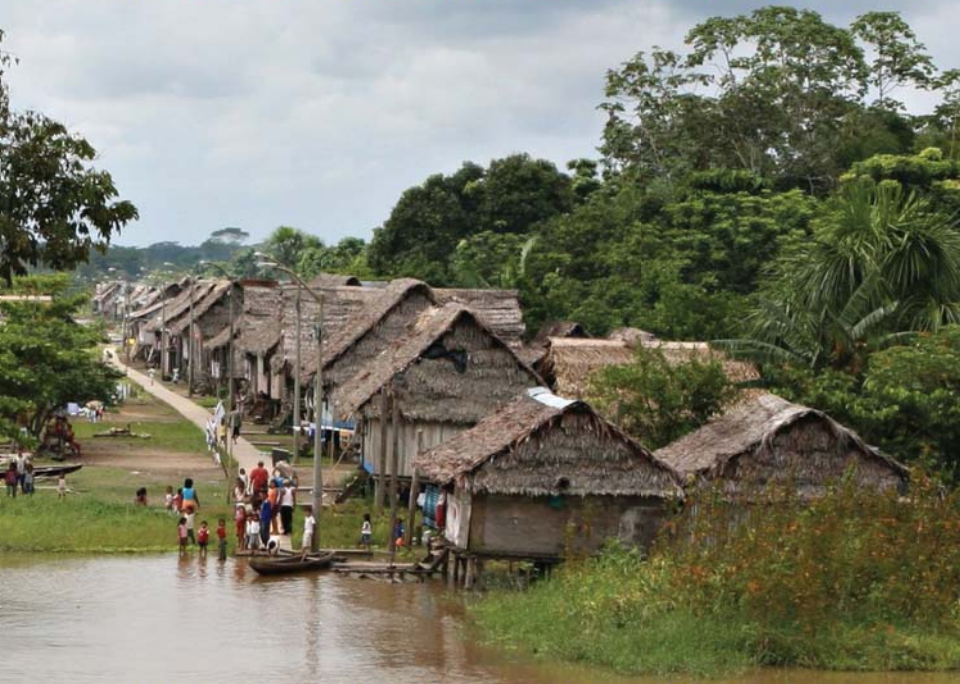
SETTLEMENT PATTERNS AND ECOSYSTEM PRESSURES IN THE PERUVIAN RAINFOREST



UNDERSTANDING THE IMPACTS OF INDIGENOUS PEOPLES ON BIODIVERSITY

RODOLFO TELLO

AMAKELLA PUBLISHING

Environmental Sustainability Series

Settlement Patterns
and Ecosystem Pressures in the Peruvian Rainforest

Understanding the Impacts of Indigenous Peoples on Biodiversity

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ISBN-10: 1-63387-028-6
ISBN-13: 978-1-63387-028-4

Cover photograph: 123rf

Amakella Publishing
Arlington, Virginia
www.amakella.com

Printed in the United States of America

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Introduction

Introduction

The role of indigenous peoples as stewards or destroyers of biodiversity has generated an academic and political debate involving social scientists, conservation biologists, interdisciplinary practitioners, indigenous organizations, government officials, and civil society representatives, among others. One of the most critical areas in that debate is understanding the factors that explain the variation in the level of ecosystem pressures created by indigenous groups. To what extent do regional socioeconomic processes influence the level of ecosystem pressure being exerted by indigenous groups? This book explores that question. The setting for such analysis is Manu National Park, one of the most important protected areas of the Peruvian rainforest. In this context, increments in the levels of ecosystem pressures have been associated with increased disruption of the traditional livelihoods of the local population, created mainly by the intensification of external socioeconomic activities in the area.

There are different approaches to the relationship between indigenous communities and protected areas. Each of these approaches suggests its own set of policies and procedures, developed according to the type of priorities defined. In Manu National Park, the most important proposals aimed at reducing human impact on the ecosystem or promoting its sustainable use include: technology control (Cerdan 2002: 85), socioeconomic and ecological zoning (Kirkby 2003: 5), population stabilization around existing settlements (Ohl et al. 2007: 1175), voluntary resettlement (Terborgh 2004: 56), participatory management (Chavez et al. 2006: 22), and environmental awareness (Rozas 2007: 3). However, these proposals do not fully take into account the regional socioeconomic processes affecting local people's behavior, which are a critical factor for understanding the levels of human impact on ecosystems.

