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PERU TROPICAL FOREST AND BIODIVERSITY ASSESSMENT

AUGUST 2014

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PERU TROPICAL FOREST AND BIODIVERSITY ASSESSMENT

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Cover Photos

Cover Sheet Photo: Logging in Pucallpa (Credit: Andrew Duffy).

Report Maps

The maps included in this report were prepared and revised by Tobias Carter at the Sun Mountain International offices.

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ABBREVIATIONS AND ACRONYMS

ACC	Adaptation to Climate Change
ACT	Amazon Cooperation Treaty
ADS	Automated Directive System
AECID	Spanish International Cooperation Agency for Development
AIDER	Association for Research and Integral Development
AIDESEP	Interethnic Association for Development of the Peruvian Jungle
AILAC	Association of Independent Latin American and Caribbean States
ANA	National Water Authority
APECO	Peruvian Association for the Conservation of Nature
APS	Annual Program Statement
bbl/d	Oil barrels per day
BEO	Bureau Environmental Officer
BMI	Business Monitor Institute
BTC	Belgian Development Cooperation
°C	Degrees Celsius
CAF	Development Bank of Latin America
CAM	Municipal Environmental Commission
CAMEP	Carnegie Amazon Mercury Ecosystem Project
CAR	Regional Environmental Commission
CCBS	Climate, Community, and Biodiversity Standard
CDCS	Country Development Cooperation Strategies
CELADE	Latin American Center of Development
CEPAL	Economic Commission for Latin America and the Caribbean
CIA	Central Intelligence Agency
CIAM	Inter-regional Amazonian Council
CIFOR	Center for International Forestry Research
CIMA	Center for Conservation, Research and Management of Natural Areas
CITES	Convention on the International Trade of Endangered Species of Wild Fauna and Flora
cm	Centimeters
CMDD	*Madre de Dios* Consortium
CO^2	Carbon Dioxide
COFOPRI	Organization of Informal Property Formalization
COHA	Council on Hemispheric Affairs
CONAM	National Environmental Council
CONAP	Confederation of Amazonian Ethnicities in Peru
CONCYTEC	Council on Science and Technology
COSUDE	Swiss Agency for Development Cooperation
CPATU	Agroforestry Research Centre for the Brazilian Eastern Amazon
CWI	Care for the Wild International
DEVIDA	National Commission for Development and Life without Drugs
DG	General Directorate
DO	Development Objective
ECOBONA	A COSUDE Program for Management of Andean Forest Ecosystems
e.g.	*exempli gratia*
EIA	Energy Information Administration
EIA	Environmental Impact Assessment
EU	European Union

FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization
FCPF	World Bank Forest Carbon Partnership Facility
FIP	Forest Investment Program
FONDAM	Fund of the Americas
FTA	Free Trade Agreement
GLOFs	Glacial Lake Outburst Floods
GBR	Global Business Report
GEMS	USAID Global Environmental Management Support Project
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	German Society for International Cooperation
GOERU	Natural Resources Administration of the Ucayali Regional Government
GOP	Government of Peru
GPAP	Climate Change Adaptation Program
ha	Hectares
HCVA	High Conservation Value Areas
IBAs	Important Bird Areas
IBC	Institute for the Common Good
IDB	Inter-American Development Bank
IDRC	International Development Research Centre
IGNP	National Geographic Institute of Peru
IGP	Geophysical Institute of Peru
IIAP	Peruvian Amazon Research Institute
IIRSA	Initiative for the Integration of the Regional Infrastructure of South America
ILO	International Labor Organization
IMARPE	Sea Institute of Peru
INANPE	Peruvian Antarctic Institute
Inc.	Incorporated
INDEPA	National Institute for the Development of Andean, Amazonian and Afro-Peruvian Peoples
INEI	National Institute for Statistics and Computing Information
INIA	National Institute for Agricultural Research
INPA	Brazilian National Institute for Amazonian Research
INRENA	National Institute of Natural Resources
IPACC	Public Investment and Adaptation to Climate Change
IPCC	Intergovernmental Panel on Climate Change
IR	Intermediate Result
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KfW	German Development Bank
Km	Kilometers
Km^2	Square kilometers
Km^3	Cubic kilometers
LAC	Latin America & Caribbean
m	Meters
masl	Meters above sea level
mm	Millimeters
MINAGRI	Ministry of Agriculture and Irrigation
MINAM	Ministry of Environment

MINCETUR	Ministry of International Commerce and Tourism
MoDef	Ministry of Defense
MRV	Monitoring, Reporting, and Verification
MT	Metric Tons
MW	Megawatt
NASA	National Aeronautics and Space Administration
n.d.	No Date
NEP	National Environmental Policy
NGO	Non-Governmental Organization
No.	Number
NORAD	Norwegian Agency for Development Cooperation
NRM	Natural Resource Management
SEIA	National System of Environmental Impact Assessment
NTFP	Non-timber Forest Product
OCBR	Coordinating Body of Forests and REDD+
OECD	Organization for Economic Cooperation and Development
OEFA	Environmental Oversight and Evaluation Agency
ONERN	National Natural Resources Evaluation Office
OSINFOR	Forest and Faunal Resources Supervisory Agency
PA	Protected Area
PCM	Presidency of the Council of Ministers
PES	Payment for Ecosystem Services
PESEM	Multi-Sector Strategic Plan of the Ministry of Agriculture
PLAN-GRACC-A	Risk Management and Climate Change Adaptation Plan for the Agricultural Sector
PNCB	National Forests Conservation Program
PROFO-NANPE	Peruvian Trust Fund for National Parks and Protected Areas
PRONATU-RALEZA	Peruvian Foundation for Conservation of Nature
RAISG	Amazon Network of Georeferenced Socio-environmental Information
Ramsar	Convention on Wetlands of International Importance
RCA	Regional Conservation Area
REA	Regional Environmental Authorities
R-PP	REDD+-Readiness Preparation Proposal
REDD	Reducing Emissions from Deforestation and Forest Degradation
SEA	Strategic Environmental Assessment
SENACE	National Service for Environmental Certification
SENAMHI	National Hydrological and Meteorological Service
SERFOR	National Service of Forests and Wildlife
SERNANP	National Service of Natural Protected Areas by the State
SINANPE	National System of Protected Natural Areas by the State
SMTN	Sun Mountain International
SNIP	National Approval Procedure for Public Investments
SNP	National Fisheries Society
sp.	Species
SPDA	Peruvian Society for Environmental Law
SPDE	Peruvian Society for Ecodevelopment
spp.	Various Species
TNC	The Nature Conservancy

UN	United Nations
UNDP	United Nations Development Program
UNDRIP	United Nations Declaration on the Rights of Indigenous People
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USAID	United States Agency for International Development
USD	United States Dollar
USG	United States Government
VCS	Voluntary Carbon Standard
WB	World Bank
WCS	Wildlife Conservation Society
WMO	World Metrological Organization
WWF	World Wildlife Fund
ZEE	Economic and Ecological Zoning

EXECUTIVE SUMMARY

INTRODUCTION

Sections 118(e) and 119(d) of the Foreign Assistance Act of 1961 direct United States Agency for International Development (USAID) to conduct an analysis of the status of biodiversity and tropical forests and if practical to integrate actions that mitigate threats to these natural resources within the country development strategy statement or other country plan prepared by USAID. This analysis can be a useful guide to USAID programming decisions. USAID/Peru commissioned this 118/119 Tropical Forest and Biodiversity Assessment in preparation for the mission's next strategy period (2017-2021) to support adjustments to the current program based on changing social, economic, institutional, and legal contexts. The objectives of the assessment are to:

1. Assess the current state and trends of tropical forests and biodiversity in Peru.
2. Identify root causes and proximate causes for the current state of biodiversity and tropical forests in Peru.
3. Provide recommendations to USAID/Peru regarding strategic support of Peruvian efforts to improve biodiversity and tropical forest conservation in the country.

