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# BOLIVIA TROPICAL FORESTRY AND BIODIVERSITY ASSESSMENT

## FINAL REPORT



**OCTOBER 2008**

This publication was produced for review by the United States Agency for International Development. It was prepared by ARD, Inc.

# ACKNOWLEDGEMENTS

Bolivia is a complex country, and the team conducting this assessment relied heavily on many other people for information and insights. We spoke with more than 50 people during the information-gathering phase of the assessment, and each of them contributed important information and thoughtful perspectives. In addition to their technical contributions, Simbiosis provided local logistics in support of the stakeholder workshops and topical assessments. We would like to thank members of each of USAID/Bolivia's Strategic Objective teams, who provided information on their past and current activities and future options. We hope this assessment will contribute to USAID's future support of environmentally and socially sustainable development in Bolivia and the conservation of its rich biological diversity and valuable tropical forests.

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Cover photo: Traditional Jalq'a weaving symbolizes Bolivia's rich biodiversity, which has been a source of economic and cultural values to people for millennia. Weaving by Julia Quispe.  
Photographer: Bruce Byers, ARD, Inc.

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**DISCLAIMER**

The views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.



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# ABBREVIATIONS AND ACRONYMS

ASDI	Swedish International Development Cooperation
ASL	<i>Agrupaciones Sociales del Lugar</i>
ATPDEA	Andean Trade Promotion and Drug Eradication Act
BOLFOR	Bolivia Forestry Project
BTBC	Bolivia Trade and Business Competitiveness Project
CADEFOR	<i>Centro Amazónico de Desarrollo Forestal</i>
CAN	<i>Comunidad Andina de Naciones</i>
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFB	Forest Chamber of Bolivia
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
COP	Conferences of the Parties
CSF	Conservation Strategy Fund
DFID	Department for International Development (UK)
ESPA	Ecosystem Services and Poverty Alleviation Program
FAA	Foreign Assistance Act
FAN	<i>Fundación Amigos de la Naturaleza</i>
FES	<i>Función Económica y Social</i>
FOCERFO	Forest Certification Fund
FONABOSQUE	<i>Fondo Nacional de Desarrollo Forestal</i>
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GNP	Gross National Product
GOB	Government of Bolivia
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
I3N	IABIN Invasives Information Network
IABIN	Inter-American Biodiversity Information Network
IBIBDD	<i>Instituto Boliviano de Investigación de la Biodiversidad para el Desarrollo</i> (Bolivian Institute on Biodiversity Research for Development)
IBIF	<i>Instituto Boliviano de Investigación Forestal</i> (Bolivian Forest Research Institute)
IDH	<i>Impuesto Directo a los Hidrocarburos</i> (Direct Tax on Hydrocarbons)
IIED	International Institute for Environment and Development
IIRSA	Integration of Regional Infrastructure in South America
INE	<i>Instituto Nacional de Estadísticas</i>
INRA	<i>Instituto Nacional de Reforma Agraria</i> (National Institute of Agrarian Reform)

ITTO	International Tropical Timber Organization
IUCN	International Union for the Conservation of Nature
LKS	Lesser Known Species
LOPE	<i>Ley de Ordenamiento del Poder Ejecutivo</i> (Law for the Organization of the Executive Power)
MAS	<i>Movimiento al Socialismo</i>
MDRAMA	<i>Ministerio de Desarrollo Rural, Agropecuario y Medio Ambiente</i> (Ministry of Rural Development, Agriculture and Environment)
MNACC	<i>Mecanismo Nacional de Adaptación al Cambio Climático</i> (National Mechanism for Adaptation to Climate Change)
MPD	<i>Ministerio de Planificación del Desarrollo</i>
MYPES	<i>Micro y pequeñas empresas</i>
NBS	National Strategy for Biodiversity
NDP	National Development Plan ( <i>Plan Nacional de Desarrollo [PND]</i> )
NGO	Nongovernmental Organization
NRBE	Natural Resource-Based Enterprise
NRM	Natural Resource Management
NTFP	Non-Timber Forest Product
ODL	<i>Oficina de Desarrollo Limpio</i> (Clean Development Office)
OECAs	<i>Organizaciones Económicas Campesinas</i>
PA	Protected Areas
PACNK	<i>Proyecto de Acción Climática Noel Kempff Mercado</i> (Noel Kempff Climate Action Project)
PDVSA	<i>Petróleos de Venezuela S.A.</i>
PES	Payments for Environmental Services
PNCC	<i>Programa Nacional de Cambios Climáticos</i> (National Climate Change Program)
REDD	Reduced Emissions from Deforestation and Degradation
SAGUAPAC	Santa Cruz water and sewage cooperative
SENAMHI	<i>Servicio Nacional de Meteorología e Hidrología</i> (National Meteorological and Hydrological Service)
SERNAP	<i>Servicio Nacional de Áreas Protegidas</i> (National Protected Areas Service)
SNAP	<i>Sistema Nacional de Areas Protegidas</i> (National System of Protected Areas)
TCOs	<i>Tierras Comunitarias de Origen</i>
TNC	The Nature Conservancy
UNCCD	United Nations Convention to Combat Desertification
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VMBRFMA	<i>Viceministerio de Biodiversidad, Recursos Forestales y Medio Ambiente</i> (Vice-Ministry of Biodiversity, Forest Resources and Environment)
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund
YPFB	<i>Yacimientos Petrolíferos Fiscales Bolivianos</i>



# EXECUTIVE SUMMARY

USAID/Bolivia could help to support a number of the actions that are needed to conserve Bolivia's unique and valuable biological diversity and tropical forests, even in the current dynamic political context. Some of these actions can be of a short-term, "no regrets" nature which can set the stage for a longer-term strategy that will build on some of the more transformational changes that have occurred, or are occurring. These changes include the trend toward decentralization and greater autonomy at the departmental and municipal levels of government, as well as the inclusion and empowerment of groups that were formerly socially, politically, and economically marginalized. In supporting some of these "actions needed" for conserving biodiversity and tropical forests, USAID would benefit Bolivians in local communities, especially socially and economically marginalized groups, and would also support the Government of Bolivia in implementing its National Development Plan (NDP) and fostering the sustainable and equitable development of the country. Furthermore, these activities would benefit US national interests and the global community by protecting Bolivia's globally significant biodiversity and by helping to mitigate global climate change.

USAID/Bolivia conducted its last Tropical Forestry and Biodiversity (FAA 118-119) Assessment in 2002 (USAID, 2002), in conjunction with the development of its 2004-2009 Country Strategy. Since that assessment, the political and economic situation in Bolivia has changed dramatically. Given these changes, USAID/Bolivia requested this updated assessment as an input to the development of its 2009-2013 Country Strategy.

The objectives of this assessment were to update information on:

- Threats to Bolivia's tropical forests and biological diversity, and their direct and indirect (root) causes;
- Actions needed to reduce and/or mitigate the direct and indirect (root) causes of those threats in the current political, economic, social context; and
- Opportunities for USAID to support such needed actions within its proposed strategy and program.

We used the information gathered from all sources in this analysis to develop five general principles for USAID to consider as it develops a strategy and programs that may assist Bolivia to meet its needs in tropical forest and biodiversity conservation. We then applied those general principles to the broad set of "actions needed" that were identified by our participatory analysis, and identified four priority areas to recommend for USAID support.

Information needed to meet the above objectives was gathered by a team of professional environmental consultants led by ARD, Inc. No single source of information was sufficient, and information from one source was validated by, and supplemented with, information from other sources. Information was gathered through:

- Expert analyses provided in topical assessment reports on selected themes;
- Review of relevant documents;
- Workshops with experts and stakeholder representatives in Santa Cruz and La Paz;
- Interviews with representatives of key stakeholder groups, including national and departmental government agencies, international and national nongovernmental organizations (NGOs), private sector representatives, community organizations and representatives, and international donors;
- Interviews with members of each of USAID/Bolivia's Strategic Objective teams; and
- Additional research by the assessment team.

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Biological diversity, or biodiversity, is the variability and variety of living systems at several levels, including the diversity of ecosystems, of species within ecosystems, and of genes within species. Bolivia's nearly unmatched ecosystem diversity results from the country's dramatic topographic, altitudinal, and climatic diversity, combined with its location in the South American tropics. Few countries in the world possess as great a diversity of ecosystems as Bolivia. It is considered a "megadiversity" country and is probably among the top 10 countries in the world with the highest species and ecosystem diversity. Tropical forest ecosystems cover approximately 49 percent of the country. Given its relatively small population, Bolivia has the largest amount of forest per capita of any country. The diverse ecosystems of Bolivia are represented in 22 protected areas (PAs) of national interest, and numerous others of departmental and municipal interest. In addition, Bolivia has eight sites registered under the international Ramsar Convention on Wetlands.

South America is particularly important as the center of origin of many cultivated species, such as potato, quinoa, amaranth, tomato, peanut, cacao, and pineapple. Wild relatives of many of these domesticated species are found in Bolivia. The genetic diversity of these wild relatives of crop plants is a resource that can help ensure the viability of these crops in the face of evolving crop pests and diseases and global climate change.

Biological diversity is the source of three general categories of benefits to humans: ecosystem products, ecosystem services, and non-material (e.g., cultural, recreational, educational, spiritual) benefits. Forest products, both timber and wood products as well as non-timber forest products (NTFPs), are a significant contributor to Bolivia's national exports. Bolivia has the largest area of certified production forests in the world, with around 1.98 million hectares. Bolivia is the world's leading producer of Brazil nuts (*castaña*), *Bertholletia excelsa*, supplying about 70 percent of world demand (Collinson et al., 2000; FAO, 2007).

Although there are many types of ecosystem services, initiatives developed by NGOs and by the government have focused only on two: hydrological services and carbon sequestration. The most important areas of Bolivia for hydrological ecosystem services are the forests at the heads of watersheds. These forests protect the soils on steep slopes and improve downstream water quality by reducing siltation; they catch, hold, and slow the runoff from precipitation, thereby reducing peak flows and flooding, as well as stabilizing flows during the dry season. Concrete examples of market-like payments schemes for conserving hydrological services have been developed in municipalities bordering Amboró National Park. Bolivia also has gained valuable field experience in monitoring and developing baseline conditions for carbon sequestration projects through the Certified Emission Reductions (CERs) from the Noel Kempff Mercado Climate Action Project, which will serve the country well as it moves forward with the implementation of REDD.

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Key threats to Bolivia's biodiversity and tropical forests—identified and ranked according to the severity of the threat they pose as informed by our analysis—are:

- Loss, conversion, and degradation of forests and other natural habitats;
- Pollution of aquatic ecosystems;
- Overharvesting of selected species; and
- Exotic invasive species.

Currently, about 300,000 hectares of forest are lost each year for a variety of reasons including an expanding agriculture/livestock frontier, due both to large-scale industrial agriculture and to small-scale colonization and cultivation; large-scale infrastructure projects (roads, dams, energy infrastructure); expanding coca production; forest fires (*chaqueo*); illegal logging; and climate change causing changes in geographical and altitudinal distribution of species and ecosystems.

Direct or proximate causes of the pollution of aquatic ecosystems are mining wastes, agro-chemicals (pesticides, fertilizers), coca processing, and industrial and domestic solid and liquid waste. Direct or proximate causes of the overharvesting of selected species include lack of sustainable use and management plans, and illegal harvesting. Global climate change caused mainly by the burning of fossil fuels and production of greenhouse gases could be described as a threat to biodiversity and forests, or it could be considered a cause of one or more of the direct threats above.

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Since the last USAID/Bolivia Tropical Forestry and Biodiversity Assessment was completed in 2002 (USAID, 2002), Bolivia has undergone a profound socio-political transformation. So, while the broad categorization of threats to Bolivia's biodiversity and tropical forests are in many ways similar to those identified in 2002, the context and opportunities for addressing them have changed significantly. The current political, economic, and social context (*la coyuntura política*) in Bolivia affects the underlying causes of the threats identified, and also gives rise to the challenges and opportunities for addressing them.

It is difficult to predict how the political situation in Bolivia will evolve and how these developments will affect the management of tropical forests and biodiversity. Several important characteristics of the *coyuntura* that are generally viewed as permanent, have important implications for the future management of biodiversity and tropical forests, and will help define the range of actions needed, are:

- Moving toward departmental autonomy;
- Empowering and including indigenous and other marginalized social groups; and
- Bringing renewable natural resources into the political debate.

Direct threats to biodiversity and forest ecosystems have multiple underlying root causes or drivers. These can be broadly categorized as political, institutional, economic, external (or global), and social causes. The specific causes identified below emerged as the more important causes underlying the threats.

Political, Institutional	<ul style="list-style-type: none"> <li>• New governing paradigm or model for development</li> <li>• Inadequate institutional/legal framework and unclear mandates</li> <li>• The need for more institutional capacity</li> <li>• Changing dynamics related to land tenure and property rights</li> </ul>
Economic	<ul style="list-style-type: none"> <li>• Limited private sector (foreign and domestic) investment</li> <li>• Economic incentives that favor land clearing over conservation</li> <li>• Large scale infrastructure development</li> <li>• New actors (e.g., communities, TCOs) in new economic model have need to develop more technical and business skills</li> </ul>
External	<ul style="list-style-type: none"> <li>• Poverty and subsistence living</li> <li>• Global market forces and trends (e.g., biofuels, food crisis)</li> <li>• Regional infrastructure development and economic integration</li> <li>• Global climate change</li> </ul>
Social	<ul style="list-style-type: none"> <li>• Need for increased awareness, understanding and information on conservation</li> <li>• Social and cultural norms and practices (e.g., <i>chaqueo</i>)</li> </ul>

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Actions to reduce the direct threats to Bolivia's biodiversity and forests must act upon the underlying political, institutional, economic, external (global), and social causes and drivers. In general terms, such "actions needed" to address, reduce, or mitigate these causes include:

- Political and institutional actions, such as to:
  - Develop an adequate legal and policy framework;

- Apply and enforce laws and regulations; and
- Improve access, rights, and tenure over land and natural resources.
- Economic actions, such as to:
  - Increase positive incentives or remove perverse incentives;
  - Reduce poverty and improve distribution of benefits;
  - Improve capacity for planning for environmentally and socially sustainable development; and
  - Improve business skills and capacity.
- Actions to address external pressures (or global forces), such as to:
  - Develop adequate environmental safeguards for agricultural production for international markets (food, biofuels);
  - Develop adequate environmental safeguards for regional mega-projects (energy, transportation, etc.); and
  - Maintain and strengthen national participation in global climate change treaties, negotiations, and mechanisms.
- Social actions, such as to:
  - Improve social participation in environmental decision making through access to information, environmental communication, and education; and
  - Change unsustainable practices through public education and social marketing campaigns.

\*\*\*\*\*

USAID/Bolivia was in the early stages of developing a new five-year strategy for most of its programs when the assessment was being conducted. Based on our analysis of the challenges and opportunities presented by the current political, economic, and social context, we have identified five general principles that should guide USAID/Bolivia programming in support of tropical forest and biodiversity conservation for the next strategy period. These are:

1. Respond to the fundamentals of Bolivia's National Development Plan (*Plan Nacional de Desarrollo*) and other GOB policies and priorities on which there is coincidence with USG and USAID priorities.
2. Build on the positive current trends on the inclusion and empowerment of socially and economically marginalized groups.
3. Focus on the local level, working with municipalities and communities to build sustainable capacity and implement for results.
4. Work in a way that balances and/or cuts across the political and geographic lines in Bolivia (e.g., Altiplano / *low-lands*, indigenous and non-indigenous,).
5. Build bridges upward from the local level to departmental and national government levels, emphasizing technical aspects of forest and biodiversity conservation.

Habitat loss, degradation and conversion emerged as the most critical threat to Bolivia's tropical forests and biodiversity. Lack of real or perceived economic value of tropical forests and biodiversity, and lack of opportunities to create value, was identified as the most significant economic driver of habitat loss and change. The most significant political/institutional cause underlying most of the threats was an overall insufficient institutional capacity to legislate and regulate the management of forestry and biodiversity resources. Given our recommendation above that USAID link its activities with key elements of the NDP, together with the scarcity of constructive opportunities to influence national-level institutions and policies in the current context, we believe that in its next strategy USAID should emphasize economic opportunities as the entry point for helping Bolivia conserve its biodiversity and tropical forests.

We further applied these general principles to the broad set of “actions needed” identified by our participatory analysis, and identified four priority work areas that can be recommended for USAID support. Based on our analysis, the team recommends that USAID/Bolivia support activities to:

1. **Strengthen Natural Resource-Based Enterprises.** The assessment team recommends that USAID/Bolivia provide support to strengthen natural resource-based enterprises (NRBEs), including wood product enterprises based on sustainable wood production from native forests, and enterprises based on NTFPs and animal products from native species found in natural ecosystems. We do so because this work area directly addresses the economic cause of the highest-ranked threat: loss, conversion, and degradation of forests and other natural habitats. It works in the economic realm, where there are opportunities to follow all five of the general strategic principles we identified.
2. **Develop Mechanisms for International Payments for Avoided Deforestation.** The assessment team recommends that USAID/Bolivia support the development of models and mechanisms for international payments for conserving forests for carbon sequestration. Such mechanisms are another way to increase the economic value of forests to local communities, thereby addressing the main cause of their loss and conversion. These mechanisms could be of two types: payments through private carbon markets, or payments structured through a post-Kyoto Reduced Emissions from Deforestation and Degradation (REDD) mechanism now being developed under the UN Framework Convention on Climate Change (UNFCCC).
3. **Develop Incentives for Conserving Watershed Forests.** The assessment team recommends that USAID/Bolivia support the development and scaling up of local-scale, watershed-based, economic incentives for conserving watershed forests, including Payments for Ecosystem Services (PES)-like mechanisms. This is another way of increasing the economic value of forests to local communities, addressing the main cause of their loss and conversion.
4. **Control Water Pollution from Altiplano Communities.** Pollution of aquatic ecosystems was identified as a threat to biodiversity in each of the three major watersheds of Bolivia, and one that also threatens human health in many places, and our analysis led us to the conclusion that USAID/Bolivia should support work to control pollution. A focus on the densely populated and highly visible watersheds flowing into Lake Titicaca from El Alto is an excellent place to begin this work, and USAID/Bolivia has recently designed and contracted a Lake Titicaca Pollution Management project along these lines.

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We relied heavily on many people for information and insights about Bolivia. We hope that this assessment is a useful synthesis of their diverse and thoughtful perspectives, and that these ideas will contribute to USAID’s future strategy for supporting environmentally and socially sustainable development in Bolivia and the conservation of its rich biological diversity and valuable tropical forests.





# 1.0 INTRODUCTION

## 1.1 OBJECTIVES

The Foreign Assistance Act (FAA), which authorizes US bilateral foreign aid programs, requires that a Tropical Forestry and Biodiversity Assessment be conducted in conjunction with the development of new foreign assistance strategies and programs. The purposes of this legal requirement are 1) to assure that US foreign aid does not support activities that harm the tropical forests and biodiversity of host countries; and 2) to inform USAID strategic planning and find ways to support host countries to sustainably use and conserve their tropical forests and biodiversity. Specifically, FAA Sections 118 and 119 state, regarding tropical forests and biodiversity respectively, that

“Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of the actions necessary in that country to conserve tropical forests and biological diversity, and the extent to which the actions proposed for support by the Agency meet the needs thus identified.”

The intent of the US Congress in passing these amendments was not to support the conservation of biological diversity and tropical forests for their own sake, but rather to support their conservation because of the belief that they are the foundation for the long-term, sustainable social and economic well-being of any country.

USAID/Bolivia conducted its last FAA 118-119 Assessment in 2002 in conjunction with development of its 2004-2009 Country Strategy. Since that assessment, the political and economic situation in Bolivia has changed significantly. Given these changes, USAID/Bolivia requested this updated assessment not only to meet the legal requirement of the FAA, but to help contextualize the strategy it will be developing within the current socio-political context in Bolivia.

The objectives of this assessment were to update information on:

- Threats to Bolivia’s tropical forests and biological diversity, and their direct and indirect (root) causes;
- Actions needed to reduce and/or mitigate the direct and indirect (root) causes of those threats in the current political, economic, and social context; and
- Opportunities for USAID to support such needed actions within its proposed strategy and program.

We used information gathered from all sources in this analysis to develop five general principles for USAID to consider as it develops a strategy and programs that may assist Bolivia to meet its needs in tropical forest and biodiversity conservation, given the country’s current political, economic, and social situation. We then applied those general principles to the broad set of “actions needed” that were identified by our analysis, and identified four priority work areas that can be recommended for USAID support.