Manu National Park is considered Peru's capital of biodiversity, and one of the world's most important tropical areas. It comprises 1.7 million hectares (WDPA 2007), covering an area slightly smaller than the State of New Jersey. John Terborgh, an influential conservation biologist who works in this area, states that "*as a repository of biodiversity, the Manu stands without peer. Its location on the western fringe of the Amazon basin puts it at the world's biodiversity epicenter... the Manu earns the distinction of holding more biodiversity than any other park in the world*" (Terborgh 2004: 23). This park also presents a high level of cultural diversity, including groups

with different levels of contact with Western society, like sedentary communities, indigenous in their initial stages of cultural assimilation, and isolated Indians who avoid contact with foreigners and maintain a nomadic lifestyle (Shepard and Izquierdo 2003; Palma et al. 2002, vol. 2; Huertas 2002; Ugarte 2001).

The following sections of this book include a brief literature review of the debate about people and protected areas, placing the discussion in a broader interdisciplinary context. The effect of regional socioeconomic processes are explored next, especially the implications of industrial activities like extraction of fossil fuels promoted by the Peruvian government, illegal hunting, religious organizations, and recent market trends in the area. These factors illustrate the effects of socioeconomic processes on the lifestyle of the indigenous population.

One of the main arguments is that external socioeconomic processes have strongly influenced the settlement patterns of the indigenous groups traditionally settled in Manu National Park, creating local conditions that have affected the current levels of ecosystem pressure. This approach is inspired by studies on immigration theory. According to this, the entry of markets and capital-intensive production technology into peripheral regions disrupts existing social and economic arrangements, and brings about a widespread displacement of people from customary livelihoods, creating a population who actively searches for new sustenance alternatives

(Massey et al. 1998: 277). This analysis, however, includes not only the changes induced by market expansion but also the role of other sociopolitical processes in the region, such as the influence of the religious organizations.

The Conservation Debate

The Conservation Debate

Addressing the long-term threats to biodiversity posed by human presence inside protected areas in tropical forests is a controversial topic. On the one hand of this debate, many conservation biologists oppose the idea of sustainable coexistence between people and other biological species. They argue that once an indigenous society acquires firearms, they usually overexploit the game supply (Terborgh 2004: 51). In the case of neotropical hunters with different hunting strategies and kill power, some studies have shown a direct association between procurement technology and prey mortality (Alvard and Kaplan 1991: 98). Many conservationists are also concerned about the capacity of indigenous communities to manage subsistence hunting and their ability to regulate wildlife harvest in a sustainable way (Robinson and Redford 1991: 3). These studies state that protecting biodiversity is not necessarily compatible with the existence of human populations (Oates 1999: xii; Redford and Robinson 1985), arguing that the indigenous groups have a different agenda than the one of the conservation community (Redford and

Stearman 1993: 248). They also point out that while ecological coexistence between people and nature has worked in the past, there is no guarantee that it will continue to work in the future, especially in a context of changing sociodemographic conditions (Terborgh 2004: 51).

The policy implications of this approach have led to the reinforcing of an agenda based on the establishment of protected areas strictly for biodiversity conservation purposes. This situation has been referred as a "back to the barriers" movement in the conservation discourse (Hutton et al. 2005: 346), a resurgence of the 'protectionist' paradigm (Wilshusen et al. 2002: 17). Under this scenario, proposals for sustainable use of the natural resources should be put aside, and conservation organizations should focus instead on developing better protection mechanisms, improving the policing of sites, and enforcing the laws against exploiting the protected areas' natural resources (Oates 2000: B6). In this context, parks should focus on the protection of biodiversity, not on solving social problems (Brandon 1998: 418). However, this approach has raised concerns among scholars about the social impacts of protected areas (West et al. 2006; Wilkie et al. 2006), especially the risk of populations displaced as a result of conservation interventions, like in the case of Central Africa (Schmidt-Soltau 2005) and other parts of the world, where the risk of displacement is closely associated with the level of enforcement of protected area legislation (Brockington and Igoe 2006: 452), which increases

the chances of creating "environmental refugees" (Vine 2006; Black 2001).

