of a culture of sustainability among visitors, the not-for-profit sector and the media, as shown in the spontaneous report by renowned environmental journalist, Eliane Brum, published in the magazine *Época*²⁵.

²⁴ The Uakari Floating Lodge provided financial support to the environmental protection and surveillance system in and around the ecotourism area in the Mamirauá SDR for approximately nine years.

²⁵ (<http://revistaepoca.globo.com/Revista/Epoca/0,,EMI238946-15230,00-SE+A+AMAZONIA+E+NOSSA+POR+QUE+NAO+CUIDAMOS+DELA.html>)

The initiative played an important role in attracting resources and as a showcase for the institution (Mamirauá Civil Society and MISD) during the implementation of the MSDR management plan and the establishment of the institution (MISD). For many years, the enterprise served as a kind of demonstration project of the economic alternatives implemented in the MSDR.

The positive results achieved by the Uakari Floating Lodge resulted in two important international awards. The first was granted by the renowned U.S. Magazine *Cond Nast Traveler*, which considered the Uakari Floating Lodge to be the best ecotourism destination in the world in 2003. In the same year, the *Smithsonian*, together with the United States Tour Operators Association (USTOA) bestowed an award for sustainable tourism on the initiative. These two awards, in addition to other coverage in the media, gave MISD and MSDR high national and international visibility.

The activity is synergistic with research being done in the area which, in addition to economic benefits for the participating projects, generates visibility for them (with the potential for raising capital).

The ecotourism activities developed in Mamirauá have a core concern for minimizing impacts on the environment. To achieve this objective, the enterprise has been developing methodologies for monitoring and mitigating environmental impacts that have the potential to be replicated in other ecotourism initiatives.

Throughout its 13 years of operation, the initiative has received more than 50 invitations to present at symposiums, conferences, technical meetings, and other national and international events (India, Germany, Columbia, Peru, England, Chile).

The Uakari Floating Lodge has held more than 80 professional development events (courses, workshops, training seminars) with more than 1,000 participants throughout its 13 year history. It has been estimated that the initiative has trained a total of 150 to 200 people from the region for some type of ecotourism work. Currently, various trained members of the community have multiplied the effect by training others who want to work in this field.

Approximately 70 professionals of other initiatives in the Brazilian Amazon have received some type of training or have participated in exchange programs with the team at the initiative. Since 2010, the initiative's calendar of events has included a training course for multipliers of Community-based Tourism, with the aim of communicating lessons learned in the most targeted fashion, thereby contributing to the development of initiatives in other regions in the Amazon.

The Uakari Floating Lodge functions as a laboratory for research in ecotourism and conservation, contributing to the production of technical-scientific information. Throughout its 14-year history, the initiative has participated in the publication of 13 scientific works, in addition to having completed more than 30 project submissions to scientific events. In addition, the enterprise has contributed to the development of post-graduate and specialization theses, undergraduate scientific research projects (PIBIC), as well as one Masters dissertation. Between articles in national and international journals, chapters in books, and books the initiative has already published in collaboration with other organizations, 13 scientific works have been produced, in addition to 30 project submissions to scientific events. Moreover, the initiative

has assisted in the development of theses for undergraduate and graduate degrees, scientific research projects (PIBIC), as well as dissertations for Masters degrees.

Due to the fact that CBT is relatively new in the country – and Mamirauá is among the pioneering initiatives – the generation of this kind of information is of great value to support interventions in other localities.

Another factor that demonstrates the relevance of the CBT in Mamirauá is the reference to the initiative in innumerable studies undertaken by undergraduate and graduate students, both within and outside of the country. Currently, community-based ecotourism in the Mamirauá SDR is disseminated and studied in various universities in Brazil, especially in courses related to the theme of tourism in natural environments and the public use of Conservation Units.

FINAL CONSIDERATIONS

Many CBT initiatives are conceptualized as projects but fail for not having been considered (sufficiently) as products. The Uakari Floating Lodge is a project that was planned as a product, which followed important steps in its implementation (business plan, commercialization strategy, monitoring system). The results revealed in this study indicate that the Uakari Floating Lodge product has quality, since it has succeeded in meeting the expectations of demand. However, businesses in the area of ecotourism are not immune to factors that are beyond the control of their managers. In the case of Uakari Floating Lodge, the “dual blow” (airport closure followed by strong valuation of the Real) had a serious impact on financial performance, which after a promising start, ended up being unsatisfactory in the period analyzed – even

though the direct and indirect economic benefits have not been overshadowed.

The impact that these risk factors can create for initiatives with characteristics like the Uakari Floating Lodge (remotely located and with a differentiated management model) emphasize the need for better preparation for dealing with times of crisis.

In this phase of difficulties, the socio-environmental nature of the enterprise and the configuration of its management model – that assume a linkage to a not-for-profit organization – was important for the continuation of the activity. It should be confirmed that, if the enterprise were strictly a traditional business or had an integrated community management structure, it would have been more difficult to maintain its operation during the crisis, either due to the opportunity cost (traditional business) or the financial difficulties (community management).

However, the episodes of rate adjustment reveal the necessity for a broader business vision in decision making, in order to make processes more agile and efficient. Although the financial results were not satisfactory for the nine years analyzed, the study revealed the existence of other positive and important results, among them: the economic multiplier effect in the region, the benefits to conservation in the area, the benefits to the image of MSDR and MISD, the professional qualification of a great number of people, as well as the diffusion of knowledge to other initiatives in the Amazon.

