

ABSTRACT

The Ecological Sustainability of Ecotourism in Manu Reserved Zone, Peru

Isabelle Alvarez

September 2004

Prepared in partial fulfillment of the requirements for MEDES (Environmental Science)
Degree in the Faculty of Environmental Design, University of Calgary

Supervisor: Dr. Grant Ross

This Master's Degree Project analyzes for the period 1995-1998 the ecological sustainability of ecotourism in Manu Reserved Zone (MRZ), a protected area of the southeastern Amazonia rainforest of Peru. MRZ is part of a biosphere reserve that also includes a national park and a multiple use zone. The study focuses on the lowland rainforest area of Salvador, the most popular destination for tourism in MRZ and in the entire biosphere reserve.

Tourism activity in MRZ, which was initiated in 1980, has increased almost constantly since 1994, with an average of 1510 tourists yearly for the period 1995-1997. The busiest tourist period of the year is July-September, which corresponds in part to the dry season (May-October).

Tourism in MRZ takes place in a relatively undisturbed tropical environment that holds one of the world's highest levels of biodiversity. MBR harbors 190 species of mammals (ranked third in the world), including 13 species of monkeys (world record), approximately 1000 species of birds (world record), 147 species of amphibians and reptiles and among the invertebrates 1300 species of butterflies (one of the world's richest areas). In addition, 2,874 botanic species have been identified. The lowland rainforest is the dominant type of vegetation in MBR and the most diverse in plants and wildlife species. Among the latter, seven species are endangered, including the giant otter, a top predator of most concern in this study. Manu is also home to native communities, the Machiguenga group being the most numerous. Non-native communities also can be found in the higher lands of the biosphere reserve and in its surrounding lands.

The analysis of sustainability was done using indicators of ecological impact for Salvador. Data on these indicators were obtained using several research techniques including field observations, survey research, interviews, literature review and others. A total of 16 indicators were studied for the following resources: wildlife, soil, vegetation, and water. The analysis has shown that tourism in Salvador did impact negatively the environment (seven indicators) and that wildlife, vegetation and soil were definitely affected. The analysis failed to demonstrate any negative impact on water. With regard to wildlife, tourism impacted negatively the giant otter. This impact was considered very severe, all the more since the giant otter is an important keystone species (e.g., one of the

largest predators of Manu and an endangered species). Damage to vegetation and soil compaction were the most severe type of impact on soil and vegetation. Impacting activities for soil and vegetation were walking and camping, and for the giant otter the use of the catamaran on the lake. The tourists, the personnel of Manu tour companies, the people who worked for Ecotur Manu, and the wardens directly caused the impacts. Indirectly, the people who make the decisions on tourism in Manu also contributed to the impact and are the main ones responsible. The study of significance of the impacts shows that only the impact on the giant otter should be considered significant.

However, tourism is more sustainable than any other activities taking place inside and outside MRZ. It seems to be the type of use of wildlife and land that can be the most compatible with conservation.

The sustainability of tourism in Manu can be improved if the recommendations made are followed, and in particular those that relate to information and education (e.g., of the guides, other tourist personnel, and the wardens). It is also recommended that the catamaran be eliminated from the lakes and that more sustainable alternatives to watch the otters, such as observation towers, be adopted. A holistic approach where there is a balance between protecting the environment and other interests (i.e., the tourists) is necessary. Once in the hands of all tourism players, the recommendations still depend on political will for implementation.

Key words: tourism and ecotourism, sustainable development, ecological impact, ecological sustainability, indicators, tropical rainforest, ecosystems, keystone species, endangered species (giant otters), reserved zone, Manu Biosphere Reserve, Peru.

RESUMEN

La sostenibilidad ecológica del ecoturismo en la Zona Reservada del Manu, Peru

Isabelle Alvarez

Septiembre 2004

Preparado para el cumplimiento parcial de los requisitos para el título de MEDes¹ (Ciencias Ambientales) en la Facultad de Diseño Ambiental, Universidad de Calgary

Director de Tesis: Dr. Grant Ross

Este proyecto de Master analiza para el período 1995-1998 la sostenibilidad ecológica del ecoturismo en la Zona Reservada del Manu (ZRM), un espacio protegido de la selva amazónica del Perú ubicada en el sureste del país. La ZRM forma parte de una reserva de la biósfera la cual también incluye un parque nacional y una zona de uso múltiple. El estudio se centra en la zona de selva baja de Salvador, el destino turístico más popular de la ZRM y de toda la reserva de la biósfera.

La actividad turística en la ZRM, la cual se inició en 1980, ha aumentado de forma casi constante desde 1994, con un promedio de 1510 turistas al año durante el período 1995-1997. La época turística más importante del año es julio-septiembre, la cual corresponde en parte con la época seca (mayo-octubre).

El turismo en la ZRM se desarrolla en un entorno tropical relativamente poco alterado que tiene uno de los niveles de biodiversidad más altos del mundo. La Reserva de la Biodiversidad del Manu (RBM) alberga 190 especies de mamíferos (el tercer lugar en importancia del mundo), incluyendo 13 especies de monos (récord mundial), aproximadamente 1000 especies de aves (récord mundial), 147 especies de anfibios y reptiles, y, entre los invertebrados, 1300 especies de mariposas (una de las zonas más ricas del mundo). Además, 2874 especies botánicas han sido identificadas. La selva baja es el tipo de vegetación que domina en la RBM. También es el tipo de selva más diverso en plantas y animales. Entre los animales, siete especies están en peligro de extinción, incluyendo al lobo de río, un depredador principal de mayor interés en este estudio. Manu también es el lugar donde viven comunidades indígenas, siendo el grupo de los Machiguenga el más numeroso. Comunidades no-indígenas se encuentran en las tierras más altas de la reserva de la biósfera y en sus alrededores.

El análisis de sostenibilidad fue hecho utilizando indicadores de impacto ecológico para Salvador. La información sobre estos indicadores se consiguió utilizando varias técnicas de investigación, incluyendo observaciones in-situ, encuestas, entrevistas, y repaso bibliográfico, entre otras. Un total de 16 indicadores fueron estudiados para los recursos siguientes: fauna, suelos, vegetación, y agua. El análisis ha mostrado que el turismo en Salvador impacta negativamente el ambiente (según siete indicadores) y que la fauna, la

¹ Master of Environmental Design (Master de Diseño Ambiental)

vegetación y los suelos fueron definitivamente afectados. El análisis no logró mostrar un impacto negativo sobre el agua. En cuanto a la fauna, el turismo impactó negativamente al lobo de río. Este impacto fue considerado muy grave ya que el lobo de río es una especie clave importante (por ejemplo uno de los más grandes depredadores de Manu y una especie en peligro de extinción). El daño a la vegetación y la compactación del suelo fueron los impactos más graves sobre la vegetación y los suelos. Las actividades que impactaron los suelos y la vegetación fueron las caminatas y los campamentos, y lo que impactó al lobo de río fue el uso del catamarán en la cocha (lago). Los turistas, el personal de las empresas turísticas de Manu, la gente que trabaja con Ecotur Manu, y los guarda parques causaron los impactos de forma directa. Indirectamente, las personas que toman las decisiones sobre el turismo en Manu también contribuyeron al impacto y son los principales responsables. El estudio de la importancia o trascendencia de los impactos muestra que sólo el impacto sobre el lobo de río debería ser considerado significativo o trascendente.