## 1.2 METHODS

Information needed to meet the above objectives was collected by a team of consultants led by ARD, Inc. and Simbiosis (see Annex B, Biographical Sketches of Team Members). We based our assessment and analysis on the following logical framework:

- Identify the direct threats to tropical forests and biodiversity;
- Identify the root causes or drivers of the threats;
- Identify the actions needed to address, remove, and/or mitigate these causes;
- Identify the institutional actors who can carry out or support the needed actions; and, based on this
- Identify opportunities for USAID to support needed actions and/or key actors within its proposed strategy.

This analytical framework was agreed upon with USAID/Bolivia at the beginning of the assessment, and it provided the structure for gathering information and presenting results (for example, it served as the organizing structure for two stakeholder workshops). The analytical framework is congruent with USAID guidance on conservation threats analysis as laid out in *Biodiversity Conservation: A Guide for USAID Staff and Partners* (2005; [http://pdf.usaid.gov/pdf\\_docs/PNADE258.pdf](http://pdf.usaid.gov/pdf_docs/PNADE258.pdf)). The analysis also adheres to USAID's "best practice" guidance provided in *Tropical Forestry and Biodiversity (FAA 118-119) Analyses: Lessons Learned and Best Practices from Recent USAID Experience* (2005; [http://pdf.usaid.gov/pdf\\_docs/Pnade195.pdf](http://pdf.usaid.gov/pdf_docs/Pnade195.pdf)).

Information was gathered from several sources. No single source by itself was sufficient, and information from one source was validated by and supplemented with information from other sources. This report is an analysis and synthesis of a large amount of information, organized according to the analytical framework given above. The sources of information include the following:

- Expert analyses provided in five commissioned topical assessment reports
- Review of relevant documents including studies, evaluations, media reports, and USAID documents;
- Additional review and research of secondary sources;
- Workshops with experts and stakeholder representatives held in Santa Cruz and La Paz (see Annex D, Workshop Invitees and Participants); and
- Interviews with a sample of representatives of key stakeholder groups (see Annex C, Persons Contacted), including:
  - National and departmental government agencies,
  - International and national NGOs,
  - Private sector representatives,
  - Community organizations and representatives,
  - International donors (bilateral and multilateral), and
  - USAID/Bolivia Mission staff.

## 1.3 REPORT STRUCTURE

This assessment report essentially follows the analytical framework presented above. Following a brief overview of the status of tropical forests and biodiversity in Bolivia (Section 2) and the values and economic benefits that these resources contribute to Bolivian society (Section 3), we present in Section 4 the principal direct threats to Bolivia's tropical forests and biodiversity. In Section 5 we discuss the underlying causes of these threats, particularly how they are framed by the current socio-political and economic reality of Bolivia. Actions needed to address, remove, or mitigate these underlying causes are presented in Section 6, followed in Section 7 by general principles and some specific recommendations for USAID/Bolivia on opportunities to support the needed actions through its new strategy.

# 2.0 STATUS OF BIODIVERSITY AND TROPICAL FORESTS

## 2.1 ECOSYSTEM DIVERSITY

Biological diversity, or biodiversity, is the variability and variety of living systems at several levels, including the diversity of ecosystems, of species within ecosystems, and of genes within species. Bolivia's nearly unmatched ecosystem diversity results from the country's dramatic topographic, altitudinal, and climatic diversity, combined with its location in the South American tropics.

Bolivia's landscapes range from over 6,000 meters above sea level in the Andes to the plains of the Amazonian and Chacoan lowlands—less than 200 meters above sea level. Topography is extremely variable, with elevations varying from greater than 6,500 meters in the Andes to less than 100 meters in the lowlands. About 70 percent of the country is less than 500 meters above sea level in the lowlands of the north and east. The major rivers drain north into the Amazon basin, east and southeast into the La Plata basin, and into closed lakes or salt lakes within the Andean highlands (Figure 1). This varied topography produces wide variations in temperature and rainfall, from the low temperatures and desert-like climate of the Altiplano of the western highlands, to the hot temperatures and high rainfall of the Amazonian lowlands of the northeast. Average annual precipitation varies from less than 200 millimeters to more than 5,000 millimeters.

Few countries in the world possess as great a diversity of ecosystems as Bolivia. Bolivia includes four major biomes: tropical forests (544,660 km<sup>2</sup>, covering approximately 49% of the total surface area); high Andean grassland plains (324,932 km<sup>2</sup>; 30%), savannas (218,196 km<sup>2</sup>; 20%) and wetlands (11,193 km<sup>2</sup>; 1%) (Government of Bolivia, 2001). The tropical forests of Bolivia are found in the departments of Santa Cruz, Beni, and Pando, and northern areas of La Paz and Cochabamba (Figure 1). These biomes can be subdivided into 12 ecoregions and their regional subtypes (Figure 2).

The diverse ecosystems of Bolivia are represented in 22 protected areas (PAs) of national interest (Table 1), and numerous others of departmental and municipal interest. Together these PAs make up the National System of PAs (*Sistema Nacional de Areas Protegidas* [SNAP]) and cover approximately 16 percent of Bolivian territory (Figure 3). Araujo et al. (2005) present an analysis of the degree to which these ecosystems are represented within the SNAP and private PAs, and they identify gaps where representation in any type of PA is less than 10 percent of the area of that ecosystem type (see Figure 2). In general, they conclude that the large majority of ecosystem types are well represented in the SNAP. Bolivia has eight sites registered under the international Ramsar Convention on Wetlands (Table 2) (<http://www.wetlands.org/rsis/> and <http://www.wetlands.org/reports/rammap/mapper.cfm>), four in the Amazonian lowlands and four in the Altiplano, with the Lake Titicaca-Desaguadero-Lake Poopó-Salar de Coipasa system forming a unique high altitude closed system.

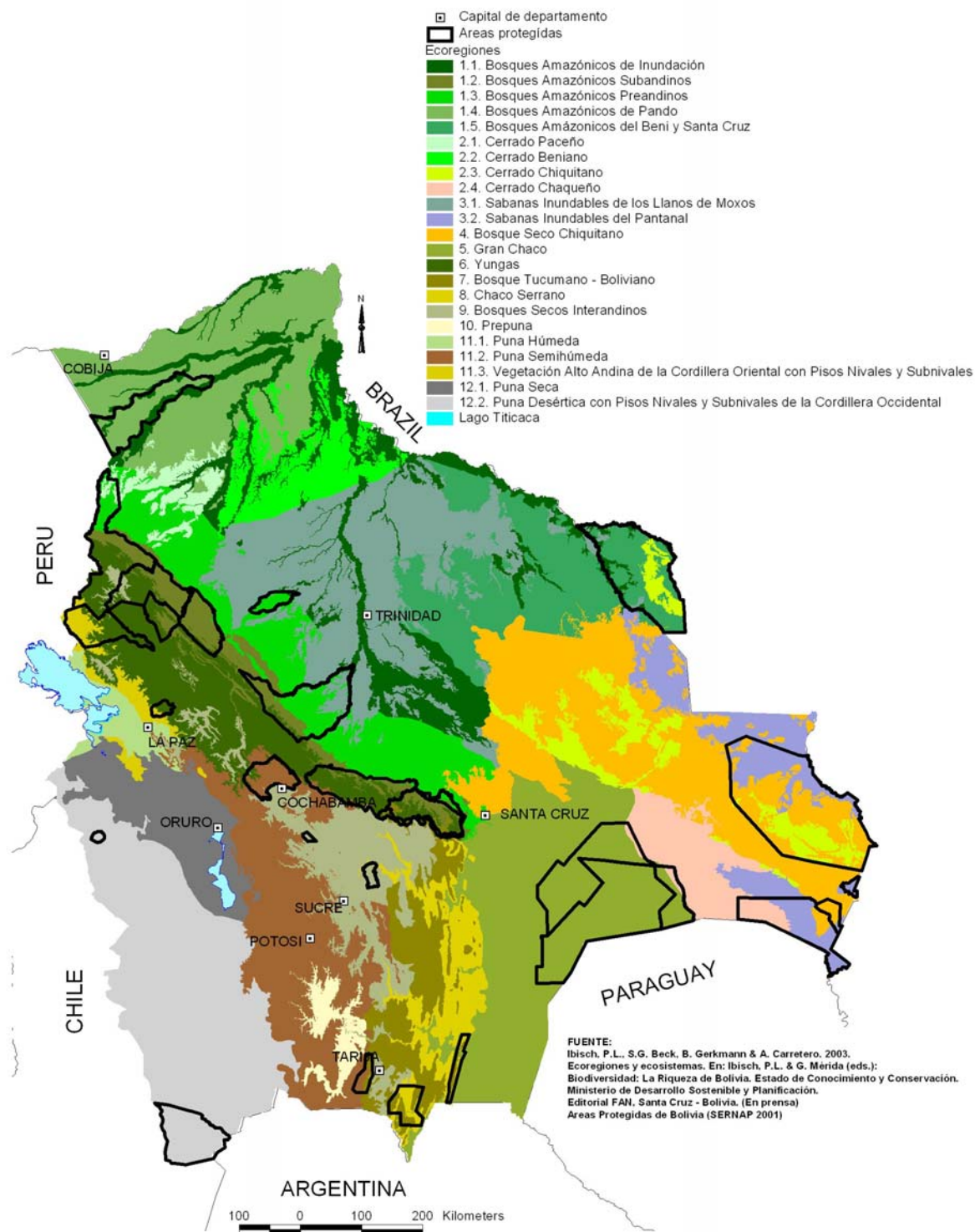


**FIGURE 1. BOLIVIA FROM SPACE**



*Source: Google Earth*

**FIGURE 2. ECOREGIONS OF BOLIVIA**





**TABLE 1. PROTECTED AREAS OF NATIONAL INTEREST (KEY TO FIGURE 3)**

Code	Name	Category
1	Sajama	National Park
2	Tunari	National Park
3	Isiboro Sécure	Indigenous Territory and National Park
4	Noel Kempff Mercado	National Park
5	Torotoro	National Park
6	Carrasco	National Park
7	Eduardo Avaroa	National Reserve for Andean Fauna
8	Manuripi	National Reserve for Amazonian Wildlife
9	Tariquía	Nacional Reserve for Flora and Fauna
10	Cordillera de Sama	Biological Reserve
11	Apolobamba	Natural Area for Integrated Management
12	Estación Biológica de Beni	Bioshpere Reserve
13	Pilón Lajas	Bioshpere Reserve and Indigenous Territory
14	El Palmar	Natural Area for Integrated Management
15	San Matias	Natural Area for Integrated Management
16	Amboró	National Park and Natural Area for Integrated Management
17	Cotopata	National Park and Natural Area for Integrated Management
18	Madidi	National Park and Natural Area for Integrated Management
19	Kaa-Iya Del Gran Chaco	National Park and Natural Area for Integrated Management
20	Otuquis	National Park and Natural Area for Integrated Management
21	Serrania del Aguaragüe	National Park and Natural Area for Integrated Management
22	Iñao	National Park and Natural Area for Integrated Management

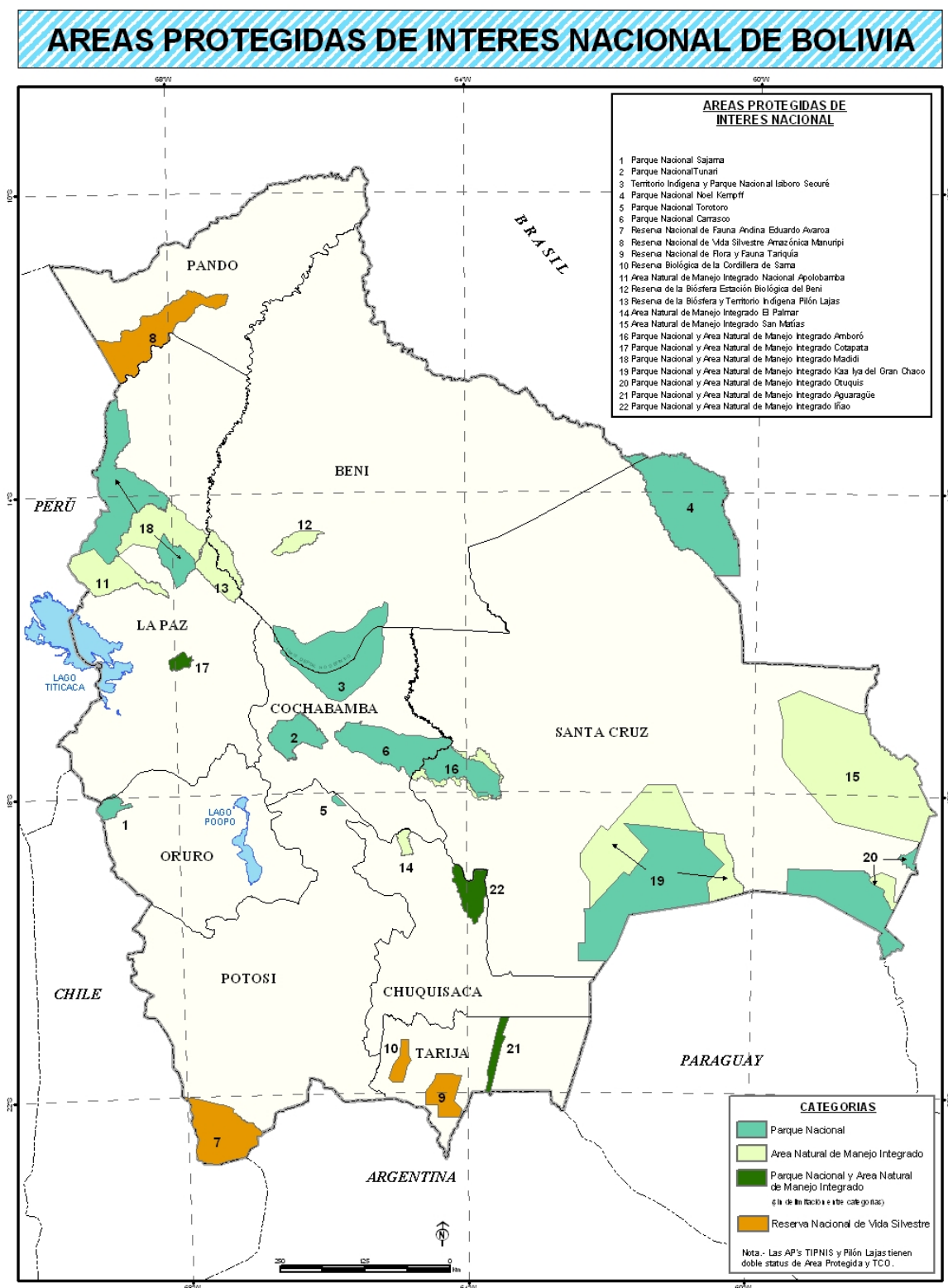
## 2.2 SPECIES DIVERSITY

Because of its exceptional ecosystem diversity and location in the tropics, Bolivia has high biological diversity at the species level. This “megadiverse” country is likely among the top 10 countries in the world in terms of species and ecosystem diversity. Biological inventories indicate that Bolivia has more than 20,000 species of plants, 356 species of mammals, approximately 1,400 species of birds, 266 species of reptiles, 203 species of amphibians, and 550 species of fish. Invertebrates in general have not been well researched, but Bolivia may place fourth in the world in number of butterfly species (FAN Bolivia, 2008). New species continue to be identified in Bolivia, including charismatic mammalian species such as the recently discovered Golden Palace Monkey (*Callicebus aureipalatii*) (WCS, 2005).

The ecosystems with the highest species diversity in Bolivia are the Yungas and Sub-Andean Amazonian Forests (*Bosques Amazónicos Subandinos*) ecosystems (Figure 2) found along the northeastern slopes of the Andes from the Peruvian border southeast to Santa Cruz (Araujo et al., 2005). The areas of highest species richness are well represented in the chain of PAs from Manuripi through Madidi, Apolobamba, Pilón Lajas, Cotapata, Isiboro Sécure, Carrasco, and Amboró. The Amazonian lowlands of Pando, Beni, northern La Paz, northern Cochabamba, and northern Santa Cruz also have high levels of species diversity (Araujo et al., 2005).



**FIGURE 3. PROTECTED AREAS OF NATIONAL INTEREST (SEE TABLE 1 FOR NAMES)**



**TABLE 2. RAMSAR SITES IN BOLIVIA**

Ramsar Site Name	Designation Date (yr)	Department	Area (hectares)
Cuenca de Tajzara	2000	Tarija	5,500
Lake Titicaca (Bolivian Sector)	1998	La Paz	800,000
Lakes Poopó y Uru Uru	2002	Oruro	967,607
Laguna Colorada	1998	Potosí	51,318
Bañados del Izozog y el Parapetí River	2001	Santa Cruz	615,882
Laguna Concepción	2002	Santa Cruz	31,124
Palmar de las Islas y las Salinas de San José	2001	Santa Cruz	856,754
Pantanal Boliviano	2001	Santa Cruz	3,189,888

Bolivia also has high levels of endemism in some taxonomic groups—that is, species with relatively limited geographic distribution, found nowhere else (Table 3). At least 100 endemic species of vertebrates are known, and it is estimated that about 20 to 25 percent of the vascular plants found in Bolivia (approximately 4,000-5,000 species) could be endemic. The ecosystems with the highest levels of endemic species are again the Yungas and Sub-Andean Amazonian Forests (*Bosques Amazónicos Subandinos*) ecosystems (Araujo et al., 2005).

Species-rich ecosystems are characterized by an extreme complexity of ecological processes and interactions (pollination, predation, etc.). This may make these ecosystems more sensitive to environmental perturbations, such as those that could result from global climate change, for example. It is important to keep in mind that species diversity is only one aspect of biological diversity and that all ecosystems contain species important to their functioning, no matter how species rich. In terms of ecological functions and economic importance to humans, the species of the relatively species-poor Altiplano are just as important as those of the species-rich Yungas.

**TABLE 3. DIVERSITY AND ENDEMISM OF SPECIES IN SELECTED GROUPS IN BOLIVIA**

Taxon	Estimated number of species	Percent of species endemic to Bolivia	Estimated rank among countries in species of this taxon
Vascular plants	18,000-19,000	20-25	10-11
Orchids	1,330	20-25	7-9
Cacti	>320	74	2
Fish	500		
Amphibians	155	15-20	11
Reptiles	229	7-8	15-16
Birds	1,385	1	5-6
Mammals	319	4-5	10

GOB, Convention on Biological Diversity, First National Report, 1997

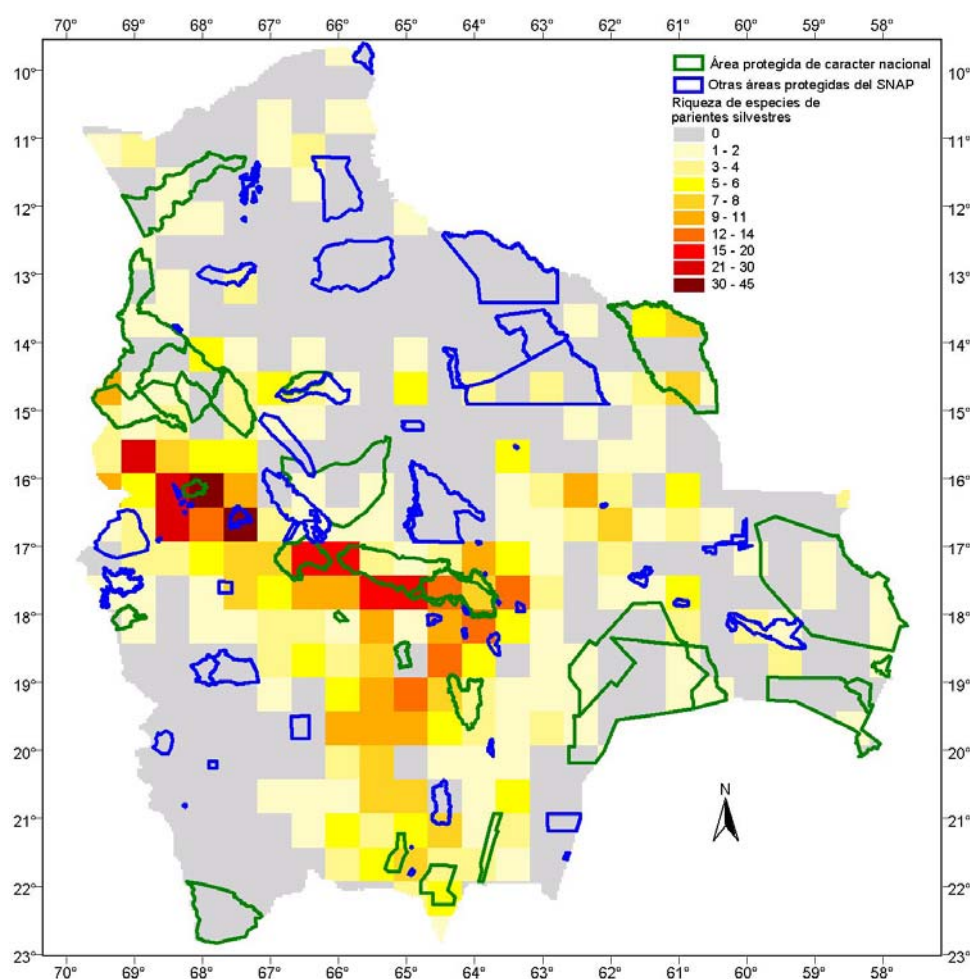
## 2.3 GENETIC AND AGRO-BIODIVERSITY

Genetic diversity allows species to adapt to changing climates and other ecological conditions. This natural genetic diversity will be especially critical to the survival of many species in the face of rapid global climate change fueled largely by anthropogenic sources. To maintain genetic diversity within species it is necessary to maintain relatively large and geographically dispersed populations. South America is particularly important as the center of origin of many cultivated species, such as potato, oca, ulluco, quinoa, amaranth, tomato, peanut, cacao, and pineapple. Wild relatives of many of these

domesticated species are found in Bolivia (GOB, CBD First National Report, 1997). The genetic diversity of these wild relatives of crop plants can help ensure the viability of these crops in the face of evolving crop pests and diseases and global climate change. About 50 species of native domesticated plants are known in Bolivia, and around 3,000 medicinal species are used at a local or regional level (FAN, 2008 <http://www.fan-bo.org:9090/fan/es/biodiversidad/index.html>). As for domesticated native animals, alpacas and llamas—domesticated camelids unique to the Andes—are economically important. Their wild relative, the vicuña, has potential as a producer of high-value wool.