On the other hand of this debate, many social scientists have been promoting the idea of coexistence between humans and nature. Inspired by the fact that indigenous peoples have lived for centuries using the natural resources of the forest in sustainable ways, they have been looking for current alternatives according to their current sociodemographic status. This approach is based on the notion of sustainable development, which states that environment and development are not separate challenges but rather are inexorably linked (Brundtland 1987: 48), and supported by the work of anthropologists who identified that the livelihood of the indigenous populations does not always threaten their ecosystem but can be sustainable managed (Balee 1998; Clay 1988; Chernela 1987). Thus, environmental interventions that are properly designed and implemented can bring not only conservation outcomes but also social improvements for the local population. In a similar way, interdisciplinary teams conducting comparative studies have been arriving at similar conclusions, like in the case of indigenous reserves that were successful in reducing deforestation and forest fires (Nepstad et al. 2006). This approach also recognizes that poverty and biodiversity degradation are intimately linked, being necessary to address these issues together (MPO 2005: 2).

The recognition of both social and environmental outcomes on an equal footing has led to a number of policy approaches based on sustainable use. The predominant ones include the implementation of Integrated Conservation and Development Programs (Rao 2006; McShane and Wells 2004; Shepherd 2004; Tongson and Dino 2004), Community-Based Conservation (Berkes 2007; Southey 2005; Russell and Harshbarger 2003; Campbell and Vainio-Mattila 2003), and Community-Based Natural Resource Management (Brosius et al. 2005; Fabricius 2004; Child and Dalal-Clayton 2004), besides other approaches that perceive the need to address both the social and biological dimensions of conservation (Chan et al. 2007; Kaimowitz and Sheil 2007; Brown 2003).

In this process, many indigenous peoples' organizations have also supported the idea of sustainable use. In a press release of the Coordinating Body of Indigenous Organizations of the Amazon Basin (COICA), addressed to the community of environmentalists, they expressed their interest in encouraging the long-term conservation and the intelligent use of the Amazonian rain forest. However, they also made public their concern of being excluded from the conservation decision-making process, indicating that the priority of the environmental community has typically been the preservation of the tropical forest and its plant and animal inhabitants while historically showing little interest in its human inhabitants (COICA 1989). This pronouncement generated a public

discussion that contributed to raising awareness about the problem (Chapin 2004). In this context, clarifying the role of indigenous peoples as stewards or destroyers of biodiversity was identified as a critical issue to assess the extent of indigenous peoples' engagement in the conservation process. To this respect, anthropologists have sought to dispel the notion that this is an "either/or" situation, moving beyond the idea of the "ecologically noble savage" (Alvard 1993: 355). In this context, further attention has been called toward the need to elucidate the social, spiritual, and economic conditions that lead to conservation and those that don't (Casagrande 2002: 11).

Nevertheless, the factors that explain the variation in the level of ecosystem pressure created by indigenous peoples remains in dispute. Several models intended to provide replicable results have been proposed, mainly by conservation biologists. One of the basic ones is expressed by the effect of the available technology and demographic trends. As Terborgh points out, "firearms, chainsaws, and a demographic explosion are not the stuff of peaceful coexistence with nature" (2004: 51). A more elaborated model includes several variables for each of the following categories: (1) social, economic, and political forces; (2) human use of resources; and (3) ecosystem impacts, which create different pressures on biodiversity (Forester and Machlis 1996: 1255). Another model is the one presented by Ceballos and Ehrlich, who argue that the levels of human

impact on species' extinctions is a product of three factors: the size of the human population, the existing technologies, and the population's per capita consumption, including the economic, political, and social arrangements established to service that consumption (2001: 89).