This assessment was based on interviews with over 50 stakeholders from government, academia, civil society, and the private sector, a review of secondary sources, and visits to three field sites. The assessment was conducted by a team of Peruvian and external consultants hired by Sun Mountain International and The Cadmus Group, Inc., under the E3 Global Environmental Management Support (GEMS II) contract.

POPULATION AND ECONOMY

Peru is a large (1.3 million km^2) country with a population that is expected to reach 33,079,000 by 2020. Internal migration is high, driven by the need to seek new economic opportunities, and most movement is from the Andean Region to coastal cities and parts of the Amazon Basin, particularly Madre de Dios.

The Peruvian economy has grown more than six percent annually since 2002. Peru's exports over the last decade have seen remarkable growth due to Free Trade Agreements (FTAs) with the USA, Canada, Japan, China, and the European Union. Economic growth has been driven in part by private investment, which exceeded USD $12 billion USD in 2012 alone and represented almost six percent of the GDP. In comparison, bilateral aid contributions from OECD countries totaled approximately $580 million USD in 2011. Private investment has been especially large in the extractive industries (*i.e.,* mining, oil, gas) that account for more than 60 percent of Peru's total exports.

CLIMATE CHANGE

Peru meets seven of the nine criteria used by the United Nations Framework Convention on Climate Change (UNFCCC) to prioritize developing countries for climate change-related assistance. About 15 percent of Peru's GDP and the economic activities of approximately one-third of its population are sensitive to climate change. The frequency of unusual hydro-meteorological phenomena has increased more than six fold from 1997 to 2006, and changes in precipitation and temperature regimes are already affecting Peru's ecosystems.

Peru contributes less than one percent of global greenhouse gas (GHG) emissions. Nearly 40 percent of Peru's total emissions (55 million tons of CO_2 equivalents) are the result of deforestation and forest degradation. Reducing emissions from deforestation and forest degradation can therefore be an effective way to mitigate climate change and help conserve biodiversity. Two Government of Peru (GOP) initiatives are currently underway to harness this potential: The National Forest Conservation Program and the REDD+ initiative.

As of late 2013, Peru's REDD+ initiative lacked a national monitoring, reporting and verification system (MRV) for quantifying reductions in emissions with avoided deforestation and forest degradation. In the absence of a REDD+-enabling framework and UNFCCC sanctioned rules, Peru has forged ahead with the development of REDD+ projects aimed at the voluntary carbon markets, including those supported by USAID. The country's experiences thus far indicate that the high costs of project preparation and implementation compromise its participation in voluntary carbon markets.

INDIGENOUS PEOPLES AND TERRITORIES

There are 76 ethnic groups in Peru, of which 15 are tribes living in voluntary isolation. Rural and native communities are recognized as legal entities. Peruvian law further establishes the right of indigenous peoples to prior consultation in accordance with the International Labor Organization (ILO) Convention 169. While the process to formalizing land tenure through legal communal title is ongoing, no communal property title to native communities has been granted since 2008.

Conflicts with regard to extractive industries, such as oil and gas, mining, and forestry, are common. Illegal logging occurs within protected areas, and even within the territories of indigenous peoples in voluntary isolation. Government approval of large projects and policies has taken place without appropriate informed consultation. Indigenous organizations are divided as to the desirability of REDD+.

LEGAL AND INSTITUTIONAL FRAMEWORK

Peru is a signatory to most international treaties, protocols, and conventions that have a bearing on tropical forests and biodiversity. There are eight national laws and 20 national institutions that are concerned with tropical forests and/or biodiversity. Peru is currently developing an ecosystem service law and a climate change law. Both its legal framework and political constitution convey an anthropocentric view of nature, whereby its purpose is to benefit Peru's society.

Peru's environmental institutions are new. The Ministry of Environment of Peru (MINAM) was created in 2008, partly in response to the Free Trade Agreement signed with the United States. The concomitant establishment of a number of ancillary institutions resulted in the formation of Peru's new public environmental sector.

While Peru has recently enacted legislation and is revising its policy instruments, there remain fundamental weaknesses in the implementation of those instruments and functioning of government bureaucracy. While sound in principle, the devolution of environmental competencies to regional governments has proven to be a challenge in practice. A number of other specific weaknesses further compromise the effectiveness of Peru's environmental governance.

BIODIVERSITY AND TROPICAL FORESTS

Peru is among the ten most biodiverse countries on the planet. It ranks first, second, third and fifth in terms of fish diversity (2,000 species), bird diversity (1,736 species), amphibian diversity (332 species), and mammal diversity (460 species), respectively. The country hosts 116 Important Bird Areas (IBAs) and encompasses large expanses of the Tropical Andes and Tumbes-Chocó-Darien Biodiversity Hotspots. In addition to being one of the most important centers of plant domestication and agro-biodiversity worldwide, Peru also houses two natural World Heritage sites, two mixed natural-cultural World Heritage sites, and 13 Ramsar sites.

The number of threatened species in Peru is increasing. Forty-four percent of plant species and eight percent of animal species assessed by the International Union for Conservation of Nature (IUCN) in Peru are threatened. The large proportion of endemics in this group is of particular concern: 36 percent of endemic bird species and 30 percent of endemic mammal species are now threatened. Besides the IUCN Red List, there are other indicators of biodiversity decline in Peru. Catch patterns indicate that some of Peru's most important marine fisheries are either fully- or overexploited, and that fisheries in the Amazon Basin are in a similar state.

Peru has a total of 73.3 million hectares (ha) of forest cover. The country's forests are classified into 11 land ownership and administrative classes. Of Peru's total forest cover, 30.4 percent is unclassified. This segment is consequently vulnerable to land speculators and the expansion of agriculture, particularly oil palm cultivation.

From 2000 to 2011, Peru lost a total of 1,482,000 ha of forest, equivalent to an annual average annual deforestation rate of 0.16 percent or a loss of 134,727 ha per year. Most of this deforestation took place in the Amazonian departments of Peru. There are also strong indications that Peru's forests are being depopulated of the fauna that drive ecosystem processes critical to forest health and regeneration.

THE PROTECTED AREAS SYSTEM

Peru´s protected areas system was previously administrated by INRENA under the Ministry of Agriculture. The SERNANP, under the Ministry of the Environment, was created in 2008. Peru has 16.3 percent of its territory in protected areas, more than the global target of 10 percent. In 2009, Peru created a new coastal-marine protected area system of Islands, Islets, and Guano Points as part of SINANPE. This agency has very limited capacity in marine management.