A preliminary map of richness of species that are wild relatives of cultivated plants is presented in Figure 4 (scale shows number of species of wild relatives per polygon) and shows that the entire region of the inter-Andean dry valleys (Bosques Secos Interandinos, #9 in Figure 2), and the humid and semi-humid puna of the Altiplano are important areas for the diversity of these wild crop relatives. These ecosystems are poorly represented in PAs. In general, the wild relatives of domesticated species are early successional species found in disturbed habitats. Nevertheless, they contain potentially valuable genetic diversity, and their conservation will require mechanisms of environmental management other than protecting undisturbed areas of natural habitat.

**FIGURE 4. RICHNESS OF SPECIES OF WILD RELATIVES OF CULTIVATED PLANTS, WITH OVERLAY OF PROTECTED AREAS**



Source : Araujo, et al., 2005

## 2.4 TROPICAL FORESTS

As discussed in Section 2.1, tropical forest ecosystems cover approximately 49 percent of the country, or about 544,660 km<sup>2</sup>. This area of forest cover places Bolivia fifth in the Americas in terms of total forest cover, behind Canada, Brazil, the US, and Peru. Bolivia also is among the top 10 countries in the world in terms of tropical forest cover. Given its relatively small population, Bolivia has the largest amount of forest per capita of any country (GOB, CBD First National Report, 1997).

Of the total forest area, roughly 412,000 km<sup>2</sup> (or 76%) are designated as Permanent Production Forests, of which 28.8 million hectares are in northern lowland Bolivia, and 12.4 million hectares in the southern lowlands and mountains. Figure 5 shows the lands of Permanent Production Forests, together with areas deforested in the period 2001-2007. According to the *Superintendencia Forestal*, about 300,000 hectares of forest are now lost annually (Table 4), and the Vice-Ministry of Biodiversity, Forest Resources and Environment (VMBRFMA) acknowledged if small-scale deforestation not captured in the aerial images is included, total deforestation could be closer to 450,000 hectares per year. Of the deforested areas, only between 5 and 13 percent have been legally cleared in recent years.

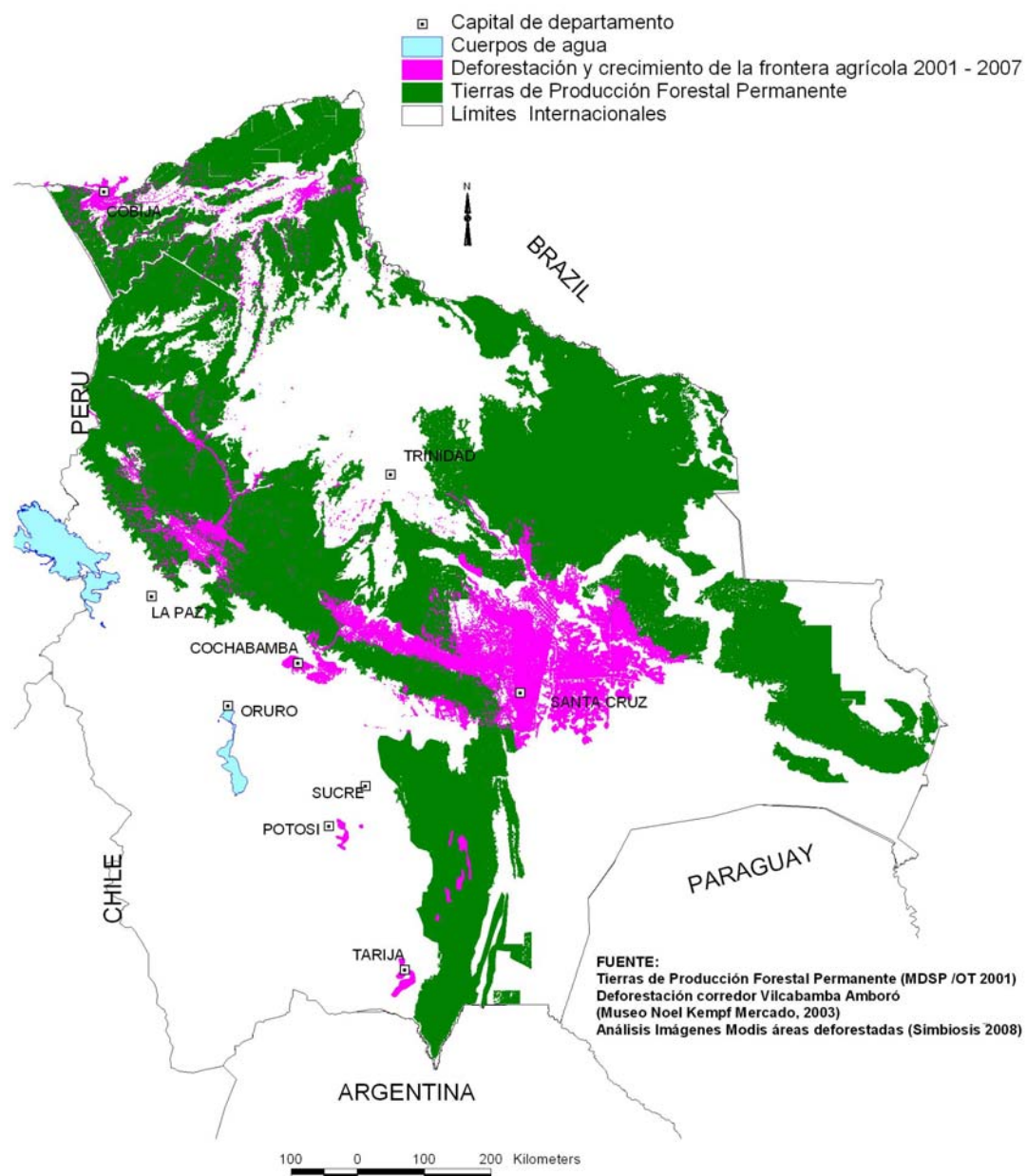
**TABLE 4. AREA DEFORESTED 2004-2006**

Year	Area deforested (ha)	Percent legally cleared
2004	275,128	11%
2005	281,283	5%
2006	307,210	13%

*Superintendencia Forestal, 2006*

Four valuable timber tree species are now scarce: mara (*Swietenia macrophylla*), roble (*Amburana cearensis*), cedro (*Cedrela spp.*), and morado (*Machaerium scleroxylon*). In contrast, other valuable and less valuable species are more abundant, including curupaú (*Anadenanthera colubrina*), momoqui (*Caesalpinia pluviosa*), tasaá (*Poeppigia procera*), cambará (*Vochysia haenkeana*), canelón (*Aniba guianensis*), ochoó (*Hura crepitans*), verdolago (*Terminalia amazonica*), bibosi (*Ficus sp.*), jorori (*Swartzia jorori*), palo maría (*Calophyllum brasiliense*), almendrillo (*Apuleia leiocarpa*, *Dypterix odorata*) and amarillo (*Aspidospermas australe*) (Superintendencia Agraria, 2004). These lesser known species (LKS) are being increasingly studied to better understand abundance and cover as well as their potential uses and market opportunities.

**FIGURE 5. PERMANENT PRODUCTION FORESTS AND RECENT DEFORESTATION**





## 3.0 VALUES AND ECONOMIC BENEFITS OF BIODIVERSITY AND FORESTS

Biological diversity, including forests, provides three general categories of benefits to humans: ecosystem products; ecosystem services; and non-material benefits, such as cultural, recreational, educational, spiritual, etc. In some cases—especially for some ecosystem products and non-material benefits such as nature-based tourism—these benefits enter into market systems and they can then be valued in monetary terms. In other cases, however, benefits from nature are not marketed, and therefore not easily valued in monetary terms. Traditional uses of ecological resources to meet subsistence and livelihood needs are common in Bolivia, such as for fuelwood, building materials, and wild foods and medicines. Many cultural and spiritual benefits derived from ecosystems are not marketed. Ecosystem services such as hydrological services from watersheds, pollination, and soil nutrient cycling also typically are not marketed or valued in monetary terms. Nevertheless, both ecosystem services and non-material benefits from nature have an undeniable value. Several recent reports present a broad overview of the values and benefits of biodiversity to Bolivia and other countries of the region.<sup>1</sup> Other studies focus on economic valuation of environmental services in Bolivia (Conservation Strategy Fund [CSF] reports) and attempt to demonstrate how these services need to be incorporated in decision making for development.

### 3.1 FOREST PRODUCTS

Forest products, both timber and wood products as well as non-timber forest products (NTFPs), are a significant contributor to Bolivia's national exports, as can be seen in Tables 5 and 6.

**TABLE 5. CONTRIBUTION OF FOREST PRODUCTS TO TOTAL EXPORTS (US\$ MILLION)**

	1992	1997	2000	2002	2004	2006	2007
Total	774	1272	1475	1372	2254	4080	4780
Forest	62	125	120	85	145	157	176
%	8	10	8	6	6	4	3.5

*Source: J. Baldivia, 2008, information from INE.*

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<sup>1</sup> For example, the Ecosystem Services and Poverty Alleviation Program's (a consortium of the British research councils and the Department for International Development [DFID]) "Challenges to Managing Ecosystems Sustainably for Poverty Alleviation: Securing Well-Being in the Andes/Amazon." (ESPA-AA, 2008), and Hjortsø, et al. (2006) discuss the economics of forest resources in Bolivia.



Between 1995 and 2005, the internal value of the forest products produced in Bolivia grew by 43 percent; however, as a percentage of Gross National Product (GNP), the contribution of the forest sector only increased slightly. In terms of exports, the relative contribution of forest products dropped in 2006 and 2007 due to a rise in the price of exported natural gas and mineral commodities in international markets. (Bolivia has exported significant amounts of gas since 2004). In 2005, the forestry sector accounted for about one percent of employment in the country.

Some examples of forest ecosystem products that are exported from Bolivia are shown in Table 6.

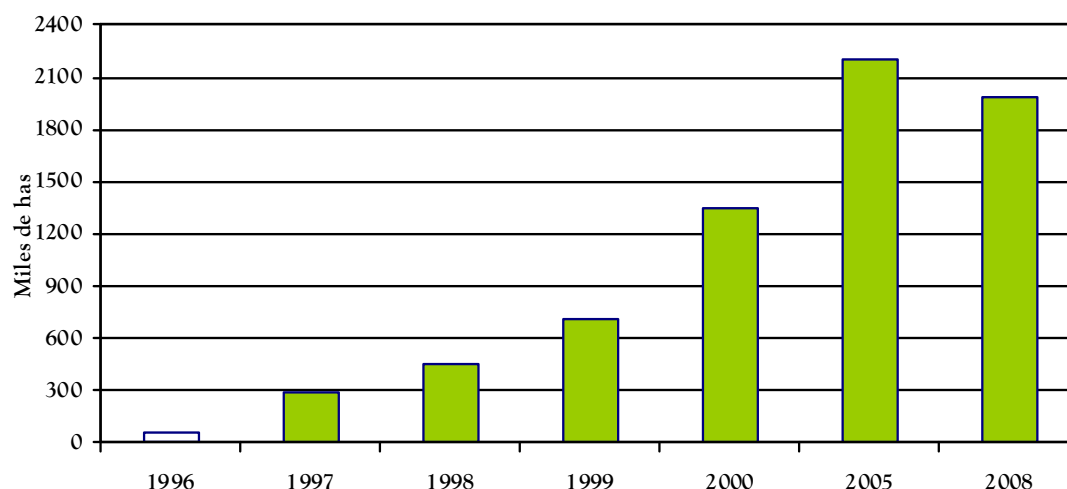
**TABLE 6. PRINCIPAL FOREST PRODUCTS EXPORTED (2004)**

Product	Value(\$ US, millions)
Brazil nuts	60
Unfinished lumber	29
Doors, window frames, finished construction materials	23
Chairs, furniture, furniture parts	18
Finished lumber	8
Palm hearts and cocoa beans	5
Cacao paste or without sugar	1
Other wood products	0.6
Charcoal	0.2
Containers	0.1
<b>Total</b>	<b>145</b>

*Fuente: Elaboración Gonzalo Flores. (FAO Bolivia)*

Bolivia has the largest area of natural forest under certified management, about 1.98 million hectares, down from about 2.2 million a few years ago. As of May 2008, there are 18 certified operations authorized by the *Superintendencia Forestal*, of which 14 are concessions, three are private lands, and one is a *Territorio Comunitario de Origen* (TCO). Fourteen of these operations are producers of wood products (furniture, doors, window frames, etc.). The correlation between wood product producers and certified forests shows that these enterprises are interested in the sustainable production of their primary raw material, wood.

**FIGURE 6. GROWTH IN AREA OF CERTIFIED NATURAL FOREST (THOUSANDS OF HA)**



*Source: Superintendencia Forestal.*

The wood product industry consists primarily of small and medium enterprises with obsolete technology producing solid wood products. The cost of production per cubic meter of wood is more than twice as high as in Brazil, Bolivia's principal competitor. This high cost of production in Bolivia results from a number of factors, including low rate of extraction per hectare; high costs of forest management; and high costs of essential inputs such as machinery, fuel, and transportation.

Growth in the international market for certified wood products from Bolivia has been slow in terms of volume purchased and price differential paid. At the moment, the economic potential of certified forest products is not being realized.

## 3.2 NON-TIMBER FOREST PRODUCTS AND OTHER NATURAL PRODUCTS

The National Biocommerce Program is an initiative of the United Nations Conference on Trade and Development (UNCTAD) that began in 2003 as a government program implemented by *Fundación Amigos de la Naturaleza* (FAN). Its objective is to generate investments for the commercialization of sustainably produced natural products. The program had several components, including developing standards and institutional capacity and developing value chains for natural products, financing, and information and training. This program is entering its concluding phase, which includes:

- Six pilot projects involving Brazil nuts, wild cacao, organic maca, honey, aromatic species, and butterflies;
- Definition of three productive networks for vicuña, caiman, and natural ingredients;
- Services comprising technical advice, technical assistance, and training;
- Operation of a fund to support biocommerce initiatives with credit, shared risk, and incentives; and
- Coordination of actors in natural products value chains, from indigenous and local small producers to businesses.

The following NTFPs and other natural products are ones for which opportunities could be explored:

- Brazil nuts, (*Bertholletia excelsa*)
- Cacao (*Theobroma cacao*),
- Jatata Palm (*Geonoma deversa*),
- Maca (*Lepidium meyenii*),
- Caiman (*Caiman yacare*), and
- Vicuña (*Vicugna vicugna*).

## 3.3 ECOSYSTEM SERVICES

Although there are many types of ecosystem services, including nutrient cycling, pollination, pest and pathogen control, carbon sequestration, and hydrologic cycle regulation (Byers, 2007), initiatives developed by NGOs and the GOB have focused on two: hydrological services and carbon sequestration.

### 3.3.1 Hydrological Services

Figure 7 identifies the most important areas of Bolivia for hydrological ecosystem services. In general, forests in the upper watersheds are a high-priority area for the provision of this type of ecosystem service. These forests protect the soils on steep slopes and improve downstream water quality by reducing siltation; they catch, hold, and slow the runoff from precipitation, thereby reducing peak flows and flooding, as well as stabilizing flows during the dry season (Araujo et al., 2005). Lakes and swamps or seasonally flooded areas likewise contribute to hydrological ecosystem services by retaining water and mitigating flooding. These wetlands and lakes are also important ecosystem types, supporting unique assemblages of species and maintaining important ecological processes and functions.