These models, however, present considerable limitations when applied to different contexts. When it comes to technology, for example, there is strong archaeological evidence that the aboriginal population in Australia experienced a significant population increase over a period of 50,000 years. Their technology changed in substantive ways, including their hunting artifacts and the use of fire. In the last 4,000 years, they also experienced the introduction of new predators like the dingo, which created considerable impacts on the environmental. However, these transformations did not prevent the aboriginal population from adapting their subsistence practices based on the principles of sustainable use of the natural resources on a continuous basis, a factor that was reinforced by their traditional spiritual beliefs (Kohen 1995: viii-ix).

In a similar way, in the case of hunting technologies, the models described assume that shotguns are more efficient than traditional hunting tools. Whereas this assumption might be true for hunting situations in general (Hames 1979: 219), some studies have also shown that in certain cases traditional tools can be more effective than shotguns, like in the case of arboreal and terrestrial game. As Eric Ross

points out, the diffuse impact of a shotgun has far less likelihood of scoring a strategic wound on a large quadruped than the concentrated force of a specialized arrow. Blowguns also allow hunters to silently kill arboreal animals one by one, without causing them to flee after the first shot (Ross 1978: 12). Moreover, studies have shown that it is the combination of traditional hunting tools and modern shotguns that provide the highest levels of hunting effectiveness (Yost and Keller 1983: 223). Under these circumstances, the assumption that shotguns are more efficient than traditional technology should be considered more carefully and examined according to the specific context.

In a similar way, recent studies among the Matsiguenka in Manu National Park conducted by an interdisciplinary team show that, despite a near doubling of the human population since 1988, hunter-prey profiles have not changed. There has been little change in per capita consumption rates or mean prey weights, apparently because of source-sink dynamics. Source-sink dynamics refer to the regular immigration flow of animals from undisturbed areas that allow animal populations to increase. The excess population is then expected to move outwards, including into those areas near human settlements, where they become the subject of hunting. In that sense, the current offtake by the Matsiguenka appears to be sustainable (Ohl et al. 2007: 1174).

This evidence, which challenges the explanatory potential of the traditional models,

creates the need to explore further the causes of variation in the level of ecosystem pressure being exerted by indigenous communities. As Forester and Machlis propose in their agenda for future research, sociocultural values (including political, cultural, and spiritual concerns) may be an important driving force behind the human use of natural resources and as a result should be included in subsequent models (1996: 1260). In this book, the effect of regional socioeconomic processes on the livelihoods of the local communities provides a context through which to understand indigenous peoples' ecological behavior. The following sections discuss the relevance of settlement patterns and recent market trends, particularly when it comes to the effect of religious organizations, fossil fuel extraction activities in the region, and illegal hunting practices, as an attempt to better understand their influence on the level of ecosystem pressure within the sociopolitical context of Manu National Park, in the Peruvian rainforest.

Religious Organizations

Religious Organizations

The settlement patterns of the indigenous communities inside and outside Manu National Park have been greatly influenced by the action of religious organizations. In the case of the villages located inside the Park, they developed as a result of the intervention of the Summer Institute of Linguistics (SIL), a Texas-based religious organization currently called SIL International. Originally, the indigenous peoples of the area lived scattered in different family settlements (Johnson 2003: 2). After the arrival of SIL, they were encouraged to congregate in a village named Tayakome, so that they could receive the social and medical services SIL provided, while also offering access for religious indoctrination. Before the creation of Manu National Park, SIL also assisted these communities in trading the skins of the animals they hunted for firearms, tools, clothes, medicines, and food products (Da Silva et al. 2005: 31). In that sense, they encouraged hunting activities as a way of obtaining market products.

A few years after the creation of Manu National Park in 1973, SIL left the community of

Tayakome, and along with that its support for the only school in the village, its provision of medical services, and its role as a facilitator of access to western goods. As a result, this community later split into several groups. The first group decided to establish a new community called Segakiato, located in the Camisea River, near the western border but outside Manu National Park. The reason was that they could perform different economic activities and continue hunting using firearms, which was no longer allowed inside the Park. A second group established a new community called Yomibato, located inside the Park, but with more abundant hunting resources than in Tayakome, while also having less risk of exposure to external illnesses. A third group created the community of Palotoa, along the southern border of Manu National Park (Shepard and Izquierdo 2003: 122). Currently, a new splitting process seems to be taking place, as expressed by the existence of two new settlements near the community of Tayakome, named Maizal and Sariguemini (Ohl et al. 2007: 1176).