Sin embargo, el turismo es más sostenible que cualquier otra actividad que se desarrolle dentro o fuera del parque y de la zona reservada. Parece ser el tipo de uso de los animales y de la tierra más compatible con conservación.

La sostenibilidad del turismo en Manu puede ser mejorada si las recomendaciones propuestas son implementadas, y en particular las que tienen que ver con información y educación (por ejemplo de los guías y otro personal turístico, y de los guardaparques). También se recomienda que el catamarán ya no sea utilizado y que alternativas más sostenibles para observar los lobos de río, como por ejemplo las torres de observación, sean adoptadas. Una visión holística donde haya un equilibrio entre la protección del medio ambiente y otros intereses (por ejemplo los turistas) es necesaria. Una vez que las recomendaciones estén en manos de todos los actores del turismo, su implementación aún dependerá de la voluntad política.

Palabras claves: turismo y ecoturismo, desarrollo sostenible, impacto ecológico, sostenibilidad ecológica, indicadores, selva tropical, ecosistemas, especies claves, especies en peligro de extinción, zona reservada, Reserva de la Biósfera de Manu, Perú.

EXECUTIVE SUMMARY

The Ecological Sustainability of Ecotourism in Manu Reserved Zone, Peru

Isabelle Alvarez
September 2004

Prepared in partial fulfillment of the requirements for MEDES (Environmental Science)
Degree in the Faculty of Environmental Design, University of Calgary

Supervisor: Dr. Grant Ross

This Master's Degree Project (MDP) analyzes for the period 1995-1998 the ecological sustainability of ecotourism in Manu Reserved Zone (MRZ), a protected area of the southeastern Amazonia rainforest of Peru. MRZ is part of a biosphere reserve (Manu Biosphere Reserve/MBR) that also includes a national park (Manu National Park/MNP) and a multiple use zone (MUZ). The study focuses on the lowland rainforest area of Salvador, the most popular destination for tourism in MRZ and in the entire biosphere reserve. Manu holds one of the world's highest levels of biodiversity (e.g., 190 species of mammals [ranked third in the world], approximately 1000 species of birds [world record], 2,874 botanic species) and includes seven endangered species, the giant otter being one of them and the species of most concern in this study. Manu is also home to native communities (e.g., the Machiguengas, and the Quechua Andean communities) and non-native communities (i.e., settlers).

Goal and objectives

The goal of this MDP is to do an analysis of the ecological sustainability of ecotourism in MRZ, and more precisely in the area of Salvador. The research objectives of the project are: to define the key concepts of ecotourism, sustainable development (and ecological sustainability), ecological impact, and reserved zone; to analyze the ecotourism activity in MRZ, and more precisely in the area of Salvador; to measure the ecological sustainability of ecotourism in Salvador through indicators; and to recommend ways of improving the ecological sustainability of ecotourism in Salvador and the rest of MRZ.

Methodology

The analysis of ecological sustainability was done using indicators of ecological impact for Salvador. A total of 16 indicators were studied for the following resources: wildlife, soil, vegetation and water. Data on these indicators were obtained using several data collection techniques (DCTs). Once collected, data was processed and analyzed.

A. Data collection techniques

1) Primary DCTs

a) Interviews (IN)

Most IN were unstructured (did not involve a questionnaire) and were conducted in Spanish, English and French. Most were conducted in private and face-to face. Two hundred and thirty two people were interviewed (see List of Interviews at the end of my thesis document). Interviewees were representatives of NGOs, tour companies, tourists lodges and other tourism enterprises, consulting companies, associations, government agencies, protected areas, and academic officers (i.e., directors, administrators, teachers and professors). IN were also held with students, guides, members of local communities, and two priests. Some of the interviewees were specifically chosen because they were key informants. IN usually did not last more than an hour. Results from the IN are incorporated within the entire document.

b) Research surveys (RS)

Eight RS were conducted (tourist survey, tourist survey on the Limonal visitor center, guide survey, other tourists personnel survey, cook survey, social carrying capacity survey, indigenous community survey, non-indigenous community survey) but only the five first applied in the end. Nonetheless, the other three provided some useful information (See Chapters 4 and 5).

➤ Tourist survey (TS) (1996)

The purpose of the TS was to elucidate, through the tourists to MRZ, information on ecological, economic and socio-cultural indicators. The TS also aimed at obtaining information on the MRZ tourist product and tourists. One hundred and forty seven tourists were interviewed. The questionnaire was available in Spanish, English and French, and consisted of 29 main questions. It took between 30 and 45 minutes to complete. The questionnaire consisted of both opened-ended and closed-ended questions (mainly). Some questions offered a choice of responses that were scaled (nominal, ordinal [Likert scale] and interval scales). The survey was implemented during the tourist season (dry season) of Manu and at two locations: on-site in Salvador (mainly) and in Cusco. Two techniques were used to administer the questionnaires: (1) in-person interviews, (2) the respondents filled in the questionnaires themselves.

➤ Tourist survey on the Limonal Visitor Center (TS-LVC) (1996)

The purpose was to collect data that could be useful or meaningful for the analysis of the reproduction success of the giant otter (the species most concerned with regard to the impact of tourism in MRZ). The TS-LVC used an interview sheet of six columns (equivalent to 6 questions). In face-to-face situations, interviews took only a few minutes. Interviews were conducted at the same time and the same way as the tourist survey, both on-site in Salvador or in Cusco. Seventy six tourists responded to the questions and in most cases they were the same respondents of the tourist survey.

➤ Guide survey (GS) (Aug. 9-Sept 17, 1996)

The purpose of the GS was to elucidate, through the guides to MRZ, information on ecological, economic and socio-cultural indicators. Eleven guides (those who most frequently guided in Manu) working with seven tour companies (Aventuras Ecológicas Manu, EcoAmazonía, Expediciones Manu, Expediciones Vilca, Manu nature Tours and Pantiacolla Tours) were interviewed. The seven tour companies were the only companies authorized to operate in Manu in 1996 and the only ones with the capacity to do so. The questionnaire

consisted of both opened-ended and closed-ended questions. Multiple choice questions used the nominal or ordinal scales. The questionnaire had 20 main questions and required approximately 20 minutes to complete (see Appendix 6A). The questionnaire was available only in Spanish since all the guides spoke Spanish.

➤ Other tourists personnel survey (OTPS) (Aug. 9-Sept 17, 1996)

The purpose of OTPS was to elucidate, through the other tourist personnel (helmsmen, spotters, cooks and cook's assistants), information on ecological, economic and socio-cultural indicators. The OTPS used an interview sheet of 16 columns (equivalent to 16 questions). Interviews took approximately 15 minutes and were conducted on-site in Salvador. A total of 37 people were interviewed.