**FIGURE 7. IMPORTANT AREAS FOR HYDROLOGICAL SERVICES**

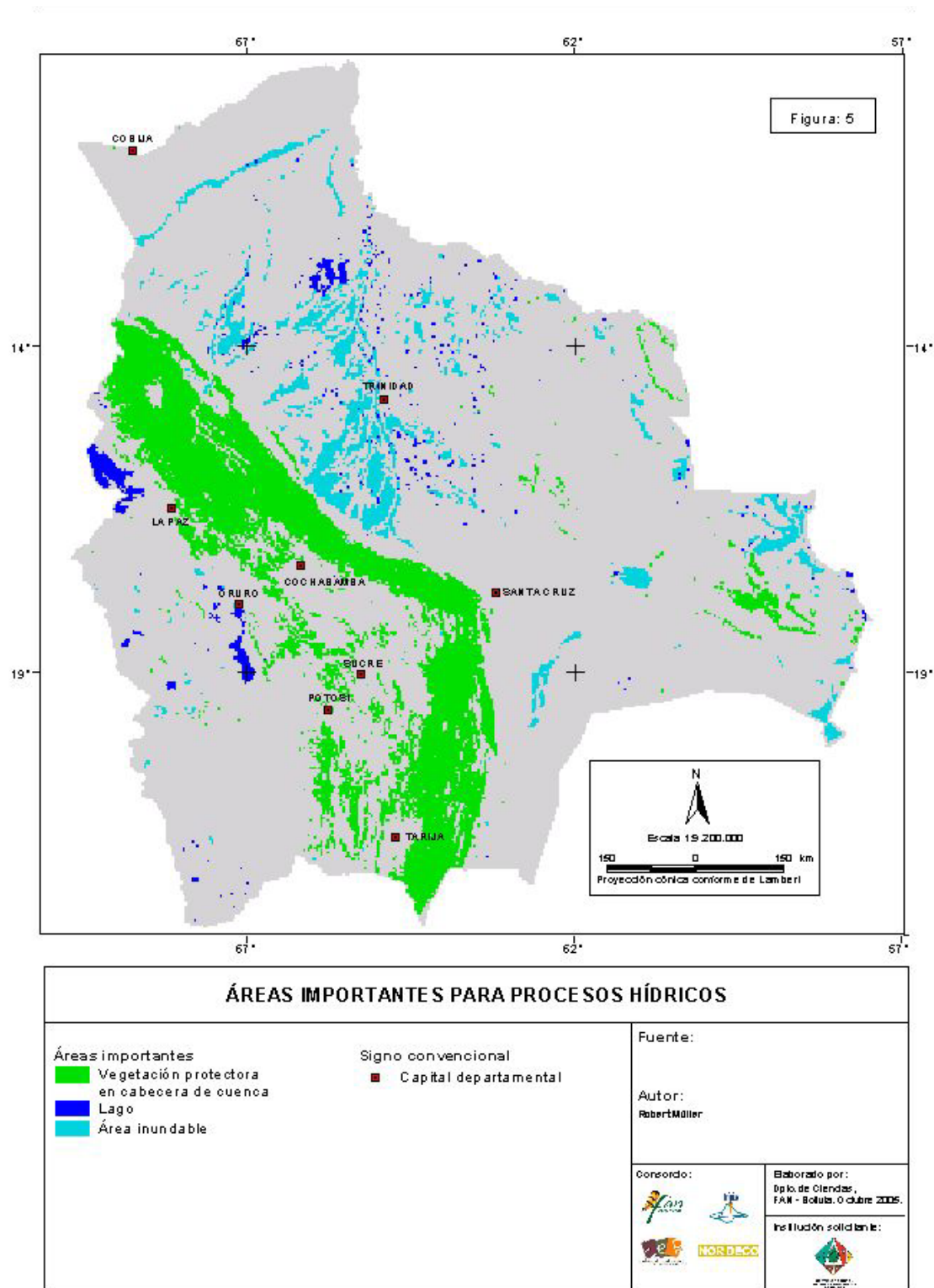
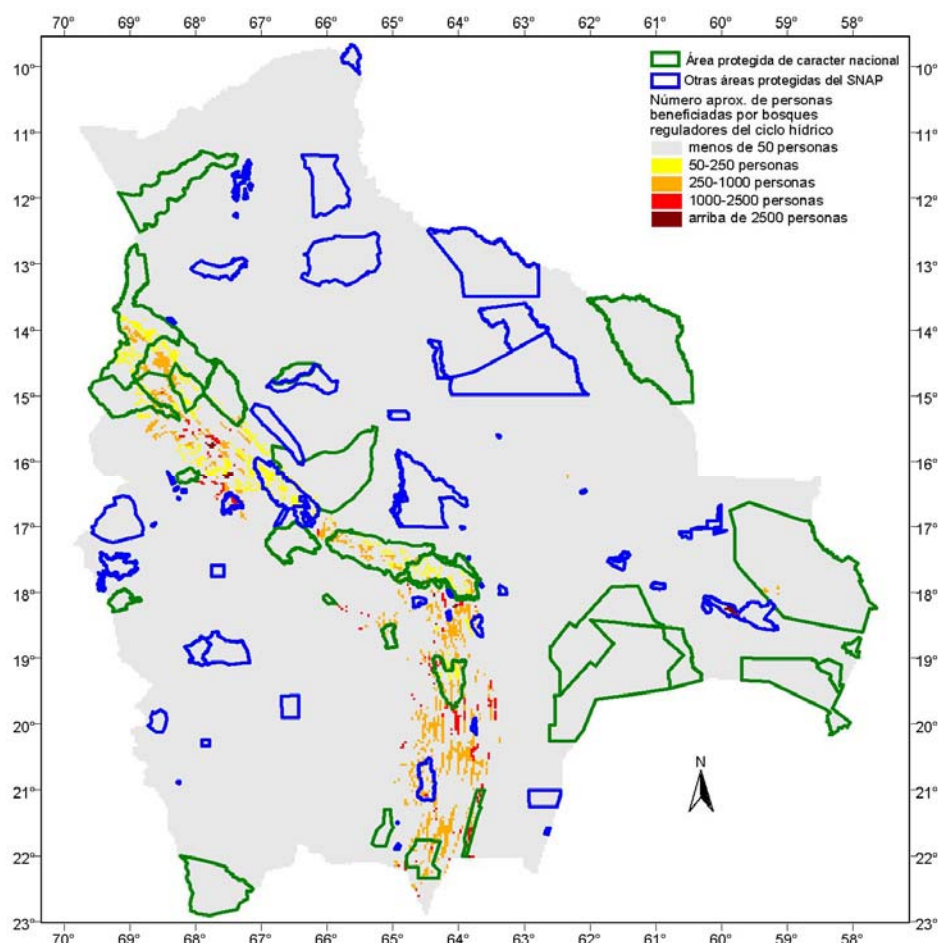


Figure 8 indicates the watershed forests of most importance to local people are found on the slopes of the eastern Cordillera, especially in the Yungas of La Paz (Coroico, Caranavi, La Asunta, and other areas), in the valleys of Santa Cruz (Comarapa, Mairana, etc.), and in some of the initial ranges of the southeast Cordillera (such as the zone of Monteagudo and Villamontes). There is a good coverage of these important watershed forests in national PAs in the Madidi-Pilón Lajas and Carrasco-Amboró PA complexes. In important areas with poor protection for watershed forests, such as the Yungas of La Paz, and mountainous areas of western Santa Cruz, Cochabamba and Tarija, these forests could be conserved through small local reserves and/or through management agreements to protect their function in providing hydrological services.

**FIGURE 8. SOURCES OF WATER IMPORTANT TO LOCAL POPULATIONS, WITH  
OVERLAY OF PROTECTED AREAS**



*Araujo et al., 2005*

The hydrological regimes of the precipitation-fed watersheds of the eastern slope of the Andes differ from those of the partly or mainly glacier-fed watersheds of the western slope that drain to the closed-basin Altiplano. Glaciers throughout the Andes are receding due to climate change, and there is not much that can be done to mitigate the impending hydrological changes in these watersheds. Adaptation strategies will be needed to conserve water supplies for human and ecological uses in these watersheds. Even with changes in precipitation caused by climate change in eastern slope watersheds, however, the conservation of watershed forests could help maintain stable hydrological regimes.

A study by Fundación Natura and the International Institute for Environment and Development (IIED) (Muller, 2005) used a number of criteria to characterize and prioritize watersheds that would be most amenable to the development of payment, compensation, or incentive schemes for the conservation of hydrological ecosystem services. The methodology examined biophysical information on topography, precipitation, hydrology, natural vegetation, and land use and land cover, as well as socioeconomic information on uses of water and amounts used; water scarcity, especially in the dry season; and public awareness of the relationship between vegetation and water. Trends in land use and deforestation were determined by comparing images (photos, aerial photos, satellite images) of different ages. This methodology for characterization and prioritization may be replicable in other parts of Bolivia.

Concrete examples of market-like payments, compensation, or incentive schemes for conserving hydrological services have been developed in municipalities bordering Amboró National Park, with the assistance of Fundación Natura and FAN. Examples include:

- In the upper watershed of the Río Negro in Los Negros, in the municipality of Pampa Grande, a local fund for the protection of cloud forest has been created. The fund originates as a minimal charge on water bills, and is administered by the water cooperative and utilized to conserve forests and buy strategic areas in the upper watershed (Asquith and Vargas, 2007; Asquith, Vargas, and Wunder, 2007; Asquith, 2006)
- In El Chape, a locality in the municipality of Mairana, the local water cooperative has formed a fund, with help from the municipality, to compensate landowners on an annual basis for hectares of forest protected, and for other activities related to protecting the watershed. Watershed forests in this area are threatened by burning, wood extraction, agricultural expansion, and unmanaged grazing.
- In Samaipata and Comarapa (Santa Cruz Department), an agreement was reached between upstream and downstream stakeholders on a system of payments for hydrological services on the Río Comarapa that would benefit farmers in the upper watershed and irrigators and users of potable water in Samaipata and Comarapa.
- In Santa Cruz city, interest is growing in mechanisms for conserving hydrological ecosystem services from the Santa Cruz water and sewage cooperative (SAGUAPAC) and the prefecture of Santa Cruz, due to the fact that providing water is becoming more difficult and expensive. Some municipalities in watersheds draining into the in Río Piraí, in the buffer zone of Amboró National Park, have been involved in discussions with FAN, SAGUAPAC, and the city and prefecture.

There are fundamental differences on the use of these types of instruments, however. Some view markets for water from watersheds as unacceptable because they see hydrological service markets as privatization of natural resources that they believe should be public. However, as noted above, some local and regional authorities, and some communities and water user groups—especially in Santa Cruz Department, have become concerned about flow reduction in local watersheds, affecting both domestic consumption of water and irrigation, and they are seeking creative, concrete solutions.

### **3.3.2 Carbon Sequestration**

Bolivia ratified the Kyoto Protocol of the United Nations Framework Convention on Climate Change in July 1999. Bolivia's National Strategy for Implementation of the UNFCCC was developed in 2000 with funding from United Nations Development Program (UNDP). The strategy defined priorities for actions related to mitigation and adaptation within the framework of the sustainable development model in use at that time. The National Climate Change Program (*Programa Nacional de Cambios Climáticos* [PNCC]), created in 1995, is now part of the Vice-Ministry for Territorial and Environmental Planning of the *Ministerio de Planificación del Desarrollo* (MPD). The PNCC is responsible for identifying the main problems that Bolivia will face from climate change and for developing plans and mechanisms for



mitigating and adapting to climate change. At the end of 2002, the Office of Clean Development was created, with the goal of implementing projects to absorb and reduce emissions of greenhouse gases through a national clean development mechanism (CDM).

Since its creation in 2002, the PNCC's Clean Development Office has developed the strategy, mechanisms, and projects within the CDM framework. Under this framework, there are about 25 projects under various stages of development. Two projects are already registered with the CDM Executive Board and are eligible for saleable certified emission reduction (CER) credits: the methane recovery project at Normandía sanitary landfill in Santa Cruz, which was registered in 2005; and the hydroelectric power station on the Río Taquesi, which was registered in 2007. Most of the projects in the pipeline are related to the energy sector, but nine are related to forestry and reforestation, including one small-scale forestry project, currently in the validation stage. One project in the investigation stage is being carried out by the Bolivian Forest Research Institute (*Instituto Boliviano de Investigación Forestal* [IBIF]). This investigation is gathering information on the carbon fixation in forests under management for different levels of timber production and forest regeneration. Measurements of the recruitment, growth, and mortality of tree species; the increase in biomass; and the fixation of carbon are being made.

The PNCC and the National Meteorological and Hydrological Service (*Servicio Nacional de Meteorología e Hidrología* [SENAMHI]) have used mathematical modeling to predict the vulnerability of ecosystems in Bolivia. This modeling study predicts that there will be potential affects on biodiversity and forest resources, including the alterations in the distribution and composition of ecosystems. For example, the spring-fed wetlands (*bofedales*) that are so important for grazing livestock on the Altiplano and their biodiversity are being affected by climate change.

In October, 2007, with funding from the Government of the Netherlands, the GOB developed a National Mechanism for Adaptation to Climate Change (*Mecanismo Nacional de Adaptación al Cambio Climático* [MNACC]). This articulated the theme of climate change with the new development policies of the GOB, specifically the National Development Plan (NDP), which defined this national mechanism as a "... long-term strategy to guide and establish actions and results, as a tool for a structural response to global warming through adaptation..." The MNACC is organized around five sectoral programs: a) adaptation of food security to climate change; b) adaptation of health to climate change; c) adaptation of water resources to climate change; d) adaptation of ecosystems to climate change; and e) adaptation of settlements and management of risks.

Through the PNCC, Bolivia has been an international leader and pioneer in international payments for avoided deforestation. It is one of about 40 current members of the Coalition for Rainforest Nations (<http://www.rainforestcoalition.org/eng/>) formed in 2005 by developing nations with tropical forests, and supports the Forests Now Declaration, which calls for changes in the Kyoto Protocol and other international carbon markets to include climate-friendly land use and forestry activities. The Declaration was created when carbon credits for maintaining land uses and forests that sequestered carbon, and for preventing damaging land use changes and deforestation, were omitted from the CDM for the First Commitment Period of the Kyoto Protocol, despite the fact that global deforestation contributes about 20 percent of all greenhouse gas emissions. In Bolivia, according to the inventories of emissions of greenhouse gases made by the PNCC, the vast majority—83 percent—of CO<sub>2</sub> emissions stem from changes in land use, in particular the conversion of forests to fields and pastures for agriculture and livestock grazing. Members of the coalition want "avoided deforestation" to be recognized as a valid criterion for carbon offsetting. This is currently not permitted under the CDM during the first phase of the Kyoto Protocol (2008–2012), which allows offsets to be generated only through reforestation and afforestation projects.

Discussions about creating a Reduced Emissions from Deforestation and Degradation (REDD) mechanism were initiated in conjunction with the UNFCCC COP 11 held in Montreal in 2005. They intensified at COP 13 in Bali in 2007, with the creation of a framework for REDD, and a "post-Kyoto



roadmap.” The World Bank is setting up a \$300 million Forest Carbon Partnership Facility (FCPF), which would pilot test schemes for reducing emissions from avoided deforestation. Bolivia was one of five countries in Latin America, and only fourteen worldwide, selected in July, 2008, to receiving funding from the World Bank’s Forest Carbon Partnership Facility (FCPF) to pilot test schemes for reducing emissions from avoided deforestation.

It is envisioned that negotiations in 2008 and 2009 will lead to the REDD mechanism becoming operational under a post-Kyoto framework after 2012. Elements of REDD in the pilot phase include 1) consideration of emissions avoided both from deforestation and degradation of forests; 2) pilot/ demonstration activities at the national or subnational level; 3) scenarios of national emissions from deforestation and degradation as the framework; and 4) reductions or increases of emissions based on historic emissions considering national circumstances. Because degradation is to be included as well as outright deforestation, a challenge will be to cheaply and effectively measure degradation. Developing a historic baseline for emissions is a critical issue in planning REDD projects. Experience with Certified Emission Reductions from the Noel Kempff Mercado Climate Action Project (<http://www.noelkempff.com/English/ProjectSummary.htm>) provide a foundation for Bolivia’s participation in future REDD projects. Methods of remote detection of degradation are under development and show promise of being effective (Villegas et al., no date).

It is difficult to forecast the future of international carbon markets and what effect they would have on avoiding deforestation through REDD payments for the ecosystem service of carbon sequestration. There is, however, much speculation in the literature. In Bolivia, it is estimated that carbon fixation potential in forests is approximately 2.4 tons C/ha-year (or 8.8 tons CO<sub>2</sub>/ha-year) for dry tropical forest ecosystems, and from 5-8 tons C/ha-year (18-29 tCO<sub>2</sub>/ha-year) for humid tropical forests. For non-forestry certified emission reductions (CERs), prices in 2008 are around US \$23/ton of CO<sub>2</sub>. The range for forestry projects varies from about US \$0.5 to \$ 4/ton CO<sub>2</sub>, owing to the delicate issue of the time frames and “impermanence” of forestry CERs. If the REDD mechanism being discussed is implemented, and a value of \$20/ton of avoided carbon emissions is set, maintaining forests would have a value as an ecosystem service providing global carbon sequestration of \$800 per hectare per year.

### **3.4 ECONOMIC VALUES FROM NON-MATERIAL USES OF BIODIVERSITY AND FORESTS**

#### **3.4.1 Ecotourism**

According to the World Travel and Tourism Council, tourism at present (2008) contributes about six percent of the GNP of Bolivia, and accounts for about nine percent of export earnings [http://www.wttc.org/eng/Tourism\\_Research/Tourism\\_Satellite\\_Accounting/TSA\\_Country\\_Reports/Bolivia/index.php](http://www.wttc.org/eng/Tourism_Research/Tourism_Satellite_Accounting/TSA_Country_Reports/Bolivia/index.php). We were unable to find information that distinguishes between ecotourism and tourism in general.

Ecotourism in the Amazon region of Bolivia is relatively new, and began about 15 years ago with the development of the Chalalán Ecolodge in Madidi National Park. At present, ecotourism in the Amazon is promoted exclusively by NGOs. The major experience comes from Madidi-Pilón Lajas, where there are important community undertakings at Chalalán and San Miguel del Bala, which have hotels, quality services, and attractive areas. In both cases, these are ecotourism enterprises that have been authorized by local communities, and can offer quality services based on a long period of capacity building.

There are no ecotourism hotels in the Chapare, but the Oilbird Caves, or Cavernas del Repechón Guacharos in Carrasco National Park, can be reached in a few hours from Villa Tunari. A community-

based enterprise, Kawsay Huasi, provides guides in the area. Conservation International helped in the training and capacity-building efforts to create Kawsay Huasi.

Important ecotourism potential exists in Amboró National Park and its integrated management zone, especially in the areas of Samaipata and Buena Vista, but this potential is not being developed systematically. In Buena Vista there is an extensive and diverse private tourism infrastructure, including hotels ranging from one star to five stars, but it is not seen as a tourist destination. Samaipata likewise has important tourist offerings through small private enterprises, but Samaipata ruins are presented as the only tourist attraction.

The Salar de Uyuni and the entire Altiplano zone of Potosi is one of the most important ecotourism destinations in Bolivia. The hotel and service infrastructure has been developed by small private national companies. Other centers of ecotourism potential in the Andean region include Torotoro National Park, Apolobamba, Sajama National Park, and various routes that connect the Andean region with the Yungas and lowlands.

# 4.0 THREATS TO BIODIVERSITY AND TROPICAL FORESTS

## 4.1 THREATS

The key threats to Bolivia's biodiversity and tropical forests are:

- Loss, conversion, and degradation of forests and other natural habitats;
- Pollution of aquatic ecosystems;
- Overharvesting of selected species; and
- Exotic invasive species.

The list is in a ranked order that emerged from a consolidation of the findings from our multiple interviews, two stakeholder workshops, and review of secondary sources. It is based generally on perceived severity, area affected, number of species affected, urgency, and other factors. This ranking is consistent with other recent efforts to categorize and prioritize the principal threats to Bolivia's natural resources (e.g., LIDEMA, 2007). Loss, conversion, and degradation of forests is by far the most severe and urgent threat. Pollution of aquatic ecosystems is pervasive in some areas, but the actual impact of this pollution on particular species, species diversity, and ecosystem functions is not well studied in most cases. Exotic invasive species may pose more of a threat than is recognized, given the lack of studies of such species and their ecological impacts.

Global climate change caused by human activities, mainly the burning of fossil fuels and production of greenhouse gases, could be described as a threat to biodiversity and forests, or it could be considered a cause of one or more of the direct threats above. Generally speaking, climate change will either affect the composition or location of forests and other natural habitats, or will reduce populations of sensitive species, making them more susceptible to overexploitation. Climate change may also exacerbate problems from exotic invasive species. For these reasons we will treat climate change as a cause of direct threats to biodiversity and tropical forests, rather than as a direct threat itself.

### 4.1.1 Loss, Conversion, and Degradation of Forests and Other Natural Habitats

Currently over 300,000 hectares of forest are being lost each year for a variety of reasons including:

- An expanding agriculture/livestock frontier, due to:
  - Large-scale agro-industry, including possible biofuel crops, and
  - Small-scale colonization;
- Large-scale infrastructure projects (roads, dams, energy infrastructure);
- Expanding coca production;
- Forest fires (*chaqueo*);
- Illegal logging; and

- Climate change causing alterations in geographical and altitudinal distribution of species and ecosystems.

### ***Expanding agriculture/livestock frontier***

Both large agro-industrial and small-scale subsistence farmers contribute to the expansion of the agriculture/livestock frontier. The map of recent deforestation provided in Section 2 (Figure 5) depicts the geographic location of these two types of deforestation. The large area of deforestation generally north and east of Santa Cruz is a result of large-scale agro-industry, whereas, the areas of deforestation around Cobija in Pando, Riberalta in Beni, and northern La Paz tend to be mainly a result of small-scale colonization and clearing. Large-scale agriculture responds mainly to external market demands (e.g., biofuels, sugarcane, soy and principally from US, Brazil and Argentina), while smaller farmers respond mainly to the domestic market. Both thrive in the near absence of regulatory oversight and control.

### ***Large-scale infrastructure projects***

The government is actively promoting the development of infrastructure projects in the Bolivian lowlands, in particular extensive road construction and improvement in the northern Amazon. The Conservation Strategy Fund conducted an assessment of the economic feasibility of road projects in northwest Bolivia, including paving of the so-called “Northern Corridor,” which is part of the Peru-Brazil-Bolivia hub of the Initiative for Integration of Regional Infrastructure in South America (IIRSA, [www.iirsa.org](http://www.iirsa.org)), as well as construction of the Ixiamas-El Chivé road, part of a possible route from San Buenaventura to Cobija. Both projects aim to strengthen the connection between northern Bolivia and the rest of the country as well as solidify links with Peru and Brazil. Using computerized highway development planning software, the assessment found that none of these road projects would be economically sound investments if environmental and social costs were taken into account ([http://conservation-strategy.org/en/project/bolivia/northern\\_roads](http://conservation-strategy.org/en/project/bolivia/northern_roads)).

Depending on other factors, road expansion may have a potentially threatening synergy with the current land tenure policy in Bolivia. The national government and municipalities are investing in road construction allowing access to lands with sometimes unclear tenure. This combination can be a recipe for unplanned colonization that is likely to expand the agricultural frontier and lead to further deforestation. Road construction in areas with clear and secure tenure would be much less threatening to forests and biodiversity.