There are currently two primary sources of funding for SERNANP: (1) the Peruvian National Budget ($14,604,485 USD) and (2) income generated by SERNANP (*e.g.,* Protected Areas entry and other fees: $3,324,741USD). SERNANP's budget and salaries are low in comparison with those of neighboring countries, and below what is deemed adequate to meet the management and conservation needs of the geographical area under its jurisdiction.

DIRECT THREATS TO TROPICAL FORESTS AND BIODIVERSITY

The assessment identified six predominant direct threats to biodiversity and tropical forests:

Deforestation and Land-Use Change - Deforestation associated with land-use change is a principal threat to tropical forest and biodiversity loss. In the tropics, land-use change is driven by multiple factors; chief among them is the spread of oil palm and illicit crops. The area in Peru under oil palm production has doubled in the past decade, reaching 200 km^2 in 2010. Because large expanses of the Amazon region present ideal conditions for oil palm cultivation and the returns are high, expansion of this crop poses a critical threat to biodiversity and tropical forests unless effective safeguards are put in place.

Overexploitation - There is evidence that Peru's forests are experiencing faunal overharvesting, particularly of larger ungulates and primates. Furthermore, in spite of a ban, dolphin hunting off the coast of Peru is widespread. As many as 15,000 dolphins are estimated to be killed annually by the Peruvian fishing fleet and three important commercial pelagic species are considered overexploited. The average size of freshwater fish catch in some regions of the Amazon basin is decreasing.

Overharvesting has also had a negative effect on Peru's timber resources. About 80 percent of all commercial timber harvested, sold, and exported from Peru is illegal. Ironically, the concessions system that Peru put in place to foster sustainable timber management has become an instrument for laundering illegally-harvested logs from protected areas and indigenous territories. The exportation of illegal wood by Peru and its importation by US companies is in clear contravention of the forest appendices in the Peru-United States FTA and the Lacey Act.

Illegal and Informal Gold Mining - Illegal and informal mining in Peru is a serious threat to tropical forests and biodiversity, as well as people. While primarily concentrated in Madre de Dios, this activity has now expanded to the Departments of Ucayali, Loreto, Amazonas, Puno, Arequipa, Lima, La Libertad, and Piura. In Madre de Dios, 99 percent of the estimated 1,546 informal mining operations take place within protected areas, their buffer zones, or indigenous territories. It is estimated that mining has destroyed between 50,000 and 70,000 ha over the past several years in Peru. Gold mining as practiced n Peru's Amazon entails deforestation, destroys topsoil essential for forest regeneration, releases large amounts of sediment that degrade aquatic habitat and kill fish, and releases large amounts of mercury and other toxic chemicals that affect the nervous and reproductive systems of animals, fish and people.

Infrastructure as a Direct Threat - The Initiative for the Integration of the Regional South American Infrastructure (IIRSA) and the Peru-Brazil energy agreement have catalyzed mega-project construction in the Amazon Basin. Dams and roads are the two most important types of projects under IIRSA (now called the South American Infrastructure and Planning Council-COSIPLAN), both in terms of financial resources and number of projects. The Peru-Brazil agreement spans a time frame of 50 years and commits Peru to providing 6,000 MW of hydropower to Brazil via the construction of 15 large dams in the headwaters of the Amazon's principal tributaries.

Habitat Degradation - The degradation of critical habitat for species conservation results from illegal mining, cultivation of illicit crops, land-use change, land and river contamination, and the alteration of natural cycles of annual floods typical of large Amazonian rivers.

Urban Markets and Mass Production - Peru is one of the most important worldwide centers of crop plant origin and domestication due to the great diversity of local varieties of multiple crop species. This diversity, however, is succumbing to several different factors, chief among them the linkage with an

urban market that economically favors large quantities and homogeneity, offering no incentive to maintain diversity.

ROOT CAUSES OF FOREST AND BIODIVERSITY LOSS

Environmental Governance - Peru's environmental governance capacity is currently unable to cope with the fast economic, social, and environmental changes taking place. In Peru's case, economic growth can be reconciled with tropical forest and biodiversity conservation *provided that the country enhances its environmental governance* and is able to plan, guide, regulate, monitor and control the effects of economic activities on the environment. Resolving the weaknesses in Peru's environmental governance would help to mitigate multiple direct threats to tropical forests and biodiversity, such as illegal logging, illegal mining, and the overexploitation of fishery resources and bush meat, among others. A sound environmental governance system will also importantly help the country cope with climate change effects, global factors over which Peru has no control.

Infrastructure - The expansion of infrastructure in forested areas threatens tropical forests and biodiversity but may be mitigated to some extent by effective governance that includes local participation. Infrastructure construction creates jobs that attract migrants from other parts of the country thus increasing demand for forest products such as timber, fish and bush meat. Roads facilitate access for hunters and illegal loggers, along with transport of forest products. When construction is completed, migrants often stay to settle along roads where they chop down the forest to establish small farms. As well, urban centers grow with their associated needs for basic services and treatment and disposal of waste.

Migration and Population Growth – Internal migration is an important threat to tropical forests and biodiversity in Peru. Most paths of migration are from rural Andean areas to urban areas on the coast as well as to Amazonian regions. Given Peru's plans for the expansion of infrastructure in the Amazon, the region's oil, gas and mineral resources, national population growth, and the degradation of soil resources in the highlands, immigration into the Amazon will continue to increase. Resultant increases in population will lead to urban expansion and the emergence of new settlements, which in turn will spur encroachment into indigenous territories, increases in hunting and fishing pressure, contamination, and deforestation, amongst other consequences.

Undervaluation of Tropical Forests and Biodiversity - Because the full economic value of tropical forests and biodiversity has yet to be captured in the economy, conservation or sustainable use cannot compete with conventional deforestation-based land uses such as oil palm cultivation. The full value of forests and biodiversity can be captured through more holistic economic valuation approaches that incorporate a broad spectrum of the environmental goods and services provided by forest ecosystems. On the other hand, the full costs of the environmental externalities of conventional land-uses such as the destruction of key habitat areas, contamination and loss of biodiversity need to feature in economic analyses of projects that entail negative impacts on forests and biodiversity.

Climate Change - Climate change will lead to ecological changes that are predictable in general terms but unpredictable at the local level and over short time frames. While it is important to continue to support global mitigation efforts, some degree of climate change is now regarded as inevitable and Peru has little option but to adapt to these predicted changes.

ADDRESSING THE ROOT CAUSES OF TROPICAL FOREST AND BIODIVERSITY LOSS

The assessment proposes a number of program areas or intervention activities for each of the root causes. These are summarized in the table below.