➤ Cook survey (CS) (Aug. 9-Sept 17, 1996)

The purpose of this survey was to elucidate, through the cooks and cooks' assistants who worked in Salvador, information on ecological, economic and socio-cultural indicators on the one hand, and information on the issues of food, garbage, kitchen and hygiene on the other. An interview sheet of seven main columns (equivalent to 7 questions) was used. It took approximately 10 minutes to complete. All interviews were conducted on-site in Salvador and in-person. A total of 30 people were interviewed.

c) Direct on-site observations (Field observations [FO])

FO were made mainly in A1 (Salvador) and to a lesser extent in A2 (All other areas of MBR, including the MUZ, MNP, and the rest of MRZ). In Salvador, observations were made on four natural resources (wildlife, soil, vegetation and water), on people and their equipment, on infrastructure, and on the giant otters. They took place in 1996, 1997 and 1998. Observational activities included walking, watching, listening, smelling, counting, measuring, recording and photographing. Observations were either written down on field observation sheets (FOS) or tape-recorded. Nine FOS were used: for the trails, the CGs¹, the lake, the beach and others. A map of the trails and lake of Salvador and a schematic reproduction of each CG were also used to ease the collection of data and help monitor changes over time. The map was very useful in finding the way in the forest. Photographs, and especially slides, were used largely in this project. In A2, FO were made on park infrastructure, tourist lodges and other tourism infrastructure, tourism activities, the tourists and tourist personnel, the local communities, means of transportation, and others. In most cases FOs were not needed and observations were written down in notebooks as they were made. Photos were also taken.

d) Personal communications (PC)

PC are a primary DCT that have served the purpose of collecting additional information and obtaining clarification on research issues. This technique was used during the period Fall 1995-Sept. 2003, and especially between 1999 and 2003, period during which I was writing the document and realized that I was lacking information on some issues or that some information already collected was unclear. I corresponded with 64 individuals from 15 countries (see List of Personal Communications at the end of my thesis document). These individuals were representatives of different organizations including NGOs, tour companies, consulting companies, universities (researchers, professors, directors, students), government agencies and protected areas. Their background was in biology, anthropology, forestry, tourism, planning, architecture or management. I communicated more than once with some individuals, especially when they were key informants (e.g., C. Schenck, M. Foster and M.

¹ CG: Camping ground

van Vlaardingen). Correspondence was made in English, Spanish and French and mainly by email. The information collected with this technique was incorporated within the entire document and individuals were identified when the data was very specific.

e) Informal conversations (IC)

IC took place at all times during the research project and with different types of people. They were spontaneous and did not involve taking notes at the time of the conversation. If necessary, notes were taken afterwards, when away from the people.

2) Secondary DCTs

a) Literature review (LR)

A thorough LR was made throughout all the study, while in Calgary before leaving for Peru, in Peru and other countries (e.g., Colombia and Brazil), and after returning to Calgary. The LR took place at a variety of institutions including universities, government agencies, tourism companies and other enterprises, NGOs, museums, and others. The LR was also done through the internet. Topics reviewed included: tourism and ecotourism, sustainable development, ecological impacts, protected areas, Manu (e.g., wildlife, vegetation, soil, water, local communities), wildlife management and conservation, wildlife-human interactions, rainforest ecosystems, rainforest ecology, indicators, carrying capacity, Limits of Acceptable Change, and Recreation Opportunity Spectrum.

b) Personal observations (PO)

Data was also collected through observations made elsewhere than in the area of study at large and that in most cases took place before this research project (e.g., observations made when working or doing research in parks in other countries).

c) Other sources of information (OSI)

OSI include nine events (e.g., conferences, seminars, courses) that were attended in Peru, mainly in Lima and Cusco, in 1995 and 1997, with the purpose of obtaining information on Manu Biosphere Reserve, institutions working in Manu, local communities, conservation problems and sustainable development issues in Manu, environmental law applied to protected areas, ecotourism, and other issues.

B. Data analysis

Results of the surveys and of part of the field observations, as well as other quantitative data, were tabulated. Once tables (one-way tables and contingency tables) were made with the help of electronic spreadsheets, I was able to calculate percentages and averages, study the relationship between variables, and draw graphs and other graphical representations.

Conclusions

The analysis of the ecological impact of tourist activities taking place in the area of Salvador, MRZ, during the period 1995-1998, has shown that tourism did impact negatively the environment, and that natural resources that were definitely affected were wildlife, vegetation and soil (Table 1). The analysis failed to demonstrate any negative impact on water (lake and river). Of the total 16 indicators studied (Table 2), nine and a half were conclusive. Of these, seven have shown that tourism had a negative ecological impact in Salvador and include most indicators (five out of six) for vegetation and soil, and one of the five indicators for wildlife. For four indicators the impact of tourism was considered "more severe".

Table 1 - Characteristics of the impacts of tourist activities in Salvador, MRZ

IMPACTING ACTIVITIES	IMPACTED RESOURCES	MAIN TYPES OF IMPACTS	HABITATS WHERE IMPACTS OCCURRED (and specific areas)
The use of the catamaran	Wildlife (giant otter)	<ul style="list-style-type: none"> • Reproduction success 	Lake (Cocha Salvador)
Walking	Vegetation	<ul style="list-style-type: none"> • Damage to vegetation: destruction of GCV, mechanical injuries to trees and other plants • Removal of organic matter* 	Forest (trails and CGs)
	Soil	<ul style="list-style-type: none"> • Compaction • Erosion* 	Forest (mainly trails)
Camping	Vegetation	<ul style="list-style-type: none"> • Damage to vegetation: destruction of GCV, mechanical injuries to trees and other plants • Removal of organic matter* 	Forest (CGs)
	Soil	<ul style="list-style-type: none"> • Erosion 	Forest (CGs)
Construction, maintenance and expansion of trails and CGs	Vegetation	<ul style="list-style-type: none"> • Damage to vegetation: destruction of GCV, mechanical injuries to tree and other plants 	Forest (trails and CGs)

NOTE: *Impact that is not very severe

KEY TO SYMBOLS:

GCV = Ground cover vegetation

CGs = Camping grounds

Table 2 - Indicators studied and their results

NATURAL RESOURCE	INDICATOR	CONCLUSIVE			NOT CONCLUSIVE
		NEGATIVE IMPACT		NO NEGATIVE IMPACT	
		MORE SEVERE	LESS SEVERE		
WILDLIFE	Wildlife species diversity				x
	Presence of keystone species			x	
	Wildlife reproduction success	x			
	Presence of noise				x
	Presence of litter				x
SOIL AND VEGETATION	Damage to vegetation	x			
	Trail and CG development	x			
	The presence of organic matter		x		
	Soil compaction	x			
	Soil erosion		x		
	Presence of fire rings			x	
WATER	pH			x (lake)	x (river)
	Nutrients				x
	Suspended solids				x
	Coliform bacteria				x
	Presence of wildlife species			x	
TOTAL	16	4	2	3.5	6.5

1) Impact on wildlife

Tourism impacted negatively at least one wildlife species in Salvador: the giant otter. It affected its reproduction success. The impacting activity was the use of the catamaran to tour the lake (Cocha Salvador) and observe wildlife. The impact of tourism on the otter was considered very severe, the most severe of all the studied impacts on wildlife, since this species is an important keystone species, probably the most important one among the keystone species observed in Salvador. What makes it be an important keystone species is that it is one of the largest predators of Manu, it is an endangered species, it has a large home range, it is hunted, and it is very sensitive to human activities.