Along the southern border of Manu National Park, the indigenous population also congregated in a community named Shintuya, encouraged by a Catholic mission of the Dominican Order, which started in the 1950s. Indigenous people from different ethnic groups were brought together in this village, but this situation created internal conflicts among them. As a result, several of these groups ended up establishing independent communities in the

surrounding areas. The indigenous population congregated in this area was quickly integrated to the regional market. They were expected to extract gold, hunt for wild animals to sell their skins, and conduct other extractive activities as a means to obtain the monetary resources needed to acquire basic goods for subsistence (Moore 2003: 85).

This short review evidences the critical role of religious organizations in defining the settlements patterns of the indigenous communities in the area, both inside and outside Manu National Park. The gathering of disperse populations in dense settlements affected the indigenous livelihoods in significant ways. It encouraged them to engage in an exchange system where the natural resources of the forest and rivers were not only used for subsistence but also served as the only means for them to obtain market goods. It also created a situation in which, within a short period, the availability of natural resources in the areas surrounding their communities reached levels of near depletion, affecting their nutritional status and health patterns, thus making them even more dependent on external goods and services.

Fossil Fuel Industries

Fossil Fuel Industries

In a context where the policies of national and regional government agencies favored investments in extractive industries, such policies have implications on the level of ecosystem pressures being exerted by the local communities as well. In the area surrounding Manu National Park, oil extraction has been a very important issue. It started in 1984 when workers of a transnational oil company reported violent raids from isolated Indians in their operation camps. The reported motive of these raids was a reaction to the invasion of their territory, but also the desire to obtain metal tools during these raids (D'Ans 1972: 96). These oil camps were located near the Northwest border of Manu National Park. As a reaction to these raids, the oil company launched a campaign to contact these isolated indigenous peoples, attempting to communicate with them, including dropping metal tools from a helicopter (Zarzar 1987: 94).

In parallel, illegal loggers were scouting this area as well. Following the path opened by the oil company, the loggers were attracted by the promise of exploiting the easily accessible

timber from these non-intervened forests. Aimed at contacting the isolated Indians that remained as the only obstacle to the advance of "civilization" in the area, they went to scout the area by themselves. They managed to make contact with a small group of the isolated Indians, later to be known as Nahua, and brought them to the nearby town of Sepahua, a logging town where most of the population was comprised of settlers from other regions. The townspeople treated the Indians well and gave them abundant gifts, encouraged them to stop their violent raids, and instructed them to return to their villages and spread the word that the settlers were friendly people (Wahl 1990: 152). In the proposed scheme, the recently contacted indigenous people would receive the metal tools and other basic goods they needed, the loggers would have vast timber resources at their disposal, and the oil company would be able to conduct their operations without having to deal with the continuous raids anymore.

However, this scheme did not work as expected. During their stay in Sepahua, the indigenous persons that visited this town in the first trip contracted respiratory illnesses, particularly influenza and cough. They were sent back to their communities as carriers of these contagious diseases. As a result, they spread their newly acquired germs among their relatives and friends once they returned. In a context where the bodies of these isolated Indians lacked organic defenses against these threats, shortly after exposure, the whole

community was infected and many people started to die. This situation was worsened by the Nahua custom of frequently visiting friends and relatives (Hill and Kaplan 1988: 83). Faced with this situation, the Nahua were forced to leave their original settlements and lifestyles to seek medical help in the town of Sepahua.

Many people, however, were not able to make the journey, which sometimes took them more than a week, traveling downriver on a canoe. Because of the health emergency presented, the SIL set up a health camp near the place where the indigenous peoples lived. SIL provided medical care for the remaining indigenous persons while at the same time attempting to learn the Nahua language in order to transmit religious beliefs to the indigenous community. After a short stay in this temporary camp, the indigenous peoples were resettled in an intermediate point between their traditional settlements and the new town of Sepahua. The reason was that in this way the indigenous people would maintain their independence but also visit the town of Sepahua more easily to obtain further medical care and basic goods.