Root Cause	Program Area/Sub-IR	Activities
Weak Environmental Governance	Strengthen Environmental Governance	• Improve knowledge for environmental management • Help selected regional governments meet environmental governance mandates • Support the consolidation of Peru's evolving institutional framework for the environment • Establish a regional Amazon Basin collaborative research program • Consolidate governance and management of indigenous territories • Assist Peru in establishing a civil service law
Infrastructure	Mitigate the environmental impacts of infrastructure on biodiversity and tropical forests	• Conduct a strategic environmental impact assessment of the Amazon Basin • Enhance the capacity of the National Service for Environmental Certification (SENACE)
Migration and Population Growth	Mitigate the impact of migration and population growth on biodiversity and tropical forests	• Support planning and environmental management efforts of regional and municipal governments in the Amazon Basin. • Raise the awareness of urban populations about their ecological footprint. • Improve the ecological and economic performance of small-scale agricultural production systems in the highlands and buffer zones.
Undervaluing of Tropical Forests and Biodiversity	Capturing the full value of tropical forest ecosystems	• Quantify and demonstrate the economic value of tropical forest ecosystems. • Capture the full value of tropical forests by reframing them as a generator of multiple services and goods.
Climate Change	Take steps to adapt SINANPE to climate change	• Conduct a vulnerability analysis of Peru's SINANPE • Integrate conservation and climate adaptation planning • Reduce anthropogenic pressures on protected areas

OPPORTUNITIES FOR ADJUSTING OR EXPANDING USAID/PERU'S CURRENT PROGRAM TO ADDRESS THREATS TO TROPICAL FORESTS AND BIODIVERSITY

The table below outlines activities and adjustments that USAID/Peru can make within the constraints of its current strategy. The list is not exhaustive.

Development Objective	Intermediate Result	Recommended Activities	Root Cause of Tropical Forest and Biodiversity Loss (Rationale)
• **DO1:** Alternatives to illicit coca cultivation increased in targeted regions	• **IR1.1:** Value chain for licit crops strengthened	• Evaluate the commercial potential of selected non-timber forest products (NTFPs) in areas affected by illicit coca cultivation. • Begin to diversify from a focus on single commodity crops (e.g. cacao, coffee) to an integrated approach that enhances the resilience and profitability of small-scale production systems, preferably in buffer zones. Apply permaculture principles. • Assess the potential for REDD+ projects in areas affected by illicit coca cultivation. • Support the development of PES schemes centered on forest ecosystem services, such as regulation of hydrological cycles, water provision and quality, sediment retention, and carbon sequestration.	• **Migration and population growth** (to reduce motives for migration by augmenting income opportunities).
• **DO2:** Management and quality of public service improved in the Amazon Basin	• **IR2.1:** Improved government capacity to provide quality public service	• Help CIAM member governments clarify regional environmental mandates. • Explore the possibility of helping Peru develop a civil service law.	• **Weak environmental governance** (mandates between governmental tiers are unclear, causing overlap and conflict; lack of civil service law undermines morale/performance and fosters rapid turnover).
	• **IR2.2:** Increased citizen engagement in decision-making and oversight	• Support citizen participation (e.g. workshops, assemblies) in the elaboration of Economic and Ecological Zoning plans (ZEE's) for CIAM regions, with an emphasis on indigenous groups.	• **Weak environmental governance** (ZEE elaboration acts as tool to enhance citizen engagement in public service sector).

Development Objective	Intermediate Result	Recommended Activities	Root Cause of Tropical Forest and Biodiversity Loss (Rationale)
• **DO3:** Natural resources sustainably managed in the Amazon Basin and glacier highlands	• **IR3.1** Capacity for environmental governance and natural resource management (NRM) improved.	• Strengthen the capacity of newly-established regional environmental authorities (REA) and analogues in the CIAM region. • Help Loreto to establish a regional environmental authority (or analogue). Help Madre de Dios and Ucayali regional environmental authorities to begin operating. • Provide support to the Ucayali and Loreto regions for the elaboration of each region's ZEE. Work with the IIAP. • Support Loreto region's strategic environmental assessment (SEA) process. • Introduce regional governments to concepts and methods for incorporating climate adaptation into regional planning.	• **Weak environmental governance** (REAs are key strategy partners; ZEEs provides a framework for improved environmental management).
	• **IR3.2:** Environmentally-sustainable livelihoods expanded	• Identify the commercial potential of non-conventional forest products (forest fruits, oils, fibers, and products with medicinal properties) and tourism in selected CIAM regions. • Assess the potential for REDD+ projects in indigenous territories and degraded areas.	• **Undervaluing of tropical forests and biodiversity** (Capturing the full economic value of forests acts as counterweight to non-sustainable uses).

1 INTRODUCTION

A sound environment is a necessary condition for sustainable development. This inherent relationship is codified in the U.S. Foreign Assistance Act (FAA) and USAID directives on biodiversity and tropical forests. Sections 118(e) and 119(d) of the FAA of 1961 direct USAID to conduct a country-specific analysis of the status of biodiversity and tropical forests, and if practical, to integrate actions that mitigate threats to these resources within the "country development strategy statement or other country plan prepared by the Agency for International Development"

The FAA legal requirement is reflected in USAID internal operating procedures. Section 201.3.4.1 (c) of the USAID Automated Directives System (ADS) states that analyses of biodiversity and tropical forests are "required by Sections 118(e) and 119(d) of the FAA of 1961, as amended, and may not be waived, modified, or eliminated." The ADS refers to these analyses as "118/119 biodiversity and tropical forest assessments" and specifies their completion "prior to initiating work on developing the joint country assistance strategy or USAID country strategic plan so that their findings will appropriately inform strategic decisions and priorities." The 118/119 Assessments are therefore integral components of USAID's Country Development Cooperation Strategies (CDCS), meant to guide development programming at a strategic level. It is in the context of these regulatory and procedural requirements that USAID/Peru commissioned this biodiversity and tropical forest conservation assessment.

1.1 PURPOSE AND OBJECTIVES

The purpose of this 118/119 assessment is to provide USAID/Peru with information and insights based on analyses that inform strategic decisions and priority-setting. Given that USAID/Peru's current strategy is well into its implementation phase, this report may be best leveraged as the mission considers adjustments to its current program and initiates design of the next five-year strategy. In keeping with the precepts of the FAA as outlined above, specific objectives are:

1. Assess the current state and trends of tropical forests and biodiversity in Peru.
2. Identify root cause(s) and proximate cause(s) for the current state of biodiversity and tropical forests in Peru.
3. Provide recommendations to USAID/Peru regarding strategic support of Peruvian efforts to advance biodiversity and tropical forest conservation in the country.

1.2 METHODS

Desk-top Review, Planning and Preparation – The team conducted a preliminary desk-top review in November and December 2013 in tandem with consultations from USAID/Peru. During this period, the team also made arrangements for the in-country assessment phase.

In-country Consultations and Field Visits – Between January 13th and 26th, 2014 the team conducted 32 semi-structured interviews with experts and authorities from central and regional government institutions, academia, national and international non-governmental organizations (NGOs), and the private sector (Annex 1). Visits to municipal markets in Iquitos, Pucallpa and Puerto Maldonado provided further insights into the local uses and markets for forest products, as well as the views of vendors of forest products. Brief excursions to illegal mining and logging sites allowed the team to observe first-hand the impacts of these practices.

Report Write-up, Review and Finalization – The first draft of this report was submitted on March 3rd, 2014 and reviewed by USAID/Peru and the USAID/Latin America & Caribbean (LAC) Bureau Environmental Officer (BEO). The final report incorporating comments and suggestions was submitted on June 4th, 2014.

1.3 SCOPE AND LIMITATIONS

USAID/Peru prepared its last FAA 118/119 report in 2007. The current assessment updates the 2007 report, and examines the status of biodiversity and tropical forests from a broader range of perspectives in light of the profound institutional, economic and social changes that Peru has undergone over the past six years.