2) Impact on vegetation and soil

Tourism impacted negatively the vegetation and soil by causing damage to the vegetation, removing organic matter, compacting soil, and eroding soil. Damage to vegetation and soil compaction were the most severe. Damage to vegetation included the destruction of GCV and mechanical injuries to trees and other plants; the latter was the most common type of damage. The expansion of trails and CGs caused more damage to vegetation. Damage to vegetation was caused more by the construction and maintenance of trails and CGs than by use (walking and camping). One indicator (the presence of fire rings) showed that tourism did not have a negative impact on vegetation.

Vegetation species of concern include species of the *Ficus-Cedrela* Zone, where most camping sites were found, and species of the late successional forest, where most trails were located. Dominant species of the *Ficus-Cedrela* Zone include the fruiting *Ficus insipida* (Moraceae), the tall, large, and very valuable timber tree *Cedrela Odorata* (Meliaceae), and the understory *Heliconia* spp. (Musaceae). All dominant species of the late successional forest include trees: *Ceiba* spp. (Bombacaceae), *Ficus* spp. (Moraceae), *Poulsenia* sp. (Moraceae), *Dipteryx* spp. (Leguminosae), and *Calycophyllum* sp. (Rubiaceae).

3) Impact on water

Indicators analyzed failed to prove any negative impact of tourism on water. On the contrary, two indicators (water pH for the lake and presence of wildlife species) showed that tourism did not have any negative impact on water in Salvador.

4) Impacted habitat and specific recreational areas

The analysis has shown that two habitats, the forest and the lake, were definitely negatively affected by tourism. Impact on vegetation and soil took place in the forest: on and along trails (mainly A-B-C) and in and around CGs (impact on vegetation mainly at C3, and impact on soil mainly at C4). Impact on wildlife (giant otter) happened at Cocha Salvador.

5) Impacting activities (and related impacts)

Tourist activities that originated the demonstrated negative ecological impacts were the use of the catamaran to tour the lake, walking, and camping. Other impacting activities related to tourist activities include the construction, maintenance and expansion of trails and CGs.

The potential exists for other species and water to be negatively impacted by tourism, and for other tourist activities or tourist-related activities to cause these impacts (e.g., tourist activities in Salvador produced noise which originated mainly from motorized boats, and these boats discharged oil and gasoline residues in the River Manu). The lack of information did not allow demonstrating that noise had an impact on wildlife or that residues from boats had an impact on the quality of the river waters and on its living organisms. In addition, it is easier to show the impact on vegetation and soil than the impact on wildlife, since vegetation and soil resources are motionless and impact on them, at least some of it, is visible. This

could explain why only one indicator for wildlife and two indicators for water were conclusive against five for vegetation and soil. Furthermore, some impacts can only be detected in the long term (e.g., effects of human activities on erosion may not be detected fully for ten years or more).

In 1996, an improvement seemed to have been made by prohibiting camping on the beach because camping led to a greater protection of beach nesting birds and turtles, but the alternative camping activity, that is camping in the forest, caused in turn more impact on vegetation and soil.

6) People causing the impacts (Table 3)

People who directly caused the impacts include the wardens, the people who worked for Ecotur Manu² during the period 1995-1996, the personnel (guides and others) of MTCs, and the tourists.

Table 3 - People who, directly or indirectly, caused the identified negative impacts in Salvador, MRZ

IMPACT	DIRECTLY	INDIRECTLY
Damage to vegetation	1) Mainly: <ul style="list-style-type: none"> • the wardens: opening and maintenance of trails and CGs • the people working for Ecotur Manu (for the period 1995-1996): opening and maintenance of trails and CGs • the personnel (guides and others) of MTCs: expansion of CGs, maintenance of CGs (since 1997), walking 2) The tourists: walking	Park authorities (INRENA) MTCs Ecotur Manu (1995-1996) MITINCI Perhaps others
Damage to soil	1) Mainly the tourists (largest group of people): walking and camping 2) The personnel (guides and others) of MTCs: walking, camping	
Impact on the giant otter reproduction success	The tourists, accompanied by their guides and sometimes other members of personnel: touring the lake on the catamaran	

KEY TO SYMBOLS:

MTCs = Manu Tour Companies

Indirectly, the impacts were caused by the people who make the decisions on tourism in Manu (park authorities: INRENA³), MTCs, Ecotur Manu (in 1995 and 1996), the MITINCI⁴, and perhaps others. These are the main groups of people responsible for the caused impacts.

7) The behavior of tourist groups with regard to wildlife, vegetation and soil, and water

Most **tourists** who visited Manu generally behaved conscientiously towards the rainforest, and whatever impact they could have caused was unintentional. Several reasons explain why it is very unlikely that the tourists would act intentionally to spoil the environment: they traveled far and paid a lot of money to see Manu; they also knew what a protected area was, and that MRZ was a protected area; and they traveled to Manu because they wanted to

² Ecotur Manu is an association of Manu Tour Companies.

³ INRENA: Instituto Nacional de Recursos Naturales (Peru’s National Institute of Natural Resources).

⁴ MITINCI: Ministerio de Industria, Turismo, Integración y Negociaciones Comerciales Internacionales (Peru’s Ministry of the Industry, Tourism, Integration and International Commercial Negotiations).

discover and enjoy the jungle. In addition, if their activities (walking, camping, or the use of the catamaran) produced negative impacts, these impacts were not intentional. All the activities that tourists do in Salvador are the activities that are proposed to them by the tour companies and that are authorized by the park authorities. Considered that way, tourists are not responsible for the impacts that their activities may produce. However, perhaps some of them, although a minority, should be a little more careful about litter (a candy wrapping easily falls out of a pocket), the way they used the forest or the beach as a bathroom and the way they left toilet paper around. But in the end it is really up to the guides and the tour companies to convey the necessary information to their tourists.

Generally, the **guides** behaved correctly with regard to the environment in Salvador. Nonetheless, some of them, although a minority, did not always do the best thing, either because they were not careful or conscious enough, not well informed or trained, or because they thought that what they were doing was correct and was beneficial to the tourists. But here again it is the responsibility of at least the tour companies and park authorities to ensure that the guides of Manu behave correctly and do the right thing.

Cooks, cooks' assistants, helmsmen and spotters are the group of people who behaved the least well in Salvador. Most of them behaved positively with regard to noise and garbage. However, their behavior was not so positive with regard to walking on the beach, making fire rings on the beach, camping on the beach, feeding wildlife, and clearing new sites and shortcuts that were not indispensable. Feeding wildlife, even if practiced only occasionally, and activities on the beach can be very impacting for wildlife, especially for beach nesting birds, and for turtles that come to lay their eggs. It can also be extremely dangerous for the tourists, especially when caimans become too habituated to humans.

Even if the amount of litter found was small, the personnel should make an effort to be more careful, especially with litter that biodegrade very slowly (usually called “non-biodegradable” such as plastic). Boatmen should also be more careful when working on the motors of their boats, especially when dealing with oil and gasoline. As for the guides, it is the responsibility of at least the tour companies and the park authorities to ensure that the cooks, cooks' assistants, helmsmen and spotters working in Manu behave correctly and do the right thing.