This new sedentary village was called Santa Rosa de Serjali, which was set up in a place where they remain even now. The transformation of four settlements into one village made out of the surviving members created significant changes in their lifestyle and the level of pressure they exerted on the ecosystem. As game grew scarcer near their new village, they became more dependent on

agricultural products for their subsistence. The need to obtain money in order to acquire basic goods also led them to start logging the timber available in their surrounding forests or establish agreements with loggers from Sepahua, based on the demand for timber in the regional market. This account evidences the importance of historical factors in shaping the current level of ecosystem pressure created by indigenous peoples, as well as the resettlement patterns that favored the development of these conditions.

A similar process is happening today in a nearby area, close to the western border of Manu National Park. After the identification of a huge reserve of natural gas, the Peruvian government granted exploitation rights to a transnational consortium to be responsible for the extraction of the natural gas in the area of the Camisea River. During the initial phase of the operations, there were reports of random encounters and failed attempts by the oil consortium's contractors to contact the isolated Indians living in this region, as reported by independent civil society organizations, including indigenous organizations. However, the consortium has denied the existence of such encounters.

A visible effect, however, is the displacement of indigenous peoples living close to the gas extraction areas toward less disturbed places inside Manu National Park. In a visit to this area in 2003, organized by the Park administration, it was evident that some members from the village of Montetoni have been moving out and started to build up new

houses and gardens in areas inside Manu National Park. From the information collected during this visit, the indigenous people of Montetoni perceived an increased scarcity of fish in the upper Camisea River, which runs next to their village and is an important part of their subsistence. This scarcity is believed to be the result of two factors. The first one is the population movement and the creation of new settlements downstream in the Camisea River, whose fishing practices reportedly include non-sustainable techniques, such as fishing with *barbasco*, a poisonous root that kills both adult and infant fish individuals, affecting the normal rate of species reproduction. The second factor is the increasing noise and chemical pollution of the lower part of the Camisea River as a result of the gas extraction operations. Indigenous organizations have reported the existence of several leaks and ruptures of the gas pipeline, spreading polluting agents in the forests and waters of this river and its tributaries.

This process reflects that government policies toward industrial activities like oil and gas operations have been an important factor in the lifestyle of the indigenous communities in the area. It has affected both the orientation of the settlement patterns in the indigenous villages, and the expansion of the indigenous extractive practices into new areas whose resources were previously unused or were exploited with less intensity. It also shows how the establishment of industrial operations in the area has been followed by illegal hunting

activities by non-indigenous settlers, whose activities created their own dynamics in the establishment of new towns and the exploitation of the natural resources in the area.

Illegal Logging Activities

Illegal Logging Activities

The most important illegal activity carried out in the areas surrounding Manu National Park is logging. With logging being one of the most profitable jobs in the region, it attracts the greatest numbers of people. Illegal logging has thus become very competitive, creating a situation where the margin of profit tends to decrease within short periods after the accessible forests are cleared of their most valuable timber. This situation creates the need among loggers to continually search for non-intervened forests, where highly valued trees are more easily available. The most valued species in the region are mahogany (*Swietenia macrophylla*) and cedar (*Cedrela odorata*). Loggers in this region prefer to use local rivers to transport the timber extracted toward cities or road-accessible points.

One of the places where timber is still widely available, but with restricted access, is the territory of isolated Indians in the headwaters of the Las Piedras River, near the southeastern border of Manu National Park. In previous years, the risk of violent conflict with the natives and the fear of being attacked by

isolated indigenous peoples at night have kept loggers at bay. However, in the last few years, this situation has changed. As a result of increasing wood scarcity, illegal loggers have been expanding the area of timber extraction. They go into the forest heavily armed so as to be able to respond to potential attacks. Some violent conflicts have been reported, but the overall effect of this process has been the displacement of the isolated Indians toward less disturbed areas inside Manu National Park.