Peru's size and high biodiversity generates a wide range of environmental issues. While in Peru, the team focused mainly on tropical forest ecosystems. It did not visit desert landscapes, high mountain ecosystems or the dry woodland regions that are also part of the Chocó-Tumbes-Magdalena hotspot. Conceptually, the focus was on key issues affecting tropical forests and biodiversity in Peru: illegal and informal mining, illegal logging, land-use change and over-use, and the rapid expansion of Peru's infrastructure. Given Peru's reliance on inland fisheries and the fact that it harbors the greatest number of freshwater fish species in the world, a solid understanding of threats to Peru's freshwater biodiversity was also prioritized. A succinct review of coastal zones and marine resources is included, based on secondary sources. Relevant literature on these subjects is limited for Peru; as such, the perspectives put forth in this document rely heavily on the team's interview findings.

In general, interviewees agreed on the main issues affecting tropical forests and biodiversity conservation in Peru. Most differences of opinion were confined to the relative importance of the different issues at hand, and the types of solutions advocated.

2 COUNTRY PROFILE

2.1 LOCATION AND ADMINISTRATIVE SUBDIVISIONS

Peru is located on the western coast of South America, delimited to the west by the Pacific Ocean, to the northwest by Ecuador, to the north by Colombia, to the east by Brazil and Bolivia, and to the south by Chile. Its territory occupies 1,285,216 square kilometers (km^2) and extends for 2,090 kilometers (km) from north to south, measuring 1,230 km at its widest point and 110 km at its narrowest point (FAO, 2013). In total, Peru has 991,195 km^2 of territorial waters.[1]

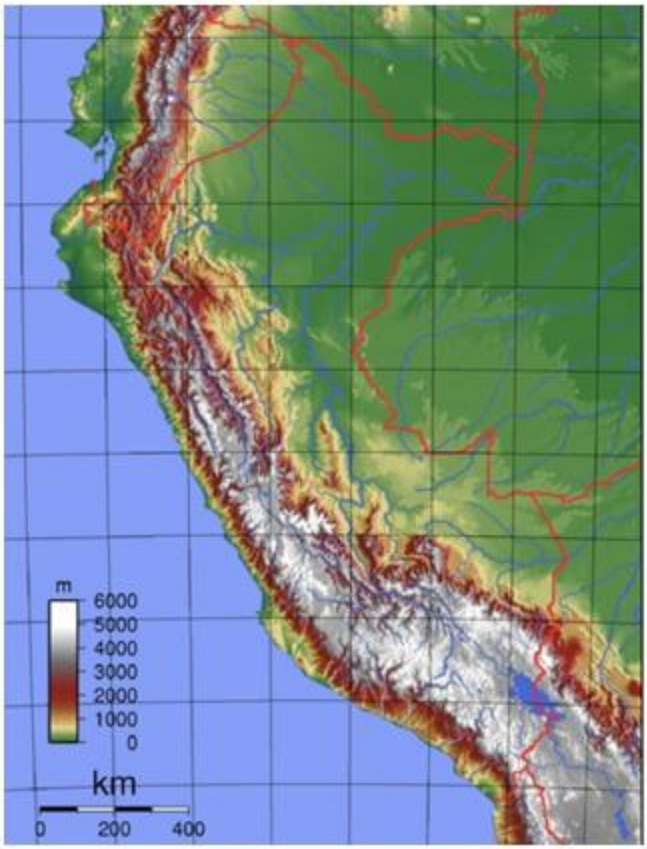
The country is divided into 25 first-level administrative units, consisting of 24 geographic regions and the autonomous Province of Callao. Regions are further subdivided into 196 provinces, which are in turn composed of 1,845 districts in total (INEI, 2014b).

[1] A recent International Court of Justice decision in favor or Peru implies an increase in the size of the country's territorial waters claim.

2.2 PHYSIOGRAPHIC PROVINCES

Peru may be subdivided into three physiographic provinces, each markedly different in soils, climate, topography (see Map 1[2]) and hydrology. These are: Coast, Andes Mountains, and Amazon Basin.

MAP 1: Topography of Peru



Source: Sadalmelik, 2007

The Coast region stretches from the northern border with Ecuador to the southern border with Chile. Topographically, this region is bounded on the east by the foothills of the Andes and comprises an area of 15,087,282 hectares (ha), 11.7 percent of Peru's land total (INEI, 2013). It ranges in altitude from sea level to 500 meters above sea level (masl) (IGNP, 1987) and in width from 65 km to160 km across (MoDef, 2014, Map 1).

The Andes Mountains run the entire length of Peru, covering approximately 28 percent of its land area (INEI, 2013; MoDef, 2014). The Andes region is 400 km wide in the south of the country, including an extensive high-altitude plateau near the Bolivian border, and becomes narrower in northern regions (MoDef, 2015). It includes three primary cordilleras (western, central, and eastern) that range in altitude from 500 to 6,700 masl (MoDef, 2014). This range encompasses mountain valleys, deeply-incised canyons, and glaciated landscapes with snow-covered peaks, cirque lakes, and glacial moraines. Due to orographic lift, an extended rainy season occurs between October and April. The highest peak in Peru, Mount Huascaran (6,768 m) is located in this region. The Andes' diverse geomorphology, altitudinal range and climate variability give rise to a suite of unique ecosystems.

The Amazon Basin extends from the eastern flanks of the Andes to a vast alluvial plain blanketed in forest. It ranges in altitude from 400 to 1,000 masl (MoDef, 2014). Sixty percent of Peru's territory is comprised by the Amazon Basin, which covers an area of 77,535,384 ha and is the largest physiogeographical region in the country (INEI, 2013). Thirteen percent of Peru's total population resides here, of which approximately twenty-seven percent resides in nine predominant urban centers populated by 20,000 or more (INEI, 2008).

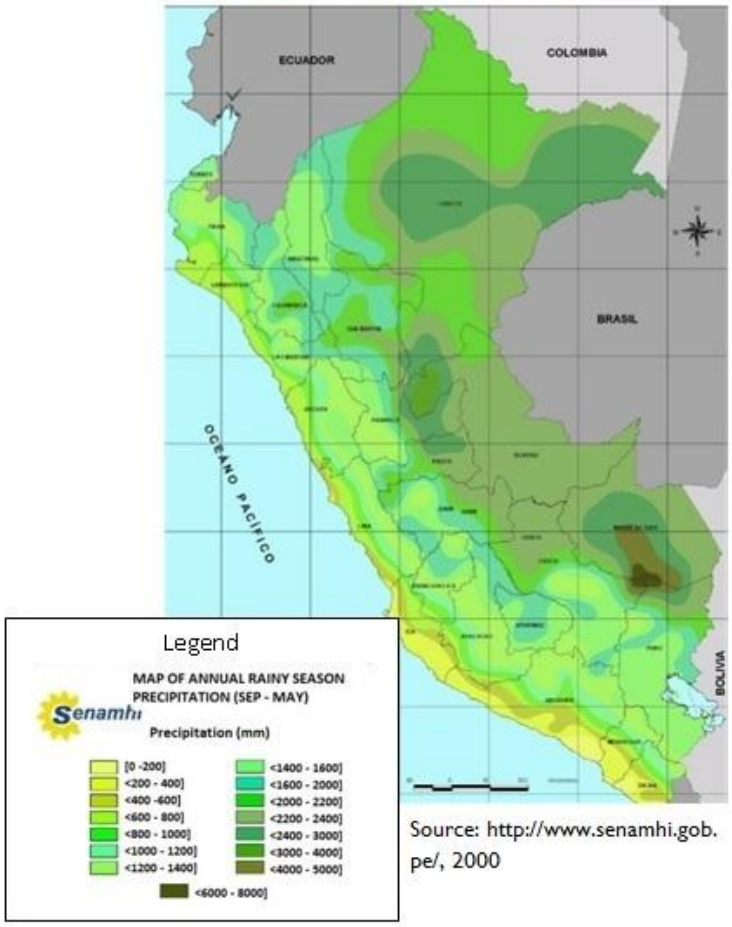
[2] A full-page rendition of each map is presented in Annex D.