Moreover, due to the fact that the initiative has good historical data, it is possible to monitor its performance (environmental, socio-economic, financial and operational), and collaborate to share the lessons learned with academia, the not-

for-profit sector, the business community and government.

The future presents a big challenge to the initiative, that is, to move forward with transferring management to local communities. With the results revealed in this and other studies, it has been possible to identify and measure important bottlenecks and challenges for the enterprise, and information such as this will contribute to the planning to reach the goal of transferring management. These challenges include: strengthening associations, refinement of the spaces for decision making, improvement of employee managerial skills, development of English skills for local workers and involving them in the commercialization of the initiative. To achieve all of this, a transfer plan will be developed and implemented, with the objective of proceeding in the most efficient way.

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PUBLICATION STANDARDS AND OTHER INFORMATION OF INTEREST TO THE COLLABORATORS OF UAKARI

INTRODUCTION

UAKARI is published by the Mamirauá Sustainable Development Institute - MSDI, a research unit of the Ministry of Science, Technology and Innovation. UAKARI was designed to publish results of original research in biodiversity conservation and sustainable and participatory use of the natural resources of the Amazonian biota. But, UAKARI focuses especially on the publication of the results of the researches developed in the Sustainable Development Reserves of Mamirauá and/or Amanã, or even in other Amazon sites with the support or sponsorship from the MSDI. Thus, UAKARI publishes texts on biological and environmental sciences in general as well as on human sciences related to the issue of biodiversity conservation in the Amazon.

This electronic publication is the responsibility of the Technical and Scientific Board of the Mamirauá Sustainable Development Institute and it is aimed at supporting and expanding the scientific capabilities of the research and monitoring programs of MSDI. The electronic (on-line) version of this magazine uses the worldwide web as the platform for dissemination. A short-run, hard copy version shall also be produced to be forwarded to depository libraries.

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The maximum paper extension is 20 to 25 pages for articles and reviews, between 5 and 10 pages for notes, and 5 pages for other sections, including references, tables, figures and legends. Special cases may be exceptionally considered.

The basic font in the text should be CG Omega. The title must be font size 11, and the parts and subtitles of the parts or sections must be font size 11, marked in bold. Words in italics will be used exclusively to designate the scientific names according to the international nomenclature use standards. Highlights in the text, other than scientific names, may be in bold. Only one level of subtitles on will be allowed in the final document (e.g.: title; 1.Part or Section; 1.1.subtitle)

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 2. Material and Methods - Brief description(s) of the study area(s) (whenever possible, with geographic coordinates), the sampling design, sample size and distribution, the methods used for collecting, organizing and analyzing data, and those pieces of equipment and materials which are absolutely necessary to be mentioned to result in proper understanding of the method applied. Details that do not interfere with understanding the text and the replicability of the study are unnecessary.
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4. Discussion - The results must be contextualized, compared where appropriate, and interpreted in order to answer the questions and hypotheses raised, and meet the goals set in the introduction.
5. Conclusion - It should be clear and appropriate to the objectives proposed in the study.
6. Acknowledgments (optional) - In this part, the author(s) can thank those people who played a key role in developing the study, in data collecting and analyzing, in drafting of texts and even involved in further revisions. Also, the institutions providing support to research must be mentioned and, where appropriate, the numbers of permits granted for collection and transporting biological material, material collected for genetic analysis, etc.
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PROJETO MAMIRAUÁ. **Síntese do plano de manejo**. Brasília: Sociedade Civil Mamirauá CNPq, IPAAM, 1996. 96p.

Book chapters:

HENDERSON, P. Aspectos do meio ambiente aquático. In: QUEIROZ, H. L.; CRAMPTON, W. (Ed.). **Estratégias para manejo dos recursos pesqueiros em Mamiraua**. Brasília: Sociedade Civil Mamiraua; IPAAM; CNPq. p. 128-138.

Journal articles:

MAGURRAN, A. E.; QUEIROZ, H. L. Partner choice in piranha schools. **Behaviour**, v.140, p.289-299, 2003.

Proceedings of scientific meetings:

BALENSIEFER, D.C.; BERNHARD, R.; RAEDER, F.L.; VOGT, R.C. Population structure of *Podocnemis unifilis* (Podocnemidae) in the Mamirauá Sustainable Development Reserve, Amazonas, Brazil. In: CONGRESSO LATINOAMERICANO DE HERPETOLOGIA, 6., 2003, Lima. **Programa e resúmenes**. Lima: Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, 2003. p.30.

Theses and dissertations:

SILVEIRA, R. Monitoramento, **Crescimento e Caça de Jacaré-Açu (*Melanosuchus niger*) e Jacaretinga (*Caiman crocodilus crocodilus*)**.2001. 102 f. Tese (Doutorado) - Universidade do Amazonas; Instituto Nacional de Pesquisas da Amazônia, Manaus, 2001.

MARIONI, B. **Comportamento Alimentar do Jacaré-Açu (*Melanosuchus níger*) e do jacaretinga (*Caiman crocodilus crocodilus*) na Reserva de Desenvolvimento Sustentável Mamirauá**. 2002, 50f. Monografia de conclusão (Graduação) - Université de Neuchâtel, Suíça, 2002.

Electronic documents:

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