Construction of dams poses another potential threat to biodiversity and tropical forest resources. An example is the proposed construction of the Bala Dam in the north of La Paz Department. This dam has been a contentious issue since it was first proposed three decades ago. Supreme Decree No. 29191 approved on July 2007 recognized the Bala Dam as a national priority and called for feasibility studies to be undertaken within the context of the National Electricity Plan. The Bala project has drawn criticism in Bolivia and abroad because it would inundate portions of two PAs, Madidi National Park and the Pilon Lajas Biosphere Reserve. Additional plans to construct dams in the northern Amazon in Brazil, on the Rio Madera, 84 kilometers from the Bolivian border, could threaten 14 migratory fish species, including high-valued varieties (e.g., surubí).

Another large-scale project is oil exploration and possible exploitation in the Apolo region in Madidi National Park, which will involve the Bolivian national petroleum company, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), and its Venezuelan counterpart, *Petróleos de Venezuela S.A.* (PDVSA). Still another proposed project is the construction of the San Buenaventura Sugar Factory in the north of La Paz Department.

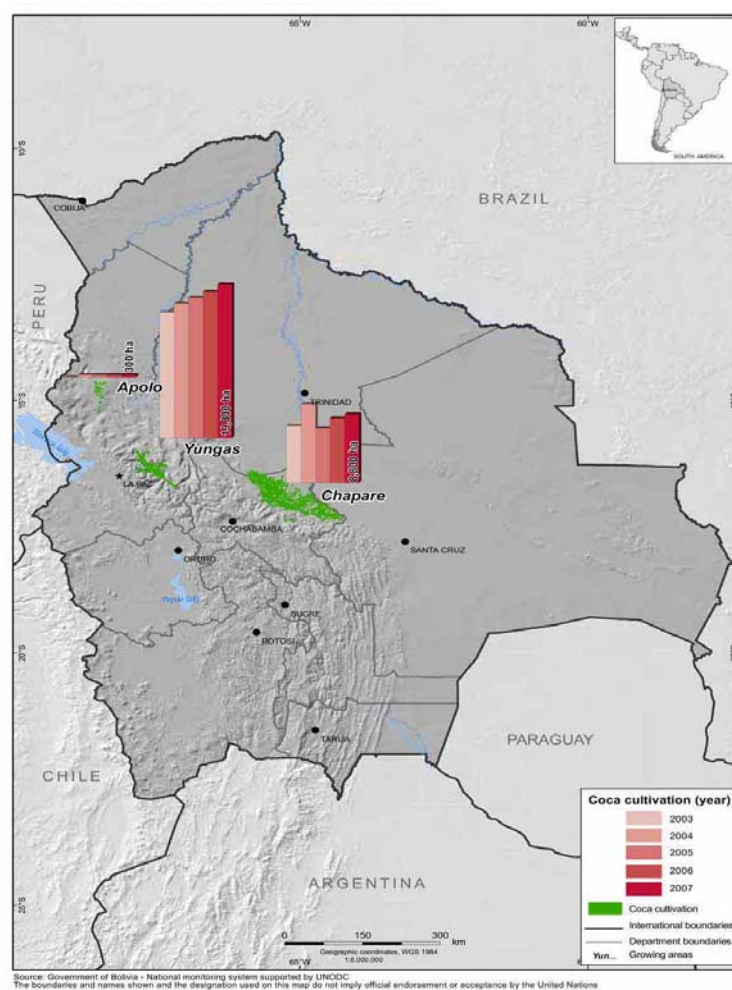
The threats from such infrastructure projects would arise largely if they are carried out in an unregulated and unplanned manner; e.g. with little concern for environmental safeguards such as systems for

monitoring compliance with environmental guidelines and adhere to environmental mitigation measures. Environmental impact can be mitigated if these are incorporated in the design in the first place.

### ***Coca production***

The area used for coca production increased by approximately five percent in Bolivia between 2006 and 2007 (UNODC, 2008), to 28,700 hectares, about two-thirds of which are in the Yungas of La Paz, and a third in the Chapare (Figure 9). Of this, only 12,000 hectares are permitted by Bolivian law to supply traditional uses. This expansion is primarily through small-scale deforestation and is increasingly reaching into the region's PAs, including Carrasco, Amboró, Madidi, and Apolobamba national parks. The main coca-producing areas are in upper watersheds of major rivers draining to the Amazon, such as the Rio Mamoré in the case of the Chapare. Forests in these upper watersheds play an important role in the provision of hydrological ecosystem services by regulating water flow and retaining soils.

**FIGURE 9. BOLIVIA, COCA CULTIVATION BY REGION, 2003-2007**



Source: UNODC, 2008

### ***Forest fires***

Fires are another significant cause of forest loss and degradation. The *Superintendencia Forestal* estimates that since 2004 there have been about 161,000 fires in Bolivian forests. In 2007, there were about 25,000 fires, most of which were the result of the traditional practice of using fire to clear land for

planting and pasture (*chaqueo*), used in both large- and small-scale agriculture. As safeguards are rarely put in place, these fires often burn out of control destroying significantly more forest than originally intended. Controlling and regulating these fires is a complex issue, and has been a contentious matter at national and regional levels. BOLFOR II and the Bolivian government have developed monitoring systems, and these have been used to monitor fires and take actions in some cases, but the economic incentives to convert forest lands to agriculture or pasture are very strong.

### ***Changes in geographical and altitudinal distribution of species and ecosystems caused by climate change***

The PNCC and SENAMHI carried out studies and applied mathematical models from 1996 to 1998 to predict the vulnerability of ecosystems to climate change ([www.pncc.gov.bo/esp/pdf/8.pdf.pdf](http://www.pncc.gov.bo/esp/pdf/8.pdf.pdf)). Three possible climate change scenarios were considered, and maps were generated to reflect the displacement and alterations to the different ecosystems due to changes in temperature regimes and precipitation patterns.

In general, these three scenarios suggest that lowland forest ecosystems (ecoregions 1-5, Figure 2) would experience changes in areal extent and displacements in location. As can be seen on the map, these forest types cover approximately half of the country—and so do the potential ecological changes due to global climate change, which could affect forestry, agriculture, and human health. The direct consequences of the ecological changes predicted by this study include the disappearance of some ecosystems, such as the desert puna (ecosystem 12.2, Figure 2), and displacement of others, with the concomitant economic and socio-cultural consequences, including a redistribution or elimination of ecosystem services (e.g., hydrological services in watersheds, climate regulation, etc.) and availability of natural resources (e.g., forest resources, grazing resources, etc.) that are utilized by rural communities now. For instance, spring-fed wetland systems of the Altiplano (*bofedales*) that are utilized for grazing llamas and alpacas are likely to be affected by climate change.

#### **4.1.2 Pollution of Aquatic Ecosystems**

Overall, there is a paucity of data on the impact of contamination on aquatic ecosystems. A few site-specific research studies exist and there is significant anecdotal evidence of these impacts. Aquatic contamination is evident in the three major watersheds of Bolivia: the Amazon, La Plata, and closed Lake Titicaca Basins. Figure 10 presents watershed areas affected by pollution. Direct or proximate causes of the pollution and contamination of aquatic ecosystems are:

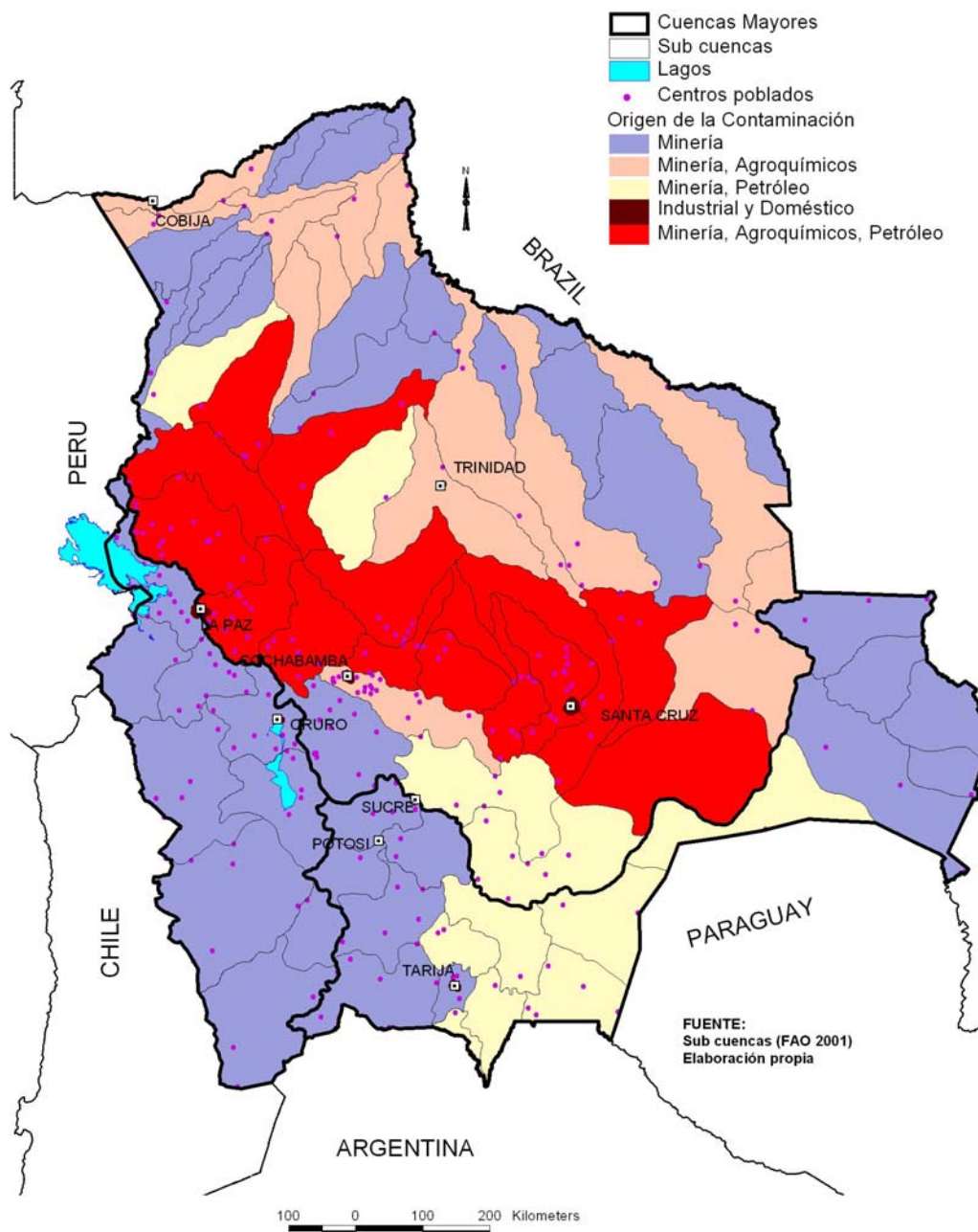
- Mining wastes from large- and small-scale (artisanal) operations,
- Agro-chemicals (pesticides, fertilizers),
- Coca processing, and
- Municipal and industrial solid and liquid wastes.

#### ***Contamination from mining wastes in the Cordilleran and sub-Andean regions***

Mining activities in the Cordillera and sub-Andean region of Bolivia, in particular small-scale gold mining, has serious adverse affects on aquatic ecosystems principally because of the indiscriminate use of mercury in processing the ore. These mining activities may affect some PAs such as Madidi National Park.



**FIGURE 10. SOURCES OF CONTAMINATION IN BOLIVIAN WATERSHEDS**



Many mining operations are taking place within PAs, as is the case with the Cotapata National Park and Integrated Natural Management Area and the Apolobamba Integrated Natural Management Area. Around 70 percent of the PAs in Bolivia have mining concessions within them. More often than not, these mining operations do not comply with environmental regulations and do not take measures to mitigate their environmental impact, such as minimizing the use of mercury, or using it only in a closed cycle.

Studies of indigenous communities living along the Rio Tuichi and Rio Beni, far from mining operations, have demonstrated levels of mercury higher than established limits due to their consumption of fish. *Hyloscirtus charazani*, a species of frog found in La Paz Department on the eastern slopes of the Andes,

is listed as “endangered” by the International Union for the Conservation of Nature (IUCN). The major threat to this species is water pollution: the only known population occurs in a stream used by the local communities living nearby <http://www.iucnredlist.org/search/details.php/55443/summ>.

### ***Contamination of Río Pilcomayo and tributaries from mining wastes***

The city of Potosi has been famous since colonial times for its silver mines, and today more than 70 mines are still functioning. Despite efforts to regulate and control mining wastes, these mines continue to discharge mine tailings containing heavy metals (such as lead), and acid mine wastes directly into the La Rivera and Tarapaya rivers, which are important tributaries of the Río Pilcomayo. Large amounts of mining residues from the past also continue to contaminate these rivers. Heavy metals enter the aquatic food chain in the tributaries of the Río Pilcomayo, and become concentrated at higher trophic levels in fish that are consumed by people. Even though there is a trinational (Bolivia, Argentina and Paraguay) commission for the integrated management of the Río Pilcomayo watershed, actions among the three countries to manage the watershed in an integrated way have not shown much progress with respect to reducing mining contamination. The Department of Potosi is unique in Bolivia in being part of each of the three watersheds of the country. In the northern region, Simbiosis has identified the main concentration of mining activities with the highest potential to generate pollution, including the mining centers of Siglo XX, Llallagua, Catavi, Uncia, Amayapampa, and Capacirca y Colquechaca, which drain into the watersheds of the Cholcha and Khara Laguni rivers. These rivers flow into the great Amazon Basin, and are a source of contamination of aquatic ecosystems in the Amazonian lowlands.

Mining wastes and sewage from human populations are the two main sources of pollution of waters in the closed Altiplano basin, which includes Lake Titicaca and Lake Poopó, and the Río Desaguadero. In various sub-watersheds, such as the Laguna Verde, Laguna Salada, Salar de Chalviri, and Río Quetena, moderate water contamination from old as well as recent mining activities has been found. On the other hand, the principal and secondary rivers and lakes in the closed Altiplano Basin are strongly affected by the uncontrolled discharge of liquid and solid wastes from human settlements. One example is the Pallina and Katari Rivers, which pass through the cities of Viacha and El Alto, and discharge in the Bay of Cohana, in Lake Titicaca. The Río Katari carries all the wastes of the industries and inhabitants of the city of El Alto, including the discharge of the wastewater treatment plant of Puchiollo. The Río Pallina also carries human and solid wastes from Viacha. As a consequence of the levels of contamination in both rivers, evidence of the problem of eutrophication in the Bay of Cohana has begun to raise concerns among local authorities. Other population centers as well as livestock contribute to the nutrient loading of the Bay of Cohana (Fontúrbel, 2005; USAID, 2007).

### ***Contamination of aquatic systems in Santa Cruz and Cochabamba from agrochemicals***

In some valleys, principally in the lowlands of Santa Cruz Department, agro-industrial development is leading to increasing use of agrochemicals. Soy, sunflower, cotton, and sugarcane are the main crops, and to a lesser extent coffee, cacao, and rice are grown. Mechanized agriculture on large areas with poor soils has required the increased use of agrochemicals, including fertilizers and pesticides, often applied by aerial spraying. Despite growing control there are 17 pesticides banned in Bolivia that are nevertheless freely sold in local markets and routinely used. As a consequence of these activities, there are potential effects from contamination by products like aldrin, chlordane, endrin, lindane, methoxychlor, toxaphene, DDT, parathion, endosulfan, malathion, and carbaryl. Farmers are not well trained in proper application methods, often over-applying agro-chemicals, applying them under inappropriate physical or environmental conditions, and not following appropriate handling, washing and storage protocols. Despite regulations governing the use of these and other pesticides, there needs to be more institutional capacity and resources to monitor their use and effects on aquatic ecosystems and biodiversity..

In the lowlands of Cochabamba there are two main sources of waters pollution. Illegal processing of coca leaves for the drug trade discharges acids, diesel, and other chemicals. Past oil and gas development have caused contamination from oil, heavy metals, and organic compounds.

#### 4.1.3 Overharvesting of Selected Species

Habitat loss and degradation is the primary threat to Bolivia's biodiversity and tropical forests. Nonetheless, the selected extraction and overharvesting of targeted species is an important threat, especially as it relates directly to these species and to their contributions to the overall functioning of ecosystems. Direct or proximate causes of the overharvesting of selected species include:

- The need for more sustainable use and management plans; and
- Illegal harvesting.

According to the IUCN Red List of Threatened Species (<http://www.iucnredlist.org/search/search-basic>), there are 13 species classified as “critically endangered,” including the Blue-throated Macaw (*Ara glaucogularis*), which is threatened by illegal capture of birds for the international pet trade. A frog found in Lake Titicaca, *Telmatobius culeus*, is also critically endangered in part because of overharvesting. A related frog, *Telmatobius gigas*, found in one location in Oruro Department, is endangered partly because of overharvesting for medicinal use. The other 10 critically endangered species, about half plants and half animals, are in danger because of habitat loss or degradation.

Thirty-two species are classified as “endangered.” Three additional macaw species are on this list, the Hyacinth Macaw (*Anodorhynchus hyacinthinus*), the Red-fronted Macaw (*Ara rubrogenys*), and Blue-headed Macaw, *Primolius couloni* these species are threatened in part by the illegal pet trade, like the critically endangered Blue-throated Macaw. Two tree species highly valued for their wood are listed as endangered in the Appendix II of CITES: *Swietenia macrophylla* (mara or caoba) and cedro, (*Cedrela fissilis*). In addition roble (*Amburana cearensis*) has been listed in the IUCN Red List, but not on CITES Appendix I or II for Bolivia and, therefore, it is not considered endangered in the country. The Andean mountain cat (*Oreailurus jacobita*) is endangered because of overhunting, and indirectly by overharvesting of its major food source, the mountain chinchilla, for the fur trade. The giant otter (*Pteronura brasiliensis*), once threatened mainly by overhunting for its fur, is now threatened by habitat loss and degradation as well. The majority of the species listed as “endangered” are threatened by habitat loss and degradation. Another 106 species are ranked as “vulnerable.”

#### 4.1.4 Exotic Invasive Species

Many species introduced from other ecosystems or continents—exotic species—can become established and can displace native species because of their competitive ability or because they lack herbivores, predators, pests, or pathogens that limit their reproduction in their native habitat. However, not all exotic species are invasive species; for example, eucalyptus planted in forest plantations is not invasive.

The European hare (*Lepus europaeus*) is a non-native species with the potential to disrupt native ecosystems in Bolivia. This hare was introduced into Argentina and Chile about 100 years ago, and has been spreading in the wild ever since. In 1983 it reached southern Brazil, and the Department of Tarija in southern Bolivia. Beginning in the mid-1990s some wild hares were seen in the departments of Tacna and Arequipa in Peru, up to an altitude of 4300 meters. European hares could compete with native herbivores like viscachas and chinchillas for food, and could negatively affect native vegetation not adapted to their herbivory.

Trout and pejerrey were introduced into Lake Titicaca in the past, and had, it is thought, some impact on native fish fauna of the lake.

Although non-native invasive species are generally recognized as a significant threat to native ecosystems and species worldwide, they have not heretofore been considered a significant problem in Bolivia. Now, however, the VBRFMA has recognized the importance of studying this issue and is developing a national strategy to deal with the detection, management, and control of invasive species (<http://www.oas.org/dsd/IABIN/Component2/Bolivia/UMayordeSanAndres/Propuesta.pdf>).

Bolivia is seeking to develop a database on invasive species and to participate in the Inter-American Biodiversity Information Network's (IABIN) Invasives Information Network (I3N, <http://www.iabin.net>). The network supports countries in the region to apply common strategies to prevent future invasions of exotic species, and mitigate the damage they can cause to native biodiversity and national economies.

# 5.0 THE CURRENT CONTEXT AND THE CAUSES OF THREATS

## 5.1 INTRODUCTION

Since the last USAID/Bolivia Tropical Forestry and Biodiversity Assessment was completed in 2002 (USAID, 2002), Bolivia has undergone a profound socio-political transformation. There were many challenges in 2002, the new forestry regime was being implemented, there was a promising National Biodiversity Strategy to guide activities, and the new Ministry of Sustainable Development and Planning sought to better integrate natural resource issues with the decentralization, popular participation, gender, land tenure, and planning agendas. Conditions today are much different. Following his December 2005 election, Evo Morales and the *Movimiento al Socialismo* (MAS) Party initiated a series of reforms based on a political and ideological vision that has significant implications for the management and utilization of renewable natural resources, including tropical forests and biodiversity. So, while the broad categorization of threats to Bolivia's biodiversity and tropical forests are in many ways similar to those identified in 2002, the context and opportunities for addressing them have changed significantly. This current political, economic and social context—the *coyuntura política*—affects the underlying causes of the threats identified in the previous section, and gives rise to the challenges and opportunities for addressing them.