8) The significance of the ecological impact of tourism in Salvador (“Table 103”)

The significance of the negative ecological impacts of tourism in Salvador was measured by doing the following: 1) analyzing how much the ecosystem was affected, whether important species (e.g., keystone species, endangered species) were affected, how severe and long-lasting the impacts were; 2) examining the objectives of the protected area; 3) studying the spatial concentration of impacts; 4) comparing the impacts of tourism with the impacts of other activities. “Table 103” clearly shows that the impacts on vegetation and soil are not significant. With regard to the impact on the giant otter, there is a dilemma: on the one hand it is significant, on the other it is not. However, I think that the impact of tourism on the giant otter should be considered significant for the following reasons: it is the most significant of all the impacts of tourism identified in Salvador; the giant otter is an important keystone species, a top predator and an endangered species; the group of otters of Cocha Salvador is very important within the population of Manu, and the population of giant otters of Manu is very important in relation to the world otter population.

Table 103 - Significance of the impact of tourism in Salvador

Identified impacts	Factors of comparison (where applicable)													
	Impact on the ecosystem, species affected, and severity of impacts	Objectives of MRZ	Spatial concentration of impacts	Weather	River dynamic	Research	Hunting and fishing	Agriculture	Other threats	Logging	Gold mining	Oil and gas activities	Habitat destruction	Diseases of domestic animals
Impact on the giant otter	S	S	S			S	NS				NS	NS	NS	NS
Impact on vegetation	NS	S	NS	NS	NS	E		NS	NS	NS	NS	NS	NS	
Impact on soil	NS	NS	NS		NS	E		NS	NS	NS	NS	NS	NS	

KEY TO SYMBOLS:

S = Impact significant

NS = Impact not significant

E = Equivalent

9) Concluding remarks

Tourism in Salvador cannot be considered ecologically sustainable since it does impact negatively the environment and its impact on the giant otter is significant and compromises the integrity of the ecosystem. However, tourism in Manu can be considered a better alternative to any other activities taking place inside and outside MRZ. Among the different uses of wildlife and land, it seems to be the most compatible use with conservation. If we can speak of degrees of sustainability, tourism in Salvador and MRZ may not be absolutely sustainable from an ecological standpoint, but it is definitely more sustainable than any other human activity inside and outside MRZ.

Recommendations

The current and future ecological sustainability of tourism in Salvador can be improved if the following recommendations (specific recommendations and general recommendations) are followed.

A. Specific recommendations

These recommendations are given for each natural resource studied and, where possible, for each indicator.

1) Wildlife

a) Wildlife species diversity

This indicator was not conclusive but did show that all species existing in the *Amazónica* province of Manu were not observed in Salvador. To be more conclusive, it is recommended that more wildlife studies (e.g., studies on habitat, density, home range and biomass) be done in Salvador. Only these studies can help determine the exact or most probable reasons why all the species that occur in the *Amazónica* province of Manu were not observed in Salvador, which ones are really absent from the area, and which ones are scarce. Such studies should indicate if tourism activities account for the absence or scarcity of some wildlife species, and if populations are healthy.

b) Presence of keystone species

This indicator has shown that tourism did not have a negative impact on wildlife. However, not all keystone species that exist in the *Amazónica* province of Manu were observed in Salvador. Thus, it is recommended that further wildlife studies be done (e.g., the list of endangered and vulnerable species of Manu be updated regularly, the reproductive rate of more species be investigated).

c) Wildlife reproduction success

This study has shown that tourism had a negative impact on the reproductive success of the group of giant otters of Cocha Salvador and that the source of impact was the use of the catamaran to tour the lake. The following is recommended to improve the reproductive success of the giant otter: 1) prohibition of the tours of the lake, and use of observation towers and viewing platforms instead; 2) control of tourism activities, enforcement of regulations and norms by the wardens who should be more present in Salvador; 3) improvement of the quality of the viewing platforms so that they are more effective to observe the otters; their location should be carefully chosen; 4) people on shore trails should

be quieter and never walk off them or attempt approaching the margins of the lake; the regulation needs to be revised and improved with regard to shore trails (e.g., distance to lakeshore); more research on shore trails is needed; 5) the administrators and wardens of the park as well as the managers and personnel (especially the guides) of MTCs should be better educated (e.g., on the biology and ecology of the otters, low disturbance otter watching); 6) tourists should be educated on otters and low disturbance otter watching; 7) tourist promotion on Manu should not focus on the giant otter; 8) A conservation plan for the giant otters in southeastern Peru is needed; 9) The giant otter can serve as a flagship species and umbrella species in the rainforest of Manu.

d) Presence of noise

This study was not conclusive about the impact of noise on wildlife but did show that tourism produced some amount of noise. Thus, the potential for impact exists. In order for this indicator to be more conclusive, it is recommended that more studies on noise and wildlife be done (e.g., the impact on wildlife of the noise produced by the motorized boats, the hearing ability of different wildlife species, and the habituation of wildlife to noise). In order to reduce the amount of noise produced by tourism in Salvador it is recommended, among others, that noise produced by motorized boats be controlled (e.g., use of more silent motors), that no camping at all takes place on the beach, that the regulation be improved and enforced, that guidelines for the tourists on their behavior when being in Salvador be developed, and that the managers and personnel of MTCs as well as the administrators and wardens of the park be well informed on the impact of noise on wildlife and on the means for reducing noise.

e) Presence of litter

This study was not conclusive about the impact of litter on wildlife but did show that tourism produced some amount of litter. Thus the potential for impact exists. In order for this indicator to be more conclusive, it is recommended that more studies on litter be done in Salvador (e.g., the origin of the litter found on the beach and river shores, and the reasons for finding it; the food habit of wildlife; the impact of litter on those wildlife species that are most likely to be attracted by the presence of foreign supplemental food in the form of litter). In order to reduce the amount of litter that is found in Salvador, it is recommended that improvements are made with regard to: 1) garbage disposal and litter (e.g., all garbage should be taken out of Salvador and MRZ, and the wardens of Limonal should check all the boats leaving MRZ to make sure that it is done; the packaging of food items brought to Salvador should be improved; plastic litter items should be eliminated as much as possible; personnel should be trained on the proper disposal of waste and on how to do their work in a more environmentally friendly way; the 1997 regulation should be improved and enforced); 2) bathroom facilities (e.g., pit privies' condition should be improved; odors from the privies should be controlled; waste other than human feces, urine and toilet paper should not be disposed of in the pits; the 1997 regulation should be improved and address the issue of bathroom facilities).

f) Other recommendations for wildlife

These include, among others: the guides and other tourist personnel should not receive tips; the tourist personnel should not leave food (e.g., fresh vegetables) outside the tents; the guides should not fish piranhas; the tourist personnel should not feed or catch wildlife; activities on the beach should be restricted or limited to avoid disturbance to turtles (during the egg-laying, hatching and nest leaving periods) and beach nesting birds; the personnel

should not light fires on the beach; research needs to be tailored to specific species and specific situations because of differences between species; and more studies should be done on, for instance, primates, felids, birds, the habituation of wildlife to people, and the adaptability and durability (tolerance) of wildlife.