2.3 CLIMATE

Of the 32 types of climates on earth defined by Thornthwaite's Climate Classification, 27 are found in Peru (SENAMHI, 2008). The influence of the Andes, the Humboldt Current and the South Pacific High (a subtropical anticyclone) combine with dramatic variations in topography to create distinct climatic conditions throughout the country (FAO, 2000). This climatic diversity plays a fundamental role in Peru's high biodiversity.

Temperatures and rainfall vary greatly throughout the country (Tables 1, 2, 3). The coastal region is dry, with an average annual temperature of 21.5° Celsius (°C) and annual rainfall of 74.2 millimeters (mm; Table 1). The majority of the coastal region receives significantly less rainfall, with the exception of Tumbes, Piura, and Lambayeque regions. To illustrate: the departments of Lima and Ica receive just 7.7 and 19.2 mm of annual precipitation, respectively. Despite this minimal rainfall, the dry coastal regions get enough moisture from fog to sustain some plant growth and animal life (FAO, 2000).

MAP 2: Rainfall Distribution in Peru



Source: http://www.senamhi.gob.pe/, 2000

TABLE 1: Average Annual Rainfall in Peru by Region, 2009-2012

Region	2009 (mm)	2010 (mm)	2011 (mm)	2012 (mm)
Coast	55.9	75.7	30.4	74.2
Sierra	775.6	667.7	834.3	809.0
Amazon Basin	1,747.4	1,156.0	1,586.6	1,571.4

Source: *Servicio Nacional de Meteorología e Hidrología del Perú* (SENAMHI). (2008). *Clima: Datos Históricos.* Retrieved January 2014 from http://www.senamhi.gob.pe/?p=0200.

In the Andes, the average annual temperature is 12.4°C. This figure, however, conveys little of the extreme spatial and temporal temperature variability. While seasonal temperature variation is limited, daily temperature variations are extreme, as indicated by a range of 22°C (FAO, 2000). In the higher altitudes, temperatures drop well below 0°C (WMO, n.d.).

The average annual precipitation in the Andes ranges from 668 mm to 834 mm (Table 1). This figure masks pronounced spatial variations in rainfall, with some areas in actuality receiving over 3,000 mm of

precipitation per year (Map 2). Generally speaking, the northern and eastern Andes tend to be the wettest regions. Annual precipitation displays pronounced seasonality, with a peak rainy season between January and March and a peak dry season between May and August (FAO, 2000). During the dry season, frost, hail and below-freezing temperatures make agriculture a high-risk activity.

TABLE 2: Average Annual Temperature in Peru by Region, 2009-2012

Region	2009 (°C)	2010 (°C)	2011 (°C)	2012 (°C)
Coast	21.4	20.9	21.1	21.5
Sierra	13.0	13.2	12.4	12.4
Amazon Basin	22.9	22.7	22.7	22.8

Source: *Servicio Nacional de Meteorología e Hidrología del Perú* (SENAMHI). (2008). *Clima: Datos Históricos.* Retrieved January 2014 from http://www.senamhi.gob.pe/?p=0200.

The Amazon Basin has a warm and humid tropical climate averaging 22.8°C with very little seasonal temperature variation (Table 2). Daily temperatures range from 5°C to 8°C, exceeding seasonal variations in temperature (from 1-2°C) (*Perú Ecológico*, n.d.). This region experiences rainfall throughout the year, with an average annual precipitation of 1,571 mm (Table 1). Some areas receive over 4,000 mm annually (Map 2).

The Peruvian Amazon may be sub-divided in two regions characterized by different morphological, biological and climatic conditions: 1) the upper Amazon, with altitudes ranging from 500 to 3,500 masl and 2) the lower Amazon, with altitudes under 500 masl (Rodriguez-Achung, 1990). Seasonal floods are vital for the reproduction of animals, seed dispersal, and faunal reproductive cycles, particularly in the lower Amazon. In Iquitos and Pucallpa, flooding normally occurs in December and March, while in Puerto Maldonado, December and January are typical (FAO, 2000).

TABLE 3: Annual Temperature Ranges & Precipitation for Important Peruvian Cities by Region, 2013

Region: City	Annual Temperature Range (°C)	Annual Precipitation (mm)	Dry Season	Rainy Season
Coast				
Lima (desert area)	24.6 – 26.5	80	May – Aug. & Oct. – Feb.	Mar. & Sep.
Piura (equatorial dry forest)	15.4 – 34.5	50	May – Dec.	Mar.
Sierra				
Cusco	0.3 – 20.9	640	May – Aug.	Mar. & Sep.
Cajamarca	3.1 – 22.0	730	Jun. – Jul.	Oct. – Apr.
Amazon Basin				
Iquitos (north)	20.8 – 31.7	2,900	None	Mar. & Dec.
Puerto Maldonado (south)	16 – 33.0	1,350	Aug.	Oct. – Mar.

Source: World Meteorological Organization (WMO). *World Weather Information Service - Peru.* Retrieved January 2014 from http://worldweather.wmo.int/029/m029.htm

El Niño is a band of warm ocean water temperatures that periodically develops off the Pacific coast of South America and has significant climate impacts on Peru. Primary effects are dramatic alterations in

the temperature and rainfall regime of the coast, as well as the western slopes of the Andes region (FAO, 2000). El Niño is cyclical, occurring once approximately every seven years. Effects can be devastating, such as the torrential rains and flooding that destroyed an estimated 205,000 ha of potato, corn, and rice crops in 1997-1998 (FAO, 2000).

2.4 HYDROGRAPHY AND HYDROLOGY

Peru has a total of 159 river basins that can be grouped into three hydrographic regions: 1) Pacific; 2) Amazon; and 3) Titicaca (Map 3). Basic parameters for each of these hydrographic regions are summarized in Table 4.

MAP 3: Hydrographic Regions of Peru

Source: Autoridad Nacional del Agua-ANA; Ministerio del Ambiente de Peru, 2003

The FAO (2000) estimates the total annual volume of rainfall in Peru to be 2,233 km^3, of which 1,616 km^3 are estimated to be renewable internal water resources. However, 98.2 percent of the nation's freshwater resources are available in the watershed of the eastern Andes and Amazon region, while only 1.8 percent is available in the coastal region, which accounts for 21.8 percent of the national territory (*Comisión Técnica Multisectorial*, 2009).