This displacement has produced both social and environmental impacts. It has created tension among the indigenous communities living in Manu National Park, which have developed mixed feelings of uncertainty and risk. The need to obtain the necessary natural resources for their subsistence within a smaller territory has also increased their level of ecological pressure inside the Park. Considering that a hunting and gathering lifestyle requires indigenous peoples to migrate seasonally in search of different resources, a reduction of their traditional territory is expected to drive them to use the Park's resources in more intense ways. In this context, the expansion of loggers' activities in previously restricted areas created the settlement patterns and the means of subsistence of the indigenous population, intensifying the level of ecosystem pressures.

Market Trends

Market Trends

Traditionally, the production activities of the indigenous communities found near the borders of Manu National Park were mostly intended for self-consumption. Their traditional subsistence practices included agriculture, hunting, fishing, and gathering. However, nowadays they also engage in small-scale commercial activities. The main products they sell are bananas, beans, fruits from the forest and from their gardens, chicken, fish, among others. To a lesser extent, some of them are also involved in logging activities, small-scale trading of groceries, the provision of food services, and some of them have jobs as salaried employees. Their income allows them to buy basic supplies for their daily life, like salt and sugar, matches and kerosene for the kitchen, flashlights and batteries, fishing hooks, clothes, school materials for children, first-aid supplies, soap, among other basic goods.

In the last few years, another important factor that has been reshaping their economic expectations is the rise of ecotourism as an economic activity. Manu National Park is a place with one of the highest levels of biological

diversity. As a result, travel agencies have been increasingly taking tourists to visit the Park. Since the main way of getting to this park is by river, some indigenous communities found near the southern border of Manu National Park have been witnesses of the everyday flow of tourists, which in most cases come from foreign countries. In some villages, the perception of such visitors has gradually turned into one in which tourists are now seen as a potential source of income, encouraging the idea of developing community-based ecotourism enterprises. Heading toward this goal, some of these communities have identified tourist attractions within their territories, built their own tourist lodges, requested technical and managerial assistance from non-profit organizations working in the area, and encouraged the young members of their communities to pursue specialized training in tourism-related areas to better serve their future enterprises.

The impacts of ecotourism have been most strongly observed among the indigenous villages located near the eastern and southern borders of Manu National Park, where tourists usually travel. These communities are now moving toward the goal of building their own ecotourism enterprises (Herrera 2007: 2; Ohl 2004: xi). Some indigenous communities in the area with ecotourism initiatives include Tayakome, Yomibato, Palotoa-Teparo, Queros, Huacaria, and Shipetiari, among others. They are aware of their limitations in this process, especially regarding the transit from their

traditional subsistence livelihoods to being engaged in market-oriented businesses. However, they are patient. They know that such a process is likely to take them many years before it matures, but they have decided to pursue it as a long-term course of action, with or without the institutional support of external organizations.

One of the most direct implications of this process on the level of ecosystem pressure is that the protection of animal species has acquired greater importance. This is especially evident in the case of birds and mammals. Among the indigenous population, wild animals are not only seen as a source of meat for human consumption but also seen through the cultural values associated with them. In addition to those values, wild animals are now perceived as a tourist attraction. Some communities have developed environmental management plans with the support of regional organizations, identifying certain areas of their territory with the potential of becoming tourist attractions as areas excluded from their regular hunting activities (Rubio and Valenzuela 2003; Pinasco 2002). Some of these areas include saltlicks and fauna corridors.

In this context, the intensification of a regional market activity such as ecotourism has influenced indigenous people's behavior toward a reduction in the level of pressure they exert on the natural resources and in the adoption of sustainable livelihoods. The development of a new sense of awareness about the value of animal species has led the indigenous villages of this area to acknowledge the fact that species are

more valuable alive than dead. This situation reinforces the need to go beyond the formulaic models discussed above when attempting to understand the variation in the level of human impact on biodiversity. It also helps to explain the preferences of indigenous peoples in continuing dwelling in these communities, instead of moving toward other areas with less hunting restrictions but also with less potential for sustainable economic activities such as ecotourism.