This section begins with an overview of the Morales administration's governing philosophy as expressed in the NDP, and a characterization of prevailing conditions. We then discuss the causes, or drivers, of the direct threats, and how the *coyuntura política* affects them. Individual causes can influence multiple threats, so we have not, in this section, attributed causes to the direct threats. That is taken up in the next chapter, where we identify actions needed.

## 5.2 THE NATIONAL DEVELOPMENT PLAN

The ideological vision of the Morales administration is presented in the June 2006 National Development Plan: *Bolivia Digna, Soberana, Productiva y Democrática para Vivir Bien 2006-2010* (Government of Bolivia, 2006) and the proposed new constitution. The National Development Plan (NDP) recognizes that natural resources play an important role in the country's development. Hydrocarbons, minerals, hydropower, and renewable biological resources (i.e., biodiversity and forests) are considered to be the four pillars of economic development. In some cases of course, the exploitation of non-renewable natural resources such as minerals and hydrocarbons may affect renewable biological resources. It is these trade-offs that leave much room for debate even though the NDP promotes development based on wise and sustainable use of natural resources.

The NDP is the Morales administration's roadmap for transforming Bolivia's economy from that of an exporter of renewable and non-renewable natural resources with little value-added processing and



production, to a value-adding commercial economy. The current Administration argues, however, that the capitalist economic model of previous administrations did not work—focused, as it was, on resource exploitation for short-term gain for a selected group leading both to overexploitation of natural resources and income inequality. The NDP addresses the historic economic and political marginalization of certain groups, particularly rural and urban indigenous peoples, placing them at the center of the administration’s vision of economic development.

The NDP emphasizes harmony with nature as part of the concept of *Vivir Bien* (Living Well). This is based on traditional economic and cultural linkages of local communities to nature and natural resources. The NDP speaks of reestablishing a balance between nature conservation and economic needs to improve livelihoods, particularly of indigenous communities. This development model is predicated on three principles for the use of biodiversity and forest resources (NDP, 2006, pp. 117-120):

1. **Productive Transformation of the Forestry Sector.** The focus of this principle is on commercial and industrial value-added processing of timber and NTFPs and the expansion of sustainable exploitation of forest resources. The NDP seeks to promote the export of value-added products to generate income and jobs for cooperatives, social groups, and TCOs, less so for private sector companies.
2. **Sustainable Use and Conservation of Biodiversity.** The NDP seeks to promote the sustainable use of biodiversity by strengthening the management and marketing capacity of community and indigenous organizations; undertaking research activities to promote new products and identify new markets; and establishing parastatal companies to promote and market natural products. Biodiversity strategies and programs considered in the NDP explicitly recognize the role of the state in promoting the sustainable use and conservation of biodiversity, working closely with indigenous and local communities.

The GOB is moving ahead in promoting and implementing this new view. It proposes to develop community forestry programs with indigenous TCOs and rural communities, and has established a goal of five million hectares of tropical forests under certified management and a doubling of the contribution of the forestry sector to the national Gross Domestic Product (GDP). The geographical focus for these programs is the tropical forests of Pando, Beni, Santa Cruz, and Cochabamba.

The requirements of the Forestry Law are closely associated with those of voluntary certification. As such, forestry operations that comply with this law can relatively easily obtain international certification, e.g., from the Forest Stewardship Council (FSC). (Bolivia has the largest area of natural tropical forests under certified management, roughly about 1.98 million hectares.) To provide an incentive to local actors to participate in the certification process in Bolivia, the *Cámara Forestal de Bolivia* (Forestry Chamber of Bolivia [CFB]), with the support of Swedish International Development Cooperation (ASDI), established the *Fondo de Certificación Forestal* (Forest Certification Fund [FOCERFO]) in June 2007, for the purpose of promoting certification, strengthening the competitiveness of certified forest products and adapt policy changes to international certification systems. The Fund has an assured cash flow of US \$250,000 until 2012 for its beneficiaries, which are TCOs, *Agrupaciones Sociales del Lugar* (ASLs), farming communities, builders, private owners, concessionaires, and forest industries.

Protected areas are viewed as an instrument for the conservation and sustainable management of biodiversity, for the preservation of cultural diversity, and as a source of income generation for local populations. The NDP calls for active participation and increased roles for local and indigenous communities and social movements in the management of the PAs. It also proposes a land-use zoning program, including property consolidation in PAs and buffer zones, in coordination with the National Institute of Agrarian Reform (INRA). The GOB indicated that PA management will be reexamined and reoriented to better serve the economic interests of the Bolivian people. To do so, the national treasury would provide funding for 51 percent of SERNAP’s operations, establishing the basis for financial self-



sustainability and assuming more control of the institutional framework. However, the NDP does not propose a strengthened institutional role for SERNAP. SERNAP faces pressures for increased access to and control over natural resources in PAs at the local level. Financial constraints and the need for more technical capacity would improve SERNAP's administrative and managerial operations.

The NDP calls for the promulgation of a Biodiversity Law, the creation of the National Institute on Biodiversity Research for Development (IBIBDD), and the promotion of local and small micro-enterprises and economic organizations (MYPES and OECAs) for developing natural resource-based enterprises and other biocommerce initiatives. There is an explicit emphasis in the NDP to promote natural resource-based enterprise projects throughout the Bolivian Amazon region, aimed at generating employment and income. The GOB acknowledges that the participatory framework and sustainable use of biodiversity promoted in the National Strategy for Biodiversity (NBS) are in keeping with the NDP, though the NBS itself has not been a significant instrument in conservation planning in recent years.

## 5.3 THE CURRENT CONTEXT FOR ADDRESSING THESE CAUSES

### 5.3.1 Institutional Framework for the Conservation of Biodiversity and Forests

Bolivia's environmental legislative framework (see Box 1) represents a significant effort since the 1992 World Summit on Sustainable Development in Rio de Janeiro to lay a foundation for the sustainable and equitable use of the country's environmental resources and to control destructive practices. This framework has had a positive effect on Bolivia's economic development, especially in the forestry sector, where it provided clearly defined roles for institutional oversight and control, but perhaps more importantly provided the mechanism for increasing access to forest resources for a previously excluded sector of Bolivian society. It also promoted certification of natural forest management, enabling Bolivia to become the world leader in area of certified production forests. Nevertheless, the present administration has challenged some of the principles and development models on which it is based.

#### Box 1. A Snapshot of Bolivia's Environmental Legislative Framework

- Environment Law 1333 (1992): Provides overarching framework for sustainable development, ensuring the protection and conservation of Bolivia's natural resources; Established and organized the National Protected Area System (SNAP); established a framework for regulating development (e.g., oil, gas, mining) and for preparing environmental assessments.
- Law of the National Institute of Agrarian Reform (*Instituto Nacional de Reforma Agraria* [INRA]) (1995): Established the property rights regime for land, introducing the concept of economic and social function (*función económico-social* [FES]) as the basis for maintaining rights to land, and introduced TCOs as one form of land tenure for indigenous peoples in the tropical zones.
- Forestry Law No. 1700 (1996) regulates the sustainable use and protection of forests and forested lands. It seeks to ensure benefits for future generations while balancing socioeconomic and environmental needs of the nation. The law promotes the sustainable management of forests through design and implementation of forest management plans and deforestation permits. The *Superintendencia Forestal* was created to analyze, approve, and monitor the implementation of forest management plans. This law also makes municipalities responsible for the development of forests within their jurisdiction and permits private individuals, companies, organized colonists, and indigenous groups to obtain forest concessions. The law has been instrumental in enhancing the participation of colonists and indigenous groups in forestry development. The monitoring, auditing and enforcement aspects of the law, however, have not been adequately implemented. Management plans are not always adhered to, and the *Superintendencia Forestal*, which is responsible for monitoring compliance with the plans, is severely understaffed and has been losing capacity and credibility in the field.

### Box 1 (continued). A Snapshot of Bolivia's Environmental Legislative Framework

- Wildlife Law (*Decreto Ley de Vida Silvestre*) (1975) is an obsolete framework, but not yet replaced by another more modern law, but only by partial standards for specific resources.
- Hunting Prohibition (*Decreto de Veda indefinida*) (1990): Prohibited the harassment, capture, collection, and processing of wild animals and products derived from them. Partially modified in 1999 to permit the use of some species of wildlife based on sustainable use plans and annual harvest quotas.
  - Regulation for the Conservation and Use of the Caiman (*Reglamento para Conservación y Aprovechamiento del Lagarto*) (2000); and
  - Regulation for the Sustainable Use of Vicuña Wool of 2005 (*Reglamento de 2005 para el Aprovechamiento sostenible de fibra de Vicuña*).
- Decree on Access to Genetic Resources (1997): Regulation based on Decision 391 of the Andean Community (*Comunidad Andina de Naciones* [CAN]) that declares genetic resources to be the patrimony of the state, and establishes the obligation that the state be involved in any experimental development of, and future benefits from, these genetic resources.
- National Strategy for Conservation and Sustainable Use of Biodiversity: Approved in 2002, but not fully implemented because of changes of government and the national political situation.
- Biocommerce: Lacks specific standards, but is framed within several other laws and decrees: i) the Investment Law (*Ley de Inversiones*) (1990) that stimulates and guarantees private national and foreign investment; ii) the Decree of 2001 for the creation of the Bolivian System of Productivity and Competitiveness (*Decreto de 2001 de creación del Sistema Boliviano de Productividad y Competitividad*) that introduced for the first time the concept of value chains and public-private alliances; iii) the Export Law of 1993 that guarantees the freedom of importation and exportation of goods and services, except among others those that affect fauna and flora and ecological equilibrium; iv) the Bolivian Strategy for Poverty Reduction of 2000, that identified the protection and conservation of the environment as a crosscutting issue, and mandated the development of mechanisms for adequate management of biological diversity.

Bolivia is a signatory to multiple international environmental treaties and agreements, including the Convention on International Trade in Endangered Species (CITES), the Convention on Biological Diversity (CBD), the Ramsar Convention on Wetlands, the UN Convention to Combat Desertification (UNCCD), the International Tropical Timber Organization (ITTO), the UN Forum on Forests (UNFF), and the UN Framework Convention on Climate Change. The Vice-Ministry of Biodiversity, Forest Resources and the Environment within the Ministry of Rural Development, Agriculture and Environment (MDRAMA) is the national focal point for most of these environmental treaties.

Participation in the UNFCCC is led by the *Programa Nacional de Cambio Climático* of the Clean Development Office (*Oficina de Desarrollo Limpio* [ODL]) in the Ministry of Planning for Development. The PNCC has conducted a national inventory of greenhouse gas emissions; and developed a five-year plan for investigating the impacts of climate change, and to support and implement projects for adaptation to climate change. PNCC has designed a National Mechanism for Adaptation to Climate Change. The PNCC's ODL has developed protocols for accessing the CDM of the Kyoto Protocol, and has facilitated certification of reduced emissions for two projects: the Normandía Sanitary Landfill in Santa Cruz, and Río Taquesi hydroelectric project. Bolivia participates in the Coalition for Rainforest Nations and is a leader in promoting a post-Kyoto mechanism for reducing emissions of CO<sub>2</sub> through avoided deforestation (REDD).

The PNCC is solid technically and has been able to retain key technical staff through several changes in administrations and maintain its involvement in international negotiations. However, because of its low political profile, the PNCC and climate change in general has not had a significant impact on national policy and on planning and financial decisions. The Ministry of Production and Microenterprise,

however, has acknowledged that climate change would affect small-scale producers and their food security, and it sees economic opportunities linked with adaptation to climate change.

Environmental NGOs and the Bolivian academic community have been involved with the PNCC in a number of actions, including:

- Workshops of a technical committee (GOB, NGO, and university representatives) to develop the idea of the post-Kyoto REDD mechanism;
- Development of a project proposal (PIN) to the World Bank's Forest Carbon Partnership Fund for US \$5 million for avoided deforestation; and
- Technical support to gain approval for small projects for reduction of emissions under the CDM.

### 5.3.2 The Current Political Situation—*La Coyuntura Política*

The current political situation (*la coyuntura política*) is complex.. Below is a discussion of some of the key characteristics of this period.

**Institutional restructuring.** The Organization of Executive Power Law's (LOPE) new organizational structure was implemented in February 2006, and it reorganized authorities over environmental matters. Previously, the Ministry of Planning and Sustainable Development had authority over environmental matters, but now roles and responsibilities are distributed among at least three ministries and various vice-ministries: MDRAMA (environmental quality, biodiversity and forestry, protected areas [SERNAP], land); the Ministry of Water (watersheds); and the Ministry of Planning for Development (global climate control, territorial planning, environmental planning). The institutional restructuring that has occurred has weakened certain environmental institutions, leaving them with reduced technical, administrative, and managerial capacity.

**Decentralization and autonomy movements.** The ratification of Autonomy Statutes by the Departments of Santa Cruz, Pando, Beni, and Tarija, the so called "*media luna*", and the conflict with the Morales government over the implications of these votes, is one of the more contentious issues of the current situation. The most important implications of this movement toward enhanced departmental authority and responsibility relate to land-use planning and authority over land tenure matters.

The Autonomy Statutes of Santa Cruz, for example, which at the time of this report had not yet been reconciled with the proposed national constitution, include two chapters on renewable natural resources, forests and land resources. The statutes state that renewable natural resources and their allocation, and environmental management in general, are the responsibility of the Autonomous Departmental Government of Santa Cruz, and that the departmental government is responsible for defining policies for the protection, use, conservation, and restoration of such resources. A specific article in the Autonomy Statutes states that the department has an interest in the conservation and restoration of protected areas and forests to guarantee environmental services, water resources, biodiversity conservation, ecotourism, and other productive activities. The departmental government, through a specialized technical entity that will be created by law, will be responsible for the direct or delegated administration and management of PAs in Santa Cruz. This would have implications for the management of some national PAs. Even before the current controversy there were proposals for the decentralization of SERNAP into regional branches, but the Autonomy Statutes consider PAs a responsibility of the departmental government.

The ecology, economy, population, and financial and technical resources of each department are different, and these factors are likely to influence the level of autonomy that they seek from the national government.

Table 7 compares the position of the four departments of the *media luna* with that of the GOB's proposed new constitution.

**TABLE 7. COMPARISON OF NATIONAL AND DEPARTMENTAL VISIONS FOR CONTROL OF NATURAL RESOURCES**

<b>Subject</b>	<b>Proposed new Constitution</b>	<b>Autonomy Statutes -- Santa Cruz</b>	<b>Autonomy Statutes -- Tarija</b>	<b>Autonomy Statutes -- Beni</b>	<b>Autonomy Statutes -- Pando</b>
Forest and biodiversity resources, including land	National	Departmental	Departmental	Departmental	Not specifically mentioned
Administration of Protected Areas	Shared -- National and Departmental	Departmental	Not specifically mentioned	Departmental, coordinated with national government	Shared -- national and municipal
Regulation of environmental quality	Shared -- National and Departmental	Departmental	Departmental	Departmental, coordinated with national government	Shared -- national and municipal

**Increased role of social movements, reduced role of private sector.** The GOB has emphasized the role of *movimientos sociales* and marginalized groups in the day-to-day operations of government. Increasing reliance on social movements for local control, monitoring, and oversight of what are traditionally government functions (*fiscalización*) has had a notable influence on the enforcement of laws and regulations in the country.

To strengthen the roles of local actors, the government is providing financial support directly to these groups, as well as to municipalities, to promote local economic development.

**Property rights and tenure over land and natural resources.** The creation of *Tierras Comunitarias de Origen* had a potentially positive effect in bringing together poor indigenous communities with private commercial actors in the forestry sector. The public policies of the current government did not completely restructure the legal-institutional framework created in the 1990s, but they have put in place sectoral plans that emphasize the direct intervention of the state in forestry, and in processes of redistribution and the reduction in size of properties and concessions. The modification of the INRA Law gave the state power to evaluate the social-economic function (FES) of a given property. Although lands with forest management plans may qualify as having an appropriate FES, these factors have created insecurity and a disincentive to investments, and could fuel the tendency of the concessionaires to rapidly maximize their profits.

Through the Vice-Ministry of Lands, and with the reform to the INRA Law, the current government has accelerated the regularization and titling of land, prioritizing titling of TCOs (approximately 5.5 million hectares) and communal lands (approximately 2.2 million hectares) and property for small landholders (approximately 0.47 million hectares). The GOB also has identified approximately 1.5 million hectares of fiscal lands for potential distribution to groups, including indigenous communities, campesinos, and communities. Many of these lands are areas that supposedly are not complying with the FES.

Currently, the GOB is only distributing fiscal lands to communities. An effort is underway to reduce the confusion of overlapping claims and land concessions. However, demands for new TCOs are easily granted and this process competes with existing forestry concessions. At present, 21 million hectares are controlled by TCOs. Concessions are use rights, not ownership rights, and there are conditions to be met for retaining concessional use rights. The reasons for reversion of concessions include not paying fees and not complying with the approved management plan.

## 5.4 ROOT CAUSES OR DRIVERS OF THREATS

Direct threats to biodiversity and forest ecosystems have multiple underlying root causes or drivers. These can be broadly categorized as political, institutional, economic, external (or global), and social causes and are affected by the prevailing socio-political context discussed above. The specific causes identified below emerged—from a synthesis of results from the workshops held in Santa Cruz and La Paz, from interviews, topical assessment reports commissioned for this assessment, and documents reviewed by the assessment team—as the more important causes affecting the threats.

### 5.4.1 Political and Institutional Causes

- **New governing paradigm and development model.** The new paradigm is a drastic change from that of previous administrations. While this may provide new opportunities for the management of natural resources, there is certainly a number of challenges. .
- **Inadequate institutional/legal framework and unclear mandates.** Bolivia is seen to have a fairly good institutional framework for environmental management, but it is not fully institutionalized in sub-national levels of government. The LOPE redefined responsibilities for environmental management and oversight. However, there are government entities with overlapping and sometimes contradictory mandates.
- **The need for stronger institutional capacity at multiple levels.** Environmental units within the GOB are generally understaffed and underfunded. Natural resource and environmental units in departmental governments, with the possible exception of Santa Cruz, also are generally understaffed and underfunded. Similarly, the capacity of indigenous organizations representing inhabitants of the 22 PAs that participate in SERNAP through the *Consejo Indígena Originario Nacional de las Áreas Protegidas* to carry out their responsibilities should be strengthened.
- **Land tenure and property rights uncertainty.** At present, there is uncertainty over property rights, especially for private lands and concessions, and illegal incursions have increased. This, together with road development plans, can result in increasing colonization along new road corridors.

### 5.4.2 Economic Causes

- **Pressures from poverty and subsistence living in much of Bolivia.** Bolivia is facing a deepening economic crisis that may lead to increased pressure on natural resources, especially from the rural poor. Aggregate inflation was estimated at 16 percent in the last year; there is a lack of food security in some staple foods, the amount of natural gas available is insufficient to meet household demand, and there is a shortage of diesel fuel for the agro-industrial and forestry sectors.
- **Limited private sector (foreign and domestic) investment.** Investment is limited due to uncertainties and risks. There are more difficulties in getting products to markets, especially external markets, with uncertain status of free trade agreements such as ATPDEA.
- **Economic incentives that favor conservation over land clearing.** Positive incentives are also needed for conservation, forest management, and avoided deforestation (e.g., application of the FES).
- **Planning development and growth.** This is especially sensitive with respect to large-scale infrastructure and the limited capacity to monitor development and growth (e.g., road projects in North; Bala Dam, Mutun).
- **New actors in new economic model need improved technical and business skills.** A common weakness of forest communities is their limited business and marketing skills, poor administration,



lack of financial resources and adequate costing for production. Technical support over the past decade has focused on developing the technical capacities of indigenous organizations—for instance, for conducting forest inventories and preparing forest management plans. The main focus of future support should be the development of institutional, organizational and decision-making capacities, with the provision of information on organization, production, and commercialization.