2) Soil and vegetation

a) Damage to vegetation, and trail and CG development

The present study has shown that damage to vegetation (destruction of GCV, and mechanical injuries to trees and other plants) was the most severe negative impact of tourism on the vegetation of Salvador. Damage to vegetation was mainly caused by the construction, expansion and maintenance of trails and CGs. The following can be recommended to reduce the extent of damage to vegetation caused by tourism in Salvador:

- Regulations and guidelines
 - Trails and CGs

Regulation and guidelines for trails and CGs should exist and be enforced. The regulation on trails should deal, among others, with the following: the people in charge of opening, closing and maintaining trails or trail sections; width of trails and types of trails; maximum length of trail systems; and distance of trails to shore. The regulation on CGs should deal, among others, with the following: the people in charge of building, closing and maintaining CGs or camping sites; area of camping sites; distance to water bodies; and capacity of CGs. There should be guidelines on the development and management of trails (e.g., best sites, trail layout, how and where to open and close trails, and engineering) and CGs (e.g., best sites for building CGs, layout of CGs, how to maintain CGs, and engineering). A trail manual and a CG manual for Manu are necessary and should include all guidelines for trails and CGs.

- Vegetation

Regulation and guidelines on damage to vegetation are needed. The regulation should mention, among others, that people should not damage the vegetation, at least intentionally, and that they should remove the least GCV as possible. The guidelines should address, for instance, how to avoid or minimize damage to vegetation (e.g., by staying on trails, using tent platforms).

- Design

Trails should be designed in consultation with biologists, ecologists and other experts.

- Management

Trails and CGs need to be better managed (e.g., how a CG is assigned to a tour company, and purposes for building a CG).

- Wardens

Wardens should be present in Salvador, at least during the entire tourist season, so that the amount of damage to vegetation would be reduced. Wardens should control, among others, the opening of new trails or trails sections, the clearance of new sites and intersite zones, the behavior of people on trails and in CGs.

- Information and education

- Signs

Inexpensive signs can be used to inform people (e.g., against carving initials, or about unauthorized trails or camping sites) and to give unambiguous directions to facilities (e.g., bathrooms, and garbage containers).

- What people should be educated on

People should be informed about the types of damage they may cause to vegetation and how to avoid them (e.g., walking in single file in order to prevent trail widening). The personnel of MTCs need to be educated, among others, about the maintenance and expansion of CGs and about walking on trails without the need of using machetes. The wardens need to be well trained (e.g., about cutting and removing vegetation, and closing trails and camping sites).

- Monitoring

Trail sections A-B and B-C should be more carefully monitored since these were the most transited trail sections and the trail sections where more damage to vegetation was observed.

- Limiting group size

Total CG capacity should be used to limit the number of persons using CGs, and thus to prevent the expansion of existing sites or the clearance of new sites, which would reduce damage to vegetation. Group size must be limited; a maximum should be defined.

- Closure

The reasons to close an area should be clearer to tourist groups (e.g., signs can be used for that purpose). Before closing an area an alternative area must always be identified. Tour companies and guides should be informed of the closure of sites and trails before groups arrive in Salvador so that plans can be adjusted. Trails and CGs that are not used by tourist groups should be closed. A trail or trail section should be closed if vegetation is more severely damaged than on other trails and if its width has increased considerably. Closure should allow revegetation. A system of rest-rotation should apply to both trails and CGs so that used areas are closed temporarily and get a chance to recuperate before being used again.

- Engineering

A raised trail or boardwalk could be built on trail A-B-C, the most transited and impacted trail, as an experiment against damage to roots and destruction of GCV. Engineering can also help prevent trail widening in muddy areas. Tent platforms can help reduce damage to vegetation.

- Expansion of CGs

To avoid the expansion of existing sites, it is recommended, among others, that the size of tents and groups be kept small, and that the capacity of CGs be defined before there are built. To avoid opening new sites, it is recommended, among other, that existing sites be cleaned, groups be kept small and adapt to the capacity of the CG. Where camping sites have been expanded, the limits should be clearly marked. Unauthorized shortcuts and new sites should be closed by placing obstructions and a sign at the entrance.

- Alternative to camping at ground level

People could camp in palm-thatched roof houses built above the ground (like the houses of the indigenous people) where they could sleep either in tents or under mosquito nets. With these houses less damage is caused to vegetation because new areas don't need to be cleared.

In order to know more about the damage to vegetation caused by tourism in Salvador it is recommended that studies are done, as for instance the following: monitoring and studying damage to vegetation on trails and in CGs over the long term; studying roots (e.g., exposed roots, death of trees because of damaged roots), the morphological and physiological characteristics of plants, keystone species, and plant diseases.

b) Presence of organic matter

This study has shown that this was the least severe negative impact of tourism on the vegetation of Salvador. By reducing the amount of organic matter removed, soil compaction, soil erosion and root exposure will also be reduced. The amount of organic matter that is removed by tourism in Salvador can be reduced through education of tourist personnel (on the importance of organic matter and thus on the reasons why it should not be removed), engineering (raised trails, especially on A-B-C, tent platforms, stairs in the access zones to CGs, and cooking and dining tents with wooden platforms), improvement of camping equipment (using cooking tents and dining tents with a floor, and using good mattresses), and an alternative to camping at ground level (palm-thatched roof houses built above the ground).

c) Soil compaction

To reduce compaction, which is inevitable, even with low use, it is recommended: 1) the closure of heavily compacted areas (trail sections, camping sites, intersite zones); 2) engineering (e.g., surfacing or hardening trails, bridging [mainly for muddy areas and quagmires], raised trails, and raised tent platforms); 3) camping in palm-thatched roof houses built above the ground. It is also recommended to do additional research on soil compaction in Salvador, especially to find out how long it takes for soils to reach their maximum compaction level and how fast soils recover from compaction.

d) Soil erosion

Although erosion was not very severe and the least severe negative impact of tourism on the soil of Salvador, it can still be reduced if: 1) trails and CGs are monitored closely; 2) severely eroded areas are closed and alternative areas are used; 3) engineering (surfacing, patching or re-grading) is required if closure of the area is not possible. Further studies on soil erosion (e.g., on agents of erosion) are also recommended.

e) Presence of fire rings

Although no negative impact on vegetation resulted from fire rings, it can still be recommended that: 1) the personnel do not light fires on the beach because of wildlife disturbance; 2) the regulation be improved and address the issue of fires (Fires should not be allowed at all in MRZ).

f) Other recommendations

These include: 1) the "linear spatial arrangement" of future CGs in Salvador or other areas of MRZ; 2) the construction of CGs and trails on more durable soils (less erosive and less prone to compaction) and more studies on the soils of Salvador (i.e., on their durability) to help develop guidelines for where to build CGs and trails; and 3) monitoring the condition of trails and CGs.