Discussion and Conclusions

Discussion and Conclusions

One of the most important socioeconomic processes in Manu National Park was the creation of densely populated indigenous settlements by religious organizations. The government policies toward the exploitation of natural resources such as fossil fuels were also a critical factor leading to the displacement and resettlement of indigenous groups. Similarly, the territorial expansion of illegal loggers into previously unexploited areas created a series of conflicts and resulted in the displacement of isolated indigenous groups. The expectation of the sedentary indigenous villages to be articulated to the regional market in sustainable ways has also influenced settlement patterns and ecological actions, particularly in areas where ecotourism activities are already part of an established business trend.

The analysis of these behavioral trends shows that socioeconomic factors have had a strong influence on the level of ecosystem pressures exerted by the indigenous groups both inside and outside Manu National Park. By influencing the settlement arrangements and the displacement

patterns of the indigenous population, external socioeconomic trends also created changes in their traditional livelihoods. The analysis of socioeconomic processes also provides a context through which to understand the influence of these various factors as part of historical processes that have played key roles in the development of the current patterns of environmental behavior among the indigenous population.

This situation also shows that the formulaic models intended to predict the level of ecosystem pressure being exerted by the indigenous communities show limited capacity to incorporate the historical aspects that contribute to the shaping of indigenous peoples' environmental behavior. However, this situation should not be interpreted as a way of disqualifying the predictive power of such models, but as a challenge to incorporate the situational factors observed in practice into their theoretical structure. By focusing on the complementarity of these approaches, it might be possible to develop a more comprehensive explanatory framework that captures both methodological structure and practical variation.

Attempts to incorporate contextual aspects into models should include the levels of social disruption created by the regional socioeconomic processes (Massey et al. 1998: 277). The ways in which regional processes disrupt peoples' lives can be enriched by the analysis of the settlement patterns and the socioenvironmental impacts they produce. The magnitude of the disruptions created by such

changes could benefit from frameworks such as the Impoverishment Risks and Reconstruction model (Cernea 2005) and the Damage Calculation Model (Vine 2006: 23), which provide a frame of reference for understanding the effect of displacement and resettlement. Methodologies developed for the analysis of social impacts, including their conceptual dimensions (Burdge 2004, Taylor et al. 2004; Canagarajah et al. 2002), operative procedures (Goodland 2000; Rietbergen-McCracken and Deepa 1996), and tracking indicators (Khurshid 2006) could also be helpful in this analytical process.

In Manu National Park, increments in the level of ecosystem pressure have been closely associated with the disruptions of traditional lifestyles, mainly as a result of an intensification of the regional socioeconomic activities and their relocation from disperse households into large settlements. Thus, the sustainability of the indigenous settlements in the area has been largely shaped by the combined effect of the regional socioeconomic processes and the settlement patterns of the indigenous population, which together provide key analytical insights to better understand the variation in the local levels of ecosystem pressure.

This concludes the main body of the present book. If you found the information contained in this book valuable, then I encourage you to please consider leaving a review. As an author, I would like to hear from you, even if it is just a few words. Your ideas and opinions about the book may help other people benefit from the content provided in these pages as well.

If you are interested in a more solid understanding of the relationship between biological factors, cultural aspects and socioeconomic processes, and seek to learn about an innovative approach to analyze their combined effect in shaping the environmental behavior of indigenous peoples in tropical forests, a more developed version of the topics covered here can be found in my book *Indigenous Peoples and Tropical Biodiversity: Analytical Considerations for Conservation and Development*. Likewise, the practical application of this innovative approach in a specific setting can be found in my book *Hunting Practices of the Wachiperi: Demystifying Indigenous Environmental Behavior*. Both books are available in print and electronic versions.

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Recommended Reading

In this book, many important subjects were only covered in a superficial way. The following list includes the top five publications I would recommend for readers interested in learning more about the relationship between conservation and development among indigenous peoples in tropical forests.

1. Stedman-Edwards, Pamela (1998). Root Causes of Biodiversity Loss: An Analytical Approach. Washington, DC: World Wild Fund.

2. Russell, Diane and Camilla Harshbarger (2003). Groundwork for Community-Based Conservation: Strategies for Social Research. Walnut Creek, CA: Altamira Press.

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About the Author

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