- **Limited basic information for decision making.**

#### 5.4.3 External Causes

- **Global market forces and trends.** Trends such as biofuels, international food crisis, financial and economic shocks, and commodity markets for minerals and hydrocarbons all indirectly impact the management and conservation of natural resources.
- **Regional infrastructure development and economic integration.** For example, IIRSA, energy, transportation corridors, hydroelectric facilities on Rio Madera in Brazil.
- **Global climate change.** Bolivia has reduced domestic ability to mitigate and adapt.
- Some positive external forces must be kept in mind in the development of actions needed, such as the trends to certification, increase of ecotourism, and REDD.

#### 5.4.4 Social Causes

- **Limited awareness, understanding and information on conservation.** For example, on the damaging role of fire (*chaqueo*) in forest degradation; role of forests in providing hydrological ecosystem services; effects of pollution on human health and aquatic ecosystems; and climate change impacts and mitigation measures.
- **Social and cultural norms and practices.** *Chaqueo*, for example.

### 5.5 MOVING FORWARD

It is difficult to predict how the political situation in Bolivia will evolve and how these developments will affect the management of tropical forests and biodiversity. Several important characteristics of the *coyuntura* that are generally viewed as permanent, that have important implications for the future management of biodiversity and tropical forests, and that will help define the range of actions needed are:

- Moving toward departmental autonomy;
- Empowering and including indigenous and other marginalized social groups; and
- Bringing renewable natural resources into the political debate.

Most everyone we interviewed agreed that there will be a greater degree of local and regional control over natural resources. Municipalities will likely play an increasing role, a trend that started in the decentralization and popular participation laws of the mid-1990s. Some observers see the ratification of departmental autonomy statutes as a positive trend, however they still need to be reconciled with the country's new draft constitution. The national and departmental governments also have not yet begun to have the technical discussions necessary to develop a new balance of sectoral authorities and responsibilities.

The inclusion and empowerment of indigenous and other marginalized social groups is a welcome and positive aspect of the Morales administration. All social groups need to be a part of the process of change and need access to their government. What is still uncertain is the form that social inclusion will take and

what powers will be vested in the social movements. The desire for economic inclusion and empowerment of small and disadvantaged producers is also positive, but again, the mechanisms through which this economic inclusion will be achieved are yet to be determined.

Another positive development which is likely to be enduring is the increasing attention being given to renewable natural resources in the political debate. This is positive because it indicates a growing recognition of the value of Bolivia's biodiversity and forests in economic development. Together with decentralization and increased social inclusion, this will create positive new opportunities for the sustainable use and conservation of Bolivia's biological resources.

# 6.0 ACTIONS NEEDED TO CONSERVE BIODIVERSITY AND TROPICAL FORESTS

## 6.1 INTRODUCTION

Actions to reduce the direct threats to Bolivia's biodiversity and tropical forests must act upon their political, institutional, economic, external, and social causes and drivers. In *general* terms, such "actions needed" to address, reduce, or mitigate these causes include:

- Political and institutional actions, such as:
  - Develop an adequate legal and policy framework;
  - Apply and enforce laws and regulations; and
  - Improve access, rights, and tenure over land and natural resources.
- Economic actions, such as:
  - Increase positive incentives or remove perverse incentives;
  - Reduce poverty and improve distribution of benefits;
  - Improve capacity for planning for environmentally and socially sustainable development; and
  - Improve business skills and capacity.
- Actions to address external pressures (or global forces), such as:
  - Develop adequate environmental safeguards for agricultural production for international markets (food, biofuels);
  - Develop adequate environmental safeguards for regional mega-projects (energy, transportation, etc.); and
  - Maintain and strengthen national participation in global climate change treaties, negotiations, and mechanisms.
- Social actions, such as:
  - Improve social participation in environmental decision making through access to information, environmental communication, and education; and
  - Change unsustainable practices and behaviors through public education and social marketing campaigns.

The sections below present, in tabular form, a synthesis of actions needed to address the identified threats. These actions emerged from the team's fact-finding, including results from the stakeholder workshops, from interviews and topical assessment reports commissioned for this assessment, and documents reviewed by the assessment team. Further information on NGO programs that may address some of the actions needed can be found in Annex F. Donor programs that support some of the needed actions are summarized in Annex G.

## 6.2 ADDRESSING THREATS ARISING FROM HABITAT CONVERSION

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/Institutional:</u> Limited application of land use and forestry law, regulations, standards (and existence of perverse legal incentives for habitat conversion, e.g., FES)	<ul style="list-style-type: none"> <li>Develop mechanisms for applying existing laws, regulations, standards</li> <li>Complete regularization of land tenure</li> <li>Strengthen the institutional communication and coordination of INRA, the Superintendencia Forestal, Superintendencia Agraria, and municipalities with social organizations</li> <li>Establish a framework and standards for conservation at departmental and municipal levels and strengthen technical capacity</li> </ul>	INRA, VMBRFMA	In areas of major expansion of agriculture and livestock, and major infrastructure development
<u>Political/institutional:</u> Limited capacity to monitor development projects, land use change, and conservation actions to provide timely information for decision-making	<ul style="list-style-type: none"> <li>Support applied research institutes and information management for analysis of scenarios of development, conservation, climate change, etc.</li> <li>Strengthen capacity of NGOs to monitor and track large infrastructure projects</li> </ul>	VMBRFMA, departmental and municipal governments, in conjunction with research institutes, universities, and NGOs	In areas of major expansion of agriculture and livestock, and major infrastructure development
<u>Economic:</u> <ul style="list-style-type: none"> <li>Insufficient economic incentives for conservation, forest management, avoided deforestation</li> <li>Insufficient financial resources for above, and over-dependence on international donor funding</li> </ul>	<ul style="list-style-type: none"> <li>Revise national laws and regulations to include economic incentives for conservation and sustainable use</li> <li>Promote sustainable economic uses of forests and biodiversity in local communities</li> <li>Support applied investigations of economic opportunities linked to forests and biodiversity</li> <li>Develop and replicate model PES mechanisms in watersheds for hydrological ecosystem services</li> <li>Work with municipalities to support programming of their resources towards natural resources</li> </ul>	VMBRFMA, <i>Superintendencia Forestal</i> , INRA, Ministry of Production and Microenterprise, National Biocommerce Program, National Institute on Biodiversity Research for Development (IBIBDD), National Fund for Forestry Development (FONABOSQUE) departmental and municipal governments, in conjunction with research institutes, universities, NGO, private sector through	In areas of major expansion of agriculture and livestock, and major infrastructure development

Cause/Driver	Actions Needed	Actors	Geographic Focus
	management	public-private alliances	
<u>External/global:</u> <ul style="list-style-type: none"> <li>Climate change</li> </ul>	<ul style="list-style-type: none"> <li>Promote and participate in, REDD mechanism (UNFCCC, post-Kyoto, Bali roadmap)</li> <li>Further develop capacity to monitor deforestation/degradation such as the pilot model from Noel Kempff Mercado NP Climate Action Project</li> <li>Investigate and develop adaptation strategies for Altiplano ecosystems, including puna, bofedales, and glacial-fed aquatic ecosystems</li> </ul>	PNCC, VMBRFMA, <i>Superintendencia Forestal</i> , IBIF, NGOs	Forested areas for REDD participation; Altiplano ecosystems for adaptation mechanisms
<u>Social:</u> <ul style="list-style-type: none"> <li>Limited awareness of damaging role of fire (<i>chaqueo</i>) in forest degradation</li> <li>Limited awareness of role of forests in providing hydrological ecosystem services</li> </ul>	<ul style="list-style-type: none"> <li>Raise awareness of role of damaging role of fire (<i>chaqueo</i>) in forest degradation</li> <li>Raise awareness of role of forests in providing hydrological services in watersheds</li> </ul>	VMBRFMA, departmental and municipal governments, NGOs	In forested areas experiencing expansion of agriculture and livestock



### 6.3 ADDRESSING THREATS ARISING FROM POLLUTION

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> <li>Limited capacity in the government agencies responsible for enforcing compliance with pollution regulations and standards</li> <li>Gaps in pollution laws, standards, and regulations</li> <li>Lack of baseline scientific knowledge of aquatic species against which to measure effects of pollution</li> </ul>	<ul style="list-style-type: none"> <li>Specific municipal ordinances and standards to control pollution</li> <li>Development of environmental units in municipalities or <i>mancomunidades</i> for monitoring and enforcement</li> <li>Development of community standards and agreements to control pollution</li> </ul>	Ministry of Water, Ministry of Mines and Metallurgy, VMBFRMA, departmental and municipal governments, NGOs, universities and research institutes	<ul style="list-style-type: none"> <li>Cordilleran and sub-Andean regions</li> <li>Río Pilcomayo and tributaries</li> <li>Altiplano watersheds, including Lake Titicaca</li> <li>Cochabamba</li> <li>Santa Cruz</li> </ul>
<u>Economic:</u> <ul style="list-style-type: none"> <li>Increased costs to control and clean up pollution</li> </ul>	<ul style="list-style-type: none"> <li>Development of cost recovery schemes for pollution control</li> <li>Enforcement and fines to provide economic disincentives</li> <li>Clean Production and pollution prevention approaches to minimize contamination</li> </ul>	National, departmental, and municipal governments; private sector	see above
<u>Social:</u> <ul style="list-style-type: none"> <li>Lack of public awareness and understanding of effects of pollution on human health and aquatic ecosystems</li> </ul>	<ul style="list-style-type: none"> <li>Public awareness and information campaigns targeting specific types of pollution in particular watersheds</li> </ul>	National, departmental, and municipal governments; NGOs	see above

## 6.4 ADDRESSING THREATS ARISING FROM OVERHARVESTING OF SELECTED SPECIES

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> <li>Illegal harvesting</li> </ul>	<ul style="list-style-type: none"> <li>Control illegal harvesting of endangered and CITES-listed species</li> <li>Enforcement and fines to provide economic disincentives</li> </ul>	VMBFRMA, departmental and municipal governments	<ul style="list-style-type: none"> <li>Habitats of endangered and CITES-listed species</li> </ul>
<u>Economic:</u> <ul style="list-style-type: none"> <li>Insufficient sustainable use and management plans</li> </ul>	<ul style="list-style-type: none"> <li>Develop and enforce more sustainable use management plans for economically valuable species</li> </ul>	VMBFRMA, Ministry of Production and Microenterprise, National Biocommerce Program, <i>IBIBDD</i> , <i>Superintendencia Forestal</i> , departmental and municipal governments, private sector, NGOs (FAN, Fundación PUMA), universities and research institutes	<ul style="list-style-type: none"> <li>Habitats of economically valuable species including most valuable timber tree species, and: castaña, vicuña, caiman, wild cacao, and maca</li> </ul>
<u>Social:</u> <ul style="list-style-type: none"> <li>Lack of public awareness and understanding of endangered species and threat of overharvesting</li> </ul>	<ul style="list-style-type: none"> <li>Public awareness and information campaigns targeting specific species in areas where they are found and killed/harvested</li> </ul>	VBRFMA, departmental and municipal governments; NGOs; private sector	see above

## 6.5 ADDRESSING THREATS ARISING FROM INVASIVE SPECIES

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> <li>Lack of national strategy and monitoring framework</li> </ul>	<ul style="list-style-type: none"> <li>Develop a national strategy on exotic invasive species</li> <li>Develop a monitoring network</li> </ul>	VMBFRMA, departmental and municipal governments	<ul style="list-style-type: none"> <li>Habitats at risk to be identified</li> </ul>
<u>Economic:</u> <ul style="list-style-type: none"> <li>Reduced economic value of species impacted by invasives</li> </ul>	<ul style="list-style-type: none"> <li>Develop strategies for combating invasive species</li> </ul>	VMBRFMA, departmental and municipal governments; NGOs; private sector	<ul style="list-style-type: none"> <li>Habitats at risk to be identified</li> </ul>
<u>Social:</u> <ul style="list-style-type: none"> <li>Lack of public awareness and understanding of invasive species and their potential impact to tropical forests and biodiversity resources</li> </ul>	<ul style="list-style-type: none"> <li>Public awareness and information campaigns targeting specific species in areas where they are found and are causing harm</li> </ul>	VMBRFMA, departmental and municipal governments; NGOs; private sector	<ul style="list-style-type: none"> <li>Habitats at risk to be identified</li> </ul>

## 6.6 ADDRESSING THREATS ARISING FROM CLIMATE CHANGE

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> <li>Lack of full implementation of the National Mechanism for Adaptation to Climate Change</li> <li>Lack of full implementation of the national Clean Development Mechanism</li> <li>Lack of available international mechanism for payments for REDD</li> </ul>	<ul style="list-style-type: none"> <li>Continue with implementation of National Mechanism for Adaptation</li> <li>Continue implementing national CDM</li> <li>Continue with leadership role in UNFCCC negotiations for post-Kyoto REDD mechanism</li> </ul>	PNCC, VMBFRMA, Ministry of Production and Microenterprise, NGOs, universities and research institutes	<ul style="list-style-type: none"> <li>National</li> <li>International</li> </ul>
<u>Economic:</u> <ul style="list-style-type: none"> <li>Lack of available mechanism for payments for REDD</li> </ul>	<ul style="list-style-type: none"> <li>Pilot projects (with Forest Carbon Partnership Facility funding) to develop methods for cost-effective certification of deforestation and degradation, and carbon sequestration rates</li> </ul>	PNCC, IBIF, <i>Superintendencia Forestal</i> , VMBFRMA, NGOs, universities and research institutes private sector	<ul style="list-style-type: none"> <li>Various forest ecosystems potentially promising for REDD payments</li> </ul>
<u>Social:</u> <ul style="list-style-type: none"> <li>Lack of public awareness and understanding of climate change impacts and mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>Public awareness and information campaign on global climate change impacts on Bolivia and mitigation</li> </ul>	PNCC, Ministry of Production and Microenterprise, VMBFRMA, departmental and municipal governments; NGOs	

If actions for adapting to and mitigating climate change are to be framed within the NDP, studies and pilot projects in different ecological zones of the country will be needed. Land tenure will have to be defined so that mechanisms for equitable distribution of possible benefits can be developed. Systems of incentives need to be developed in forest areas threatened by land use changes where the price per CER is not high enough itself to be an incentive for forest conservation. It is important to consider that experiences related to avoided deforestation (such as that of FAN) in Noel Kempff Mercado National Park. Between 1997 and 2005 the Noel Kempff Climate Action Project (*Proyecto de Acción Climática Noel Kempff Mercado* [PACNK]) was responsible for an estimated 1,034,000 tons of certified emissions reductions of CO<sub>2</sub> through project activities that reduced deforestation and degradation of forests in the Noel Kempff area (Villagas et al., no date). The project complied with the most rigorous certification criteria.

# 7.0 OPPORTUNITIES FOR USAID STRATEGY AND PROGRAMS

## 7.1 EXTENT TO WHICH PROPOSED ACTIVITIES MEET NEEDS OF TROPICAL FOREST AND BIODIVERSITY CONSERVATION

FAA Sections 118 and 119 require that this assessment discuss “the extent to which the actions proposed for support by the Agency meet the needs thus identified.” In fulfilling this requirement, timing of the assessment is critical, as is discussed in USAID’s 2005 report *Tropical Forestry and Biodiversity (FAA 118 and 119) Analyses: Lessons Learned and Best Practices from Recent USAID Experience*. The specificity with which the question about USAID activities meeting national needs can be answered depends on the state of USAID strategy development, and the level of detail about the new strategy provided to the assessment team.

USAID/Bolivia was in the early stages of developing a new strategy for most of its programs when the assessment was conducted and in the process of a review of their portfolio with the Government of Bolivia. Therefore, we discussed ideas for how the actions needed for the conservation of biodiversity and forests in Bolivia might present opportunities for USAID in each of its sectoral programs (see Table 8 for a summary of current program areas).

We used the information gathered from all sources in this analysis to develop five general principles for USAID to consider as it develops a strategy and programs that may assist Bolivia to meet its needs in tropical forest and biodiversity conservation, given the current political, economic, and social situation in the country. We then applied those general principles to the broad set of “actions needed” that were identified by our participatory analysis (see Section 6), and identified four priority areas to recommend for USAID support.

The assessment team did not hear about plans for any activities that would create threats to the tropical forests or biodiversity of Bolivia. We are confident that the standard environmental compliance procedures that the Agency must follow (22 CFR 216) in the course of implementing programs will suffice to prevent any direct or indirect threats to tropical forests and biodiversity ([http://www.usaid.gov/our\\_work/environment/compliance/22cfr216.htm](http://www.usaid.gov/our_work/environment/compliance/22cfr216.htm)).

**TABLE 8. CURRENT USAID/BOLIVIA PROGRAMMATIC AREAS**

<b>Strategic Objective</b>	<b>Programmatic Areas</b>
Environment	Improved management of forests, water, and biodiversity for sustained economic growth, including sustainable tropical forestry management, in collaboration with local communities; sound management of areas of significant biological diversity at a value (parks and protected areas); and reduced industrial pollution.
Economic Opportunities	Development of financial services for the urban and rural poor; agricultural development for small producers; and improved trade and business competitiveness for small and medium sized businesses. The Bolivian Competitiveness and Business Competitiveness Project is working to improve value chains in the wood products and textiles sectors.
Health	Improved maternal and child health; improved community-based health initiatives; expanded access to family planning services; greater awareness and prevention of HIV/AIDS and sexually transmitted disease; infectious disease control; and partnerships with private organizations to enable sustainable health services.
Integrated Alternative Development	Economic diversification in coca-growing and associated areas, through development of rural competitiveness and market linkages, rural roads, municipal strengthening, access to justice, land titling and community and social development.
Democracy and Governance	Support all levels of government and all branches to strengthen democratic institutions; improve civil society participation in democratic processes; increase access to more efficient and transparent justice services; and strengthening local and regional governments.
Title II, Food Security	Improve economic sustainability in food insecure areas, and also coordinate with the US government disaster assistance program. The Title II program is scheduled to end this fiscal year.

## 7.2 GENERAL PRINCIPLES UNDERLYING OUR RECOMMENDATIONS

Based on our analysis of the challenges and opportunities presented by the current political, economic, and social context, we have identified five general principles that should guide USAID/Bolivia programming in support of tropical forest and biodiversity conservation for the next strategy period. These are:

1. Respond to the fundamentals of Bolivia's National Development Plan (*Plan Nacional de Desarrollo*) and other GOB policies and priorities on which there is coincidence with USG and USAID priorities.
2. Build on the positive current trends on the inclusion and empowerment of socially and economically marginalized groups.
3. Focus on the local level, working with municipalities and communities to build sustainable capacity and implement for results.
4. Work in a way that balances and/or cuts across the political and geographic lines in Bolivia (e.g., Altiplano / low-lands, indigenous and non-indigenous).

Build bridges upward from the local level to departmental and national government levels, emphasizing technical aspects of forest and biodiversity conservation.

While the focus of activities ought to be at the local level (Principle 3), the need to be sensitive to the GOB's NDP and development priorities (Principle 1) and to build bridges upward (Principle 5) requires



that USAID coordinate with and engage national authorities to the extent possible and practical in the design and implementation of its programs.

USAID will need to evaluate carefully the near-term challenges and constraints created by the uncertainty of the present political context, keeping in mind that some aspects of the current context will change, and that some may not. But the current situation also provides some positive opportunities that need to be considered, for instance involving new actors, new partners, new focal themes, and new geographic areas.

A final general consideration is that USAID/Bolivia should seek to develop biodiversity conservation and tropical forestry activities that benefit or have clearly identified links to more populated areas such that program visibility will be higher, rather than focusing on remote, low population regions where conservation work tends to occur.

### 7.3 ANALYSIS AND IDENTIFICATION OF PRIORITY WORK AREAS

The assessment team ranked the relative importance of the four main categories of threats. It is clear that habitat conversion is by far the most important threat to biodiversity and tropical forests in Bolivia, based on a number of criteria, including the area affected, number of species threatened, ecological processes disrupted, and reductions in biomass/carbon storage. Compared to the other main threats - pollution of aquatic ecosystems, overharvesting of selected species, and exotic invasive species - habitat conversion deserves the majority of attention and action.

The assessment team then ranked the four main root causes or drivers of these threats (political/institutional, economic, external, and social) according to how well the general principles presented in Section 7.2 can be applied in actions to mitigate these root causes, and concluded that the economic root causes or drivers are the most important and most tractable for USAID to address in the current political context.