3) Water

a) pH

The present study shows that tourism did not affect negatively the pH of the lake but was not conclusive on the pH of the river. For this indicator to be more conclusive it is recommended that: the pH of the River Manu be updated; the pH of the River Manu and Cocha Salvador be monitored during the dry season and the rainy season (to make comparisons) and also once a month during the peak tourist period; the level of alkalinity of the River Manu and Cocha Salvador be measured so that we know the capacity of the water pH for change; and, as a

preventive measure, all detergents and body washing and hygiene products be low in acidic ingredients.

a) Nutrients

The present study was not conclusive on the impact of tourism on the nutrients of the water bodies of Salvador. For this indicator to be more conclusive, it is recommended that more studies be done on the nutrients released by tourism activities in Salvador, and, among others, on the quantity of nutrients that enters the water bodies of Salvador and on the increase in the concentration of phosphates and other nutrients because of tourism activities. In order to reduce the input of nutrients into the water of the River Manu, it is recommended, among others, that people do not bathe in the river but use showers and clothes and dishes are not washed in the river, and that boats have recycling devices. If bathing, laundry and dishwashing take place in the river, detergents and body washing and hygiene products should be phosphate and nitrogen free.

b) Suspended solids

The present study was not conclusive on the impact of tourism on the turbidity of the water of the River Manu and Cocha Salvador. For this indicator to be more conclusive, it is recommended that further studies be done. For instance, it is important to study how much tourism related activities increase the load of suspended solids. To prevent increased turbidity of the water of the River Manu because of tourism it is recommended that no bathing and washing take place in the river, or that detergents and body washing and hygiene products contain ingredients that do not affect water turbidity.

c) Coliform bacteria

The present study was not conclusive on the contamination of the water bodies by human coliform bacteria. For this indicator to be more conclusive, it is recommended that further studies be done. The following are some examples of what should be studied: methods (cathole and pit privy) used in Salvador for the disposal of human waste and the possible fecal contamination of water bodies by such methods; depth of the pits; and rate of water infiltration. In order to reduce the risk of fecal contamination of water, it is recommended that human waste (feces and urine) be removed from Salvador or that pit privies be used only after being improved, and that, in any case, tourist personnel be educated.

e) Presence of wildlife species

This indicator has shown that tourism did not have a negative impact on the lake habitat. However, it is recommended that more studies be done on species that, besides the giant otter, are good indicators of water quality.

f) Other recommendations

Seven more recommendations were made, among them that more studies be done on the impact of tourism activities on water resources in Salvador, and that the 1997 regulation be improved with regard to water and related activities.

B. General recommendations

1) Information and education

➤ The tourists, the managers of MTCs, the tourist personnel (guides and others), the wardens and the administrators of the park should be better informed and educated.

➤ Twenty-eight methods of education were indentified, as, for instance, printed material, interpretive trails, and courses.

- The 1997 regulation should be improved with regard to the training of both the personnel of MTCs and the wardens, and the education of all the people involved with tourism in Manu.
- Prior to their trip to MRZ, tourists should be well informed of the activities in Manu that are allowed and of those that aren't.
- The operating license of MTCs should be subject to the training of their guides and other personnel (i.e., in "sustainable tourism practices")
- Eight issues on the guides of Manu were recommended, among them: they should be of better quality (through more and better training); the park should be more involved in their training; their examination by the park should be improved; and guides should be interpreters.
- Other tourist personnel need more training and so, for instance, should be encouraged to accompany the tourists in their daily activities and go to the VIC⁵ and the library.
- The administrators of the park need, among others, to be better informed and educated to effectively manage the park.
- Eleven issues were recommended for the wardens, among them: more courses or seminars for wardens should be organized; they need to be better trained in order to deal better with visitors; they must have the will to protect wildlife; researchers can contribute to the education of the wardens; in-service training programs should be developed.
- The reasons for certain restrictions in the interest of conservation should be explained to the tourists and personnel of MTCs.
- Scholarships and other incentives should be proposed to encourage guides and wardens to pursue training in the English language.
- Guides and wardens should be encouraged to have a degree.
- Guides, managers of tour companies and wardens should keep informed of matters associated with management, tourism and conservation in Manu.
- Information should be shared as widely as possible so that others might benefit from it.
- Information on MNP and MRZ issues must be updated regularly.
- Courses, lectures and seminars should be organized by the public sector (the INRENA, the MITINCI, universities, research stations), the private sector (NGOs, tour companies), and other institutions such as the FZS⁶.
- The guides, other tourist personnel and the tourists can be better informed through signs too (e.g., directional, informative or explanatory, and regulatory signs)
- Education in Manu should also be done through interpretation. It is recommended, among others, that an interpretation plan be done for Manu. Also, interpretation techniques should include an interpretive center, interpretive trails, and interpreters.
- The infrastructure available for informing and educating people should be further developed (e.g., a nature education center).
- An educational book on the rainforest of Manu should be produced.
- More funding should be made available to information and education. The park administration should have a separate budget for information and education.

⁵ VIC: Visitor information center.

⁶ FZS: Frankfurt Zoological Society.

2) Research and monitoring

More research is needed, as for instance on the following: the ecological impact of tourism on the natural resources of Manu; community structure (e.g., species diversity, dominant species); and site durability. Long term studies of tourism impacts are needed in Manu. Also, students should be encouraged to do their thesis on issues related to the problematic of conservation and the impact of tourism.

- Research in Manu should be managed and planned according to priorities. Universities should be aware of the research needs of the park.

- The administrators of the park should be research-oriented.

- The park administration should control all research in Manu.

- In-house research organization: the park administration should have its own researchers

- Research infrastructure should be improved. For instance, Limonal and Pakitza should have some space available for researchers.

- More funding should be made available to research in Manu. In particular, the park administration should have a separate budget for research to make sure that research will be funded.

- Study techniques should be improved: mapping of the locations that are particularly sensitive should be done in Salvador.

- Seven recommendations were made with regard to communication and cooperation, among which: research results, usually communicated to the INRENA, must also be communicated to tour companies (managers and guides), NGOs, and the wardens; the park administration should make sure that research results are available for free consultation by tour companies (managers and guides), NGOs, students and any other interested party; the existing park library located in Lima should be improved.

- Monitoring is needed. A monitoring program is needed for Salvador, for instance to follow the evolution of the condition of the natural resources exposed to tourism. Standards should be developed for monitoring impacts. Aspects that would need to be monitored over time in Salvador include, for instance, the number of keystone species, and the length and width of trails.

- Research and monitoring should be an integral part of the management of Salvador, MRZ and MNP. Also, the Tourism Management Plan for MBR should include a section or chapter on research and monitoring. The 1997 regulation should be improved and be more specific on the issue of research and monitoring.

- The park administration should explore all the options available (e.g., wardens, students, and consultants) to accomplish its research and monitoring needs.

3) Regulations and guidelines

- One of the recommendations made for the regulations is that the existing regulation on tourism in MRZ be revised, improved and implemented.

- Guidelines for tourism in MRZ should be established. Twelve more aspects on guidelines were recommended, and in particular that their objective should be to develop and maintain environmentally-responsible tourism activities, and also that guidelines are another tool for putting tourism on the path to sustainability.

➤ Compliance with regulations and guidelines will be successful if regulations and guidelines are well distributed and implemented. Tour companies and their personnel must comply with regulations and future guidelines.

➤ Most important environmental issues that need to be added to the existing regulation or be included in future guidelines were mentioned previously. At least two other aspects, research, and education and information should also be included (see Table 105 of the thesis document for issues addressed or to be addressed by the 1997 regulation).