Freshwater resources in this region are derived from rivers that originate on the western slopes of the Andes and cut across the coastal region, creating a landscape of coastal valleys separated by deserts (*Comisión Técnica Multisectorial*, 2009). This complex of rivers draining into the Pacific is collectively referred to as the Pacific Basin. The rapid loss of Peru's glaciers—15 percent from 1987 to 2007 in the Cordillera Blanca (Zambrano-Barragán, 2007)—is a serious threat to Peru's coastal irrigation schemes, cities, and electricity supply. Water deficits are already common in the watersheds that drain into the Pacific, including the region's four major rivers: Lambayeque, Tumbes, Rimac and Jequetepeque (MINAGRI, 2014). These rivers are intensely utilized by irrigation schemes and urban centers. The Amazon basin stands in stark contrast to this pattern, with 98 percent of the country's freshwater resources and very low population densities that demand little water.

TABLE 4: Selected Parameters of Hydrographic Regions of Peru

Hydro-graphic Region	Surface Area (km^2)	Water Use by Sector, 2000-2001 (Million Cubic Meters)					Water Available (mm3)	Percentage of Total Water Consumption
		Domestic	Agriculture	Industry	Mining	Total		
Pacific	279,689	2,086	14,051	1,103	302	17,542	37,363	87%
		12%	80%	6%	2%			
Amazon	956,751	345	1,946	49	97	2,437	1,998,752	12.1%
		14%	80%	2%	4%			
Titicaca	48,775	27	61	3	2	93	10,172	0.5%
		30%	66%	3%	3%			
Total	**1,285,251**							

Source: *Comisión Técnica Multisectorial* (2009). *Política y Estrategia Nacional de Recursos Hídricos del Perú, 2009*. Autoridad Nacional del Agua, Ministerio de Agricultura del Perú, Lima. 85 pp.)

2.4.1 LAKES, WETLANDS, AND GLACIERS

Lakes

Peru has 12,201 lakes, of which 7,441 (61 percent) are found in the Amazon hydrographic region, 3,896 (32 percent) in the Pacific hydrographic region, and 841 (7 percent) in the Titicaca hydrographic region (ONERN, 1980). Lake Titicaca is the largest lake in South America with a surface area of 8,300 km^2 (UNESCO, 2005). Its water level fluctuates seasonally by approximately 2.5 meters, rising with the rains between December and March and dropping during the dry season (UNESCO, 2005).

Wetlands

Wetlands are important sources of potable water, food, medicine, and ecosystem services. For example, they help control erosion and floods, protect against storms, provide critical habitat for bird and fish species, and retain nutrients, sediment and contaminants. Peru's wetlands, totaling 6,582,170 ha of land cover, can be subdivided into four wetland ecosystem types: 1) *Mauritia* palm swamps, 2) mangroves, 3) *bofedales* (Andean wetlands), and 4) coastal marshes and lagoons (SERNANP, 2013). *Mauritia* palm swamps, with an area of 6,063,551 ha, account for the greatest proportion of Peru's wetlands. The majority of this wetland type is found within the Loreto Department, with smaller patches in the departments of Ucayali and Madre de Dios (*Ministerio del Ambiente del Perú*, 2010). The second most extensive wetland type is that of the bofedales with 509,381 ha, occurring in the Andes hydrographic region from the department of Puno northwestward to Huánuco. As Peru's other two dominant wetland types, mangroves and coastal marshes and lagoons occupy small extensions, with an area of less than 10,000 ha combined. Coastal wetlands are found along the entire coast from Tacna to Tumbes, while mangroves are concentrated in the northern reaches of Tumbes (*Ministerio del Ambiente del Perú*, 2010).

Tropical Glaciers

The Peruvian Andes house the most tropical glaciers in the world and account for 71 percent of the tropical glaciers found in the Central Andes. Approximately 85 percent of the Peruvian population depends on glacier-fed rivers, lakes and wetlands for water (Gil Mora, 2012), as illustrated by the fact that these are the principal water source for large Peruvian cities such as Lima and Trujillo *(Comisión Técnica Multisectoral*, 2009).

The glaciers in Peru are essential in buffering against pronounced shifts in seasonal precipitation and ensuring that water is available for domestic, agricultural, and industrial needs during the dry season (IDB, 2013).Glacial melt is also crucial for the maintenance of ecological processes (and thus ecosystem services) due to its role in the provision of water during the dry season via all Andean rivers, most

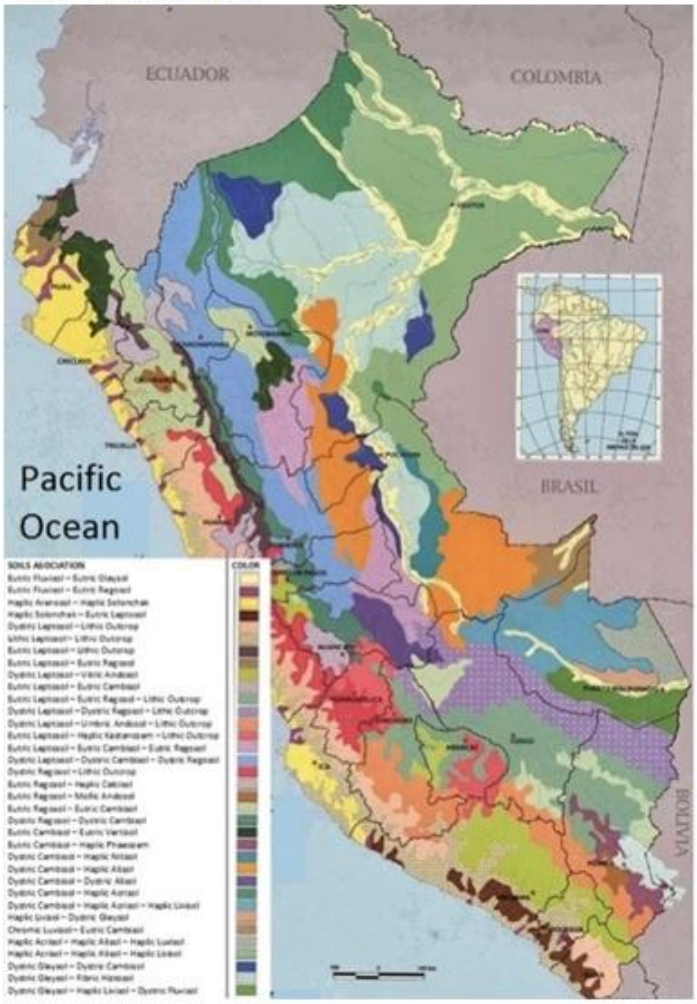
coastal rivers, and some Amazonian rivers. For example, 30 percent to 45 percent of the Santa River's water comes from Cordillera Blanca glacier melt in dry season months (IDB, 2013a).

For decades, climate change has been driving the recession of Peru's glaciers (*Comisión Técnica Multisectoral,* 2009). During a 30-year period, the surface area and volume of glaciers in all 18 primary ranges of the Peruvian Andes have declined more than 20 percent (Chevallier et al., 2011). In addition, a study done in the Cordillera Blanca concluded that the glacier area has retracted more than 15 percent in 25 years (Silverio & Jaquet, 2005).

2.5 SOILS

Peru harbors a great variety of soil types, largely as a result of its complex topography and climatic diversity (Map 4). While a thorough discussion of Peru's soil types is beyond the scope of this document, the following observations are important based on their relevance to biodiversity and tropical forest conservation:

MAP 4: Soils of Peru



Source: INRENA, n.d.