Our recommendations for priority work areas for USAID very strongly support the need for actions that will address the **economic root causes** of **habitat conversion**. The five major actions needed to address the economic causes of habitat conversion (see Table 6.2) are:

1. Revise national laws and regulations to include economic incentives for conservation and sustainable use
2. Promote sustainable economic uses of forests and biodiversity in local communities
3. Support applied investigations of economic opportunities linked to forests and biodiversity
4. Develop and replicate model PES mechanisms in watersheds for hydrological ecosystem services
5. Work with municipalities to support programming of their resources toward natural resources management

Of these five, our general principles lead us to not recommend (1) and (5) due to the current coyuntura.

We see that (3) is a necessary component of both (2) and (4). Thus, our analysis leads us to recommend “actions needed” under categories (2) and (4). In addition, we see the possibility of developing international mechanisms for payments for avoided deforestation as falling in line with (2) and (4), in that such a mechanism would also address the economic root causes of habitat conversion.

Although not nearly as important in terms of area or number of species affected, the assessment team believes that controlling pollution in Altiplano communities should be considered by USAID as a fourth priority work area because it does address another type of threat to Bolivia’s biodiversity, and provides an avenue for applying many of the general principles presented in Section 7.2.

Our analysis also strongly suggests that the USAID/Bolivia Environment Program should:

- Focus on the economic values of biodiversity and forests, including the value of ecosystem products, ecosystem services, and non-material benefits such as ecotourism. Future work in the environment and renewable natural resources sector will be most effective if economic opportunities provide the entry point.
- Use global climate change as an entry point to biodiversity and forest conservation. Conserving biodiversity and forests will both help to mitigate global climate change and will be needed to help Bolivians adapt to the effects of climate change that the country is experiencing already.
- Use water as an entry point in working with municipalities to conserve forests and biodiversity. Water from forested watersheds and/or glaciers is essential for domestic consumption, sanitation, industrial production, and irrigation. Bolivians need to conserve their forests to maintain hydrological ecosystem services and they need to conserve biodiversity in order to adapt to increasing water scarcity caused by global climate change.
- Use pollution of aquatic ecosystems as an entry point to biodiversity conservation. Aquatic pollution of several kinds threatens aquatic ecosystems and species in each of the three major watersheds of Bolivia (Altiplano, Amazon, La Plata), and at the same time, endangers human health.
- Adopt a more integrated approach for biodiversity and forestry conservation, rather than treating them as separate sectors or issues. Bolivia's forests are part of its biological diversity, and forests and other biodiversity are essential to Bolivia's sustainable economic development.

## 7.4 PRIORITIES FOR USAID SUPPORT

Based on our analysis, the assessment team recommends that USAID/Bolivia support activities in the following four priority areas:

1. Strengthening natural resource-based enterprises,
2. Developing mechanisms for international payments for avoided deforestation,
3. Developing incentives for conserving watershed forests, and
4. Controlling water pollution from Altiplano communities.

USAID support in these areas would assist Bolivia's people and government implement "actions needed" for conserving their tropical forests and biodiversity. Three of the four recommended priority areas address directly the creation of greater value for Bolivia's tropical forests and biodiversity. The following matrix summarizes how the four priority areas we recommend for USAID support conform to the general principles given above. The five guiding principles should be seen as crosscutting and embedded in each of the four proposed work areas. For example, each priority work area should view increased participation, inclusion, and empowerment of indigenous communities and other socially and economically marginalized groups as a positive development and take advantage of it to create new constituencies for conservation at the local level.

**TABLE 9. PRINCIPLES AND PRIORITY WORK AREAS**

Principles ►	Link with NDP and GOB Priorities	Inclusion & Empowerment	Local Level & Municipalities	Balance Altiplano & Lowlands	Build Bridges Between Local, Departmental, & National Government
Priority Work Areas ▼					
<b>Strengthening Natural Resource-Based Enterprises</b>	Through National Biocommerce Program and IBIBDD	Support for wood products & NTFPs that benefit marginalized groups; camelids for Altiplano indigenous communities	Work with enterprise associations & selected municipalities on selected products/value chains	Altiplano NRBEs for vicuña, llama, alpaca; lowlands for wood products, Brazil nuts, caiman	Involve selected municipalities and Ministry of Production and Microenterprise
<b>Developing a Mechanism for International Payments for Avoided Deforestation</b>	Through National Climate Change Program (PNCC)	Work with forest communities, including indigenous	Involve municipalities & local communities in forest conservation	Payments shared with local and national; main potential is lowlands	PNCC link down to local, municipal, departmental sites and National Parks; model baseline work in Noel Kempff NP
<b>Incentives for Conserving Watershed Forests</b>	Through NDP, water as a public resource	Work with watershed forest owners and downstream communities	Model work in Santa Cruz municipalities; replicate in other depts, municipalities	Main focus on Cordillera and foothills communities	Replication in several departments may generate national interest
<b>Controlling Water Pollution from Altiplano Communities</b>	<i>Vivir Bien</i> & harmony with nature outlook of NDP	Benefits health & economy of indigenous Altiplano communities	Requires work with selected municipalities & communities	Benefit is Altiplano & high-population area in El Alto	El Alto and municipalities, La Paz Dept., but Lake Titicaca is national tourism resource

#### 7.4.1 Priority Work Area 1: Strengthening Natural Resource-Based Enterprises

The assessment team recommends that USAID/Bolivia provide support to strengthen natural resource-based enterprises (NRBEs), including wood product enterprises based on sustainable wood production from native forests, and enterprises based NTFPs and animal products from native species found in natural ecosystems. We do so because this work area directly addresses the economic cause of the highest-ranked threat: loss, conversion, and degradation of forests and other natural habitats. It works in the economic realm, where there are opportunities to follow all five of the general strategic principles given in Section 7.2. This work area addresses asymmetries between the agricultural and forestry sectors by supporting natural resource-based enterprise development. In many parts of Bolivia, the long-term benefits to sustainable economic growth are greater from managing natural forests and other natural habitats than from converting them to agriculture. This recommendation also avoids working on national

policy, institutional, governance, or land and resource tenure issues at a time when our analysis shows that the short-term context is not ripe for successful work in these areas.

One reason for recommending natural resource-based enterprises as a priority work area is that it fits with the NDP's interest in sustainable uses of biodiversity and the promotion of small, local enterprises that add value to natural products through processing and manufacturing. It also links with the National Institute on Biodiversity Research for Development (IBIBDD) and the National Biocommerce Program. Another benefit for USAID/Bolivia is that this work area can take advantage of some of the lessons learned in the Bolivia Trade and Business Competitiveness (BTBC) Project, and provide synergies between the interests of the Environment and Economic Opportunities Offices. The BTBC Project is already working in the wood products manufacturing and textiles sector, so BTBC already has some experience with two of the natural products "clusters" that are proposed for focus as a result of this analysis.

We recommend that USAID consider supporting NRBE development and value chain strengthening for the following four categories of natural products, for reasons that are discussed below in relation to each. However, these could be considered illustrative, and USAID/Bolivia will need to set its own priorities.

### ***Wood product NRBEs***

The assessment team recommends that USAID/Bolivia continue and perhaps replicate and expand the work in the wood products manufacturing sector that has been supported by the BTBC Project. This work has been conducted with micro, small, and medium enterprises that make wood products such as furniture. It has worked in Santa Cruz, La Paz, Cochabamba, and some in Tarija. In La Paz, manufacturing enterprises benefit workers in El Alto. Wood for these products comes mainly from Beni and Santa Cruz. The project is trying to ensure that the wood used in these products is legal, even certified if possible. One of the lessons learned in this project is that working with associations of small companies, rather than one company at a time, is a way to more quickly scale up capacity. Recent work with the *Instituto del Mueble Boliviano* suggests that this may be a partner that can help strengthen vertical integration of the furniture value chain. Continued USAID support for wood product enterprises could be a way to maintain some of the value of investments made in BOLFOR, and strengthen connections between former BOLFOR partners and BTBC partners.

### ***Brazil nut NRBEs***

The assessment team recommends that USAID/Bolivia consider supporting the strengthening of Brazil nut value chains and NRBEs. One reason for this recommendation is the value of the product (see Table 6). Bolivia is the world's leading exporter of Brazil nuts (*castaña—Bertholletia excelsa*), supplying about 50-70 percent of world demand (Collinson et al., 2000; FAO, 2007). Because of the complex pollination ecology of this tree, it produces nuts almost exclusively in virgin forests, as disturbed forests usually lack an orchid that is indirectly responsible for the pollination of the flowers. Brazil nuts are gathered from wild stands, and their collection is the economic base of northern Bolivia, mainly in Pando and Beni departments. Approximately 7,000 families are involved in collection of the nuts, and about 4,500 people are employed in their processing, 75 percent of which are women. Overall, about half of the working population of the region is involved in Brazil nut production.

Primary export markets are North America, Europe, and Australia. The principal problem in accessing European markets is that Brazil nuts frequently exceed permitted levels of aflatoxins. Another problem for Brazil nut production is to resolve conflicts of interest with the TCOs in whose territories an important part of the collection of Brazil nuts takes place. Maintaining production will require large extractive reserves and management plans that prevent such intensive seed collection that the species does not reproduce itself. (Sources: <http://www.bolivia-riberalta.com/sitio/leer.php?id=424> and <http://ccbolgroup.com/brasilnutsE.html>)

### ***Altiplano camelid-based textiles NRBEs (vicuña, llama, alpaca)***

The assessment team recommends that USAID/Bolivia consider support to strengthen alpaca, llama, and perhaps vicuña textiles value chains, and link these back to the producers on the ground and to sustainable management of biodiverse Altiplano ecosystems for grazing. Supporting conservation of Altiplano ecosystems and watersheds will help provide resilience for traditional grazing livelihoods and food security for Altiplano communities in the face of climate change (deglaciation and drying of the Altiplano climate). The USAID BTBC Project has worked with llama and alpaca textile producers, and, as with the wood products sector, some of the lessons learned there could be carried forward in future USAID support for these textiles value chains.

The vicuña is a wild camelid found on the Altiplano which possesses very fine, high-quality wool. In 1969, Bolivia and Peru signed an agreement to protect vicuñas, and as a result, the population surpassed 34,000 animals in 1996. Studies have estimated that in 2021 Bolivia could support 80,000 vicuñas. It is difficult to estimate the potential international market for products made from vicuña wool for several reasons, including the fact that these are wild, not domesticated, animals; the CITES prohibition against maintaining these animals in captivity; the necessity of maintaining ample open habitats to support them; and the costs of harvesting their wool. The National Biocommerce Program, an UNCTAD initiative that began in 2003 as a government program implemented by FAN, has done some work on vicuña (discussed in Section 3.2).

### ***Caiman NRBEs***

USAID could build upon the work of the National Biocommerce Program which included the definition of a productive network for the export marketing of caiman skins and meat. The Yacare caiman (*Caiman yacare*), or *lagarto* in Spanish, is found in six departments in Bolivia, although it is most abundant in the flooded plains of Beni and the Panatana region of Santa Cruz. The main products from this species are skins and frozen meat. The GOB created the Program for the Use and Conservation of the Lagarto, and within its framework up to 59,000 caiman skins can be harvested annually (although it is estimated that the maximum annual harvest should be 45,000 skins). These skins are processed by six tanneries that sell all the skins directly or indirectly to the international market, with a value of approximately US\$ 1.7 million per year. The meat is all sold through one company to markets in North America.

## **7.4.2 Priority Work Area 2: Developing Mechanisms for International Payments for Avoided Deforestation**

The assessment team recommends that USAID/Bolivia support the development of models and mechanisms for international payments for conserving forests for the carbon sequestration service they provide to the global atmosphere. Such economic mechanisms are another way to increase the economic value of forests to local communities, thereby addressing the main cause of their loss and conversion. The ideal would be to eventually realize mechanisms for international payments for forest conservation that would compete, on a dollars per hectare basis, with forest conversion for all or most agricultural uses. These mechanisms could be of two types: payments through private carbon markets, or payments structured through a post-Kyoto REDD mechanism now being developed under the UNFCCC.

International negotiations will probably lead to the REDD mechanism becoming operational under a post-Kyoto framework after 2012. Elements of REDD in the pilot phase may include consideration of emissions avoided both from deforestation and degradation of forests; pilot/ demonstration activities at the national or subnational level; scenarios of national emissions from deforestation and degradation as the framework; and reductions or increases of emissions based on historic emissions considering national circumstances. Developing a historic baseline for emissions will be a critical issue in planning REDD projects. Given its experience with Certified Emission Reductions from the Noel Kempff Mercado Climate Action Project (<http://www.noelkempff.com/English/ProjectSummary.htm>), Bolivia is on its way



toward being able to develop a baseline and to monitor and verify carbon sequestration and emissions from forests. Methods of remote detection of degradation are under development and show promise.

Support from USAID to help Bolivia prepare for full participation in a post-Kyoto REDD mechanism would link action at the local level with communities and municipalities, with national-level policy and coordination being carried out through the PNCC. This supports several of the general principles identified in this analysis.

### **7.4.3 Priority Area 3: Developing Incentives for Conserving Watershed Forests**

Supporting the development and scale up of economic mechanisms for conserving watershed forests and the hydrological services they provide is another means of increasing the economic value of forests to local communities, addressing the main cause of their loss and conversion. The assessment team recommends that USAID/Bolivia investigate and support the implementation of local-scale watershed-based incentives for conserving watershed forests, including PES-like mechanisms.

If it chooses to support work on this topic, USAID/Bolivia could begin by assessing in detail some of the concrete examples of market-like payments, compensation, or incentive schemes for conserving hydrological services that are in different stages of implementation in municipalities bordering Amboró National Park (described in Section 3.3). These approaches could be applicable in watershed forests of high importance in Santa Cruz Department, but also on the slopes of the eastern Cordillera in the Yungas of La Paz and in some of the initial ranges of the southeast Cordillera. These forests could be conserved through small local reserves and/or through management agreements to protect their function in providing hydrological services. In coca-producing areas, economic mechanisms such as payments by downstream users to forest owners/managers in upper watersheds could link with the USAID/Bolivia Alternative Development program.

Fundación Natura and IIED (Muller 2005) present an approach for characterizing and prioritizing watersheds that would be most amenable to the development of payment, compensation, or incentive schemes for the conservation of hydrological ecosystem services. This approach could serve as the basis for evaluating potential watersheds in other regions of the country, explicitly identifying the differences and difficulties that may exist. For instance, the hydrological regimes of the precipitation-fed watersheds of the eastern slope of the Andes differ from those of the partly or mainly glacier-fed watersheds that drain to the closed-basin in the Altiplano.

Fundamental differences in views and perceptions exist, however, on the validity and appropriateness of these types of compensation instruments. On one end of the spectrum are those that view any sort of market-based, compensatory scheme for the use or services derived from natural resources as philosophically unacceptable and contrary to the perception of these services as public goods. However, some local and regional authorities, as well as some communities and water user groups—especially in the Department of Santa Cruz—that have become increasingly concerned about flow reduction in local watersheds are seeking creative, concrete solutions, including PES-like mechanisms. There are contradictions within the NDP regarding the role of ecosystem services in national development. In some instances, the NDP supports markets for these services, especially carbon sequestration (NDP, p. 124), while rejecting the notion that people should have to pay for these services, as in the case of payments for hydrological services from watershed management (NDP, pp. 114-115). In short, PES and PES-like mechanisms, while broadly applicable in theory, need to be carefully planned and designed to account for local socio-political, economic and physical conditions.

### **7.4.4 Priority Work Area 4: Controlling Water Pollution from Altiplano Communities**

Pollution of aquatic ecosystems was identified as a threat to biodiversity in each of the three major watersheds of Bolivia, and one that also threatens human health in many places. As discussed in Section



4.1.2., mining wastes, human sewage, and contaminants from manufacturing processes are the main sources of pollution of waters in the closed Altiplano basin, which includes Ramsar sites such as Lake Titicaca and Lakes Poopó and Uru Uru. A major source of some of this pollution is the city of El Alto. The problem of eutrophication in the Bay of Cohana on Lake Titicaca, which receives pollution from El Alto and neighboring watersheds, has begun to raise concerns among local authorities. Livestock also contribute to the nutrient loading of the Bay of Cohana.

Reducing water pollution is especially critical to biodiversity and human health in the glacially fed watersheds of the Altiplano, on which major cities and Altiplano lakes depend. The issue of controlling water pollution in Altiplano communities is an important aspect of adaptation to climate change. As water becomes increasingly scarce as the glaciers melt in a warming climate, it is critical to keep what water there is as clean as possible, so it can be reused and recycled for both human and ecological uses.

USAID/Bolivia has recently designed and contracted a Lake Titicaca Pollution Management project along these lines. The objectives of the project are to: reduce threats to key biodiversity targets of the El Alto–Lake Titicaca axis; and, improve the environmental health and quality for residents of targeted areas within the El Alto-Lake Titicaca axis. The assessment team believes that models developed in the El Alto-Cohana Bay area should be replicated throughout the Titicaca-Desaguadero-Poopó-Salar de Coipasa closed basin ecosystem.

## **7.5 CONCLUSIONS**

USAID/Bolivia could assist the government and people of Bolivia to carry out a number of the actions that are needed to conserve the country's unique and valuable biological diversity and tropical forests. The current political context presents not only challenges but new opportunities. Not only the Environment Program but other sectoral programs in the Mission could engage in activities that help to meet the needs that were identified in this assessment. Some of these actions can be of a short-term, “no regrets” nature, appropriate for the context that exists right now in Bolivia. These can set the stage for a longer-term strategy that will build on some of the probably irreversible changes in economics and governance that have occurred, or are taking place now. These include the trend toward decentralization and greater autonomy at the departmental and municipal levels of government, as well as the inclusion and empowerment of groups that were formerly socially, politically, and economically marginalized. In supporting one or more of the four priority work areas recommended by this assessment, USAID would benefit Bolivians in local communities, especially socially and economically marginalized groups, and would also support the Government of Bolivia in implementing its National Development Plan and fostering the sustainable and equitable development of the country. Furthermore, these activities would benefit the US national interests, and the global community, through protecting Bolivia's globally significant biodiversity and by helping to mitigate global climate change.

# ANNEXES

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# ANNEX A. BIOGRAPHICAL SKETCHES OF TEAM MEMBERS

**Dr. Bruce Byers**, an ARD Senior Associate, is a biodiversity conservation and natural resources management specialist with more than 20 years of experience in the field. Dr. Byers has led or participated on FAA 118-119 assessment teams in five countries. In 2005 he led a study of USAID's recent experience conducting such Tropical Forestry and Biodiversity analyses, and worked with the USAID Biodiversity Team (EGAT/NRM Office) and staff from each regional bureau to prepare guidelines on how to conduct them, *Tropical Forestry and Biodiversity (FAA 118 and 119) Analyses: Lessons Learned from Recent USAID Experience and Guidelines for USAID Staff*, June 2005. He was also the lead consultant and a major contributor in the development of USAID's Biodiversity Guide, *Biodiversity Conservation: A Guide for USAID Staff and Partners*, June 2005.

**Dr. Morris Israel**, an ARD Associate, is a water resources and environment specialist with 20 years experience in the programming, design, implementation, and evaluation of field activities. In his 10 years at USAID, Dr. Israel led or was part of numerous evaluation and design teams, and designed and managed a variety of environmental programs in the areas of watershed management, biodiversity conservation, cleaner production, trade-environment, and water supply and sanitation. He served four years as Environment Specialist in USAID/Bolivia and has an appreciation for development dynamics in Bolivia and working relationship with key stakeholders in the environment sector. During his tenure at USAID, he served as LAC Bureau Environment Officer and Mission Environment Officer (Bolivia) responsible for ensuring that all programs complied with the Agency's environmental procedures (22 CFR 216).

**Rafael Anze**, a Principal with Simbiosis SRL, is a specialist in environmental management systems and environmental audits of industrial process, especially in the mining and industrial sectors. He has over 13 years experience in working with public and private sector in Bolivia preparing environmental sampling and monitoring programs and environmental action plans.

**Evelyn Taucer**, a Principal with Simbiosis SRL, is a biologist by training with over 15 years experience in Bolivia on environmental audits, environmental impact assessments, ecological monitoring, and natural resources management. She has worked closely with national and local governments in the design and implementation of environmental projects and on ensuring compliance with environmental regulations. She is a lecturer at the Ecology Institute of the Universidad Mayor de San Andres, where she also coordinates the post-graduate program in Ecology and Conservation.

# ANNEX B. PERSONS CONTACTED

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# ANNEX C. WORKSHOP INVITEES AND PARTICIPANTS

**Taller de Análisis de Situación: Bosques Tropicales y Biodiversidad**  
**La Paz - 16 de junio de 2008**  
**Registro de Participantes**

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