4) Control of tourism and law enforcement

To improve the control of tourism activities and the enforcement of regulations, the following is recommended:

- Patrols should be more frequent, and more efficient and effective
- Wardens should: be more numerous (they are needed in Salvador, Limonal, Pakitza, and for the patrols), be present aboard tour boats, be better equipped to do their job, have better salaries, have more skills, be familiar with all park regulations and observe them at all times, be empowered and have more authority, and be more permanent and more experienced.
 - The WSs⁷ of Limonal and Pakitza need to be improved.
 - Regulations (e.g., against following the giant otters and getting close to their dens) should be enforced.
 - There should be severe sanctions for the personnel who fail to comply with the regulations.
 - More funds are needed.

5) Planning

- Five recommendations were made with regard to the Management Plan, in particular that it should be evaluated, improved and updated, and implemented.
 - The Master Plan needs to be updated.
 - A site plan is needed for Salvador and should include information on aspects such as location of trails and number of CGs and camping sites. The site plan would need to be reevaluated and updated periodically.
 - A strategy for planning sustainable tourism would help improve the management and planning of tourism activities in MRZ.
 - Integrated planning between all the players is necessary to ensure the success of tourism in MRZ as a sustainable activity.
 - The local committee of MBR should be strengthened, and a Sustainable Tourism Committee could be created at the level of MBR.
 - Air photographs, satellite images, and GIS (Geographic Information Systems) should be used for planning and managing tourism in MRZ.

6) Funding

- The park administration requires funds in order to make tourism more sustainable in Salvador and in the entire reserved zone.
 - Funds are needed for instance for education, the control of tourism (wardens), research and monitoring, visitor management, and tourist facilities in Salvador

⁷ WSs: Wardens' stations.

➤ Financial strategies or mechanisms need to be reevaluated. Six recommendations were made, among which that the park raises its revenue from tourism by increasing fees and charges on concessions, and through sales, donations, support from the private sector and even taxes. Also, a larger part of the revenues that tourism in MRZ generates should be invested in the management and conservation of MRZ.

7) Communication and cooperation

➤ Communication and cooperation between all tourism players needs to be improved in order to prevent the duplication of actions and institutional conflicts. It must be permanent and requires organizational mechanisms to be successful.

➤ All players must always coordinate their actions with the park administration, and especially with the INRENA. They must be aware of the existence, goals and activities of each other. Also, they must share their experience, knowledge, information and resources.

➤ The existing tourism management plan should be reviewed in conjunction with all the different players.

➤ Coordination should be improved especially between tour companies, between the Ministry of Agriculture (INRENA) and the MITINCI, between the park administration and MTCs, between the offices of the INRENA in Lima and Cusco, between the INRENA and the regional government, between NGOs, and between the two departments (Cusco and Madre de Dios) in which MBR is located.

8) Marketing

Marketing practices should be improved for tourism in Manu to be more ecologically sustainable. It is recommended among others that: 1) the promotion of ecotourism in Manu should not lead to alter the environment and thus activities (e.g., caiman spotting) which have or could have a negative ecological impact should never be promoted; 2) endangered species (e.g., the giant otter) should never be the focus of the promotion of Manu; 3) ecotourism in Manu should always be promoted in a sensitive manner, in accordance with the objective of conservation of Manu, with sustainability and conservation a key element of the advertising message; 4) the promotion of tourism in Manu must be based on adequate and reliable information; and 5) the park administration should control all the promotion done on Manu.

9) Accreditation

Accreditation is recommended for MTCs and guides:

➤ A system of accreditation for MTCs claiming environmental credentials should be developed. Only the tour companies that would meet a set of agreed criteria and follow a code of conduct or guidelines would be accredited and licensed to operate in Manu. Environmental programs could also be developed to encourage commitment of tour companies to environmental sustainability.

➤ A system of accreditation could also be developed for the guides of Manu.

10) Incentives

Incentives should encourage the people who work in MRZ to become more environmentally sensitive and respect the rules. They can apply to the following people: 1) the managers of MTCs (so that, for instance, they would make an effort to provide tourists and personnel with hygiene products that are safer for the environment); 2) the guides of Manu (e.g., an increase

in their salary, so that, for instance, they would not fish piranhas or catch baby caimans in order to get monetary compensation from their tourists); 3) other personnel of MTCs (cooks, cook's assistants, helmsmen and spotters) (e.g., an increase in their salaries, so that they would not have to rely so much on tips and perhaps would care a little more about the environment); and 4) the wardens (e.g., increases in salary, and better working conditions).

11) Non-government organizations

Eight recommendations were made for NGOs, among which: 1) more NGOs should be working with the park administration and support it; 2) NGOs should develop a monitoring program in which both guides and tourists will collect information on aspects such as the conditions of trails and CGs; and 3) NGOs, especially others than the FPCN⁸, should be more active in the field of tourism in Manu.

C. Final remarks

➤ The ecological impact of tourism in Salvador, and the entire reserved zone, will never be totally eliminated since people will always have an impact, but the level of impact will be reduced quite significantly if the proposed recommendations are followed.

➤ None of the recommended measures is likely to be successful in isolation; a combination of measures is necessary to achieve maximum success.

➤ An analysis of costs and effectiveness will help to decide which measures to adopt, when (in the short-term or long-term) and by whom (the park administration, ENGOs, other players).

➤ Measures related to information and education should be prioritized, and in particular the education of the guides, other tourist personnel and the wardens. In the long term, education will cost less and be more effective than, for instance, engineering.

➤ Among all environmental problems identified, the giant otter should be a priority for the reasons already mentioned. It is urgent to make the observation of the giant otter more sustainable by eliminating the catamaran and replacing it with stationary observation towers on the shores of the lake. This not only applies to Cocha Salvador, but also to any other lake inhabited by the otters and opened to tourism.

➤ The recommendations should be in the hands of all the tourism players. They all have a role to play in improving the sustainability of tourism in Salvador and the rest of MRZ, either through education, funding and others. Their combined effort is necessary. All should contribute to the cost of making tourism in Salvador and MRZ more sustainable.

➤ Political will is necessary to adopt any of the recommended measures and achieve the goal of making tourism in Manu more sustainable.

➤ The management of the ecological impact of tourism in the area of Salvador must be extended beyond this area and the boundaries of the reserved zone. Salvador cannot be managed as an island in the middle of Manu.

➤ Measures to reduce ecological impacts should not be adopted without assessing the economic and socio-cultural implications of such measures; a holistic approach is necessary where there is a balance between protecting the environment and other interests. The needs of the local population, the happiness of the tourists and the needs of MTCs must be taken into account. Hence, it would be necessary to complete the study of the ecological

⁸ FPCN: Fundación Peruana para la Conservación de la Naturaleza (Peruvian Foundation for the Conservation of Nature).

impact of tourism with a study of the economic and socio-cultural impact of tourism. Such a study will generate information that will help reach the balance. The study of the economic and socio-cultural impacts of tourism will have to apply to an area larger than Salvador, that is MRZ, the MUZ and areas outside the biosphere reserve. Thus this is another reason for extending the ecological impact study done for Salvador to those same areas. Only when economic and socio-cultural criteria will be considered, will we be able to determine where to draw the line between acceptable and unacceptable impacts of tourism in Manu.

➤ Ecologically, the future of Salvador and MRZ depends not only on the measures that will be taken, on the role played by the different players, and on the political will, but also on its final status (since the status of reserved zone is temporary), and on the international community since "Manu is a world patrimony and as such it is a global responsibility".