1. Peru is dominated by soils that generally do not facilitate conventional large-scale agriculture. Specific soil limitations are:

- Along the coast: aridity, coarse soil textures (Arenosols[3]), topography, soil depth (Lithosols), and salinity (Solonetz, Solonchaks);
- In high altitude ecozones (e.g. Puna and Paramo): low temperatures, topography, soil depth (Lithosols), and a pronounced dry season;
- In high forest zones (e.g. Yungas): topography and soil depth (Lithosols);
- In low-lying Amazon forest regions: soil fertility (Acrisols, Podzols) and drainage (Gleysols).

2. Peru's most productive agricultural soils are Fluvisols, located along rivers and streams that cross the dry coastal zone, consequently receiving glacial melt. Significant areas of irrigated soils along coastal rivers are now experiencing the effects of soil salinity. Salinization is a formidable problem because it decreases the osmotic potential of the soil and reduces the ability of plants to absorb water from the soil.

[3]In Peru, soil information is presented according to different classification schemes. Herein, FAO's "Soil Legend" is used.

In 2005, two-thirds of Peru's agricultural Gross Domestic Product (GDP) and 10 percent of all exports came from irrigated coastal zones (The World Bank, 2013). Peru's primary crops, such as rice, are dependent upon water originating in the Andes Mountains. The most important of these rice-producing areas are Lambayeque and Piura in the north and Arequipa in the south (Nolte & Beillard, 2014). Due to irrigation difficulties, a government campaign has been encouraging rice producers to move cultivation to the eastern slopes of the Andes. This initiative has been successful in the San Martin region but has failed to affect the northern coast.

3. Pockets of fertile soils (Kastanozems, Phaozems, Calcisols, Eutric Cambisols, and Nitosols) occur in high altitude valleys (2,000 to 4,000 masl). These soils have been used for thousands of years for small-scale, diversified agriculture; however, climate change and soil degradation are now impacting their productivity (Kauffman and Valencia Ramos, 1998). It is likely that together, soil degradation and climate change are the causal factors driving relocation trends to low-lying areas where illegal mining and irrigated agriculture are the norm.

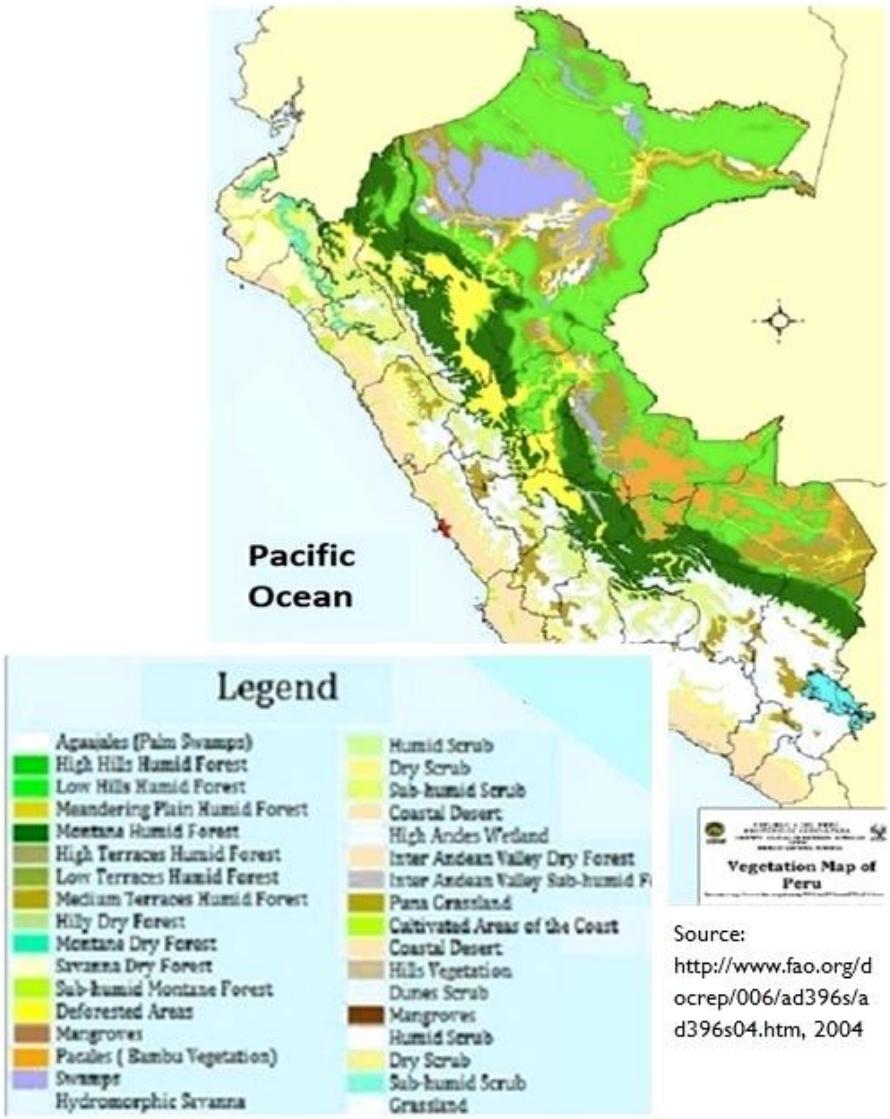
4. Besides fertile alluvial soils in coastal valleys that are often farmed using irrigation systems, the only areas with appropriate topographic conditions for large-scale mechanized agriculture are located in the Amazon region. Low soil fertility (Acrisols, Lixisols) and poor soil drainage (Gleysols) limit the Amazon's potential for annual crops. Large areas are however suitable for oil palm, a perennial crop that thrives in well-watered regions but requires the implementation of massive surface drainage systems in flood-prone areas (Gleysols).

In summary, Peru's soils, topography and climate combine to limit the country's agricultural potential. Unsustainable practices in past decades have further compromised this potential, for both annual and perennial small or large crops. This scenario explains part of why freshwater fish are the most important source of protein for the country's population and a crucial element of household strategies for food security.

2.6 VEGETATION

Peru's vegetation can be classified into three main climate-based distribution zones: 1) Arid & Semiarid Zone; 2) Sub-humid Zone; 3) Humid Zone. Map 5 and Table 5 show distribution of different categories of vegetation cover within each. Because vegetation innately integrates the effect of soils, climate, topography, and geology, the boundaries of vegetation zones and Ecoregions tend to overlap. This complementarity can be appreciated by comparing the Vegetation data presented here (Map 5, Table 5) to that of the Ecoregions (Map 6, Table 6).

MAP 5: Vegetation of Peru



Source: http://www.fao.org/docrep/006/ad396s/ad396s04.htm, 2004

Coastal desert vegetation covers approximately 10 percent of Peru's land area. This sparse vegetation cover consists primarily of slow-growing, drought-resistant scrub species interspersed with a mosaic of alluvial soils on the flood plains that house most of Peru's irrigated agriculture.

In the highland steppes and high Andes, vegetation is comprised by species adapted to the region's cold and arid or semi-arid conditions. Vegetation classes typical of these areas include dry montane forests and sub-humid scrub. Of the sub-humid high altitude zones, "*Puna*" grasslands cover the largest total surface area, accounting for 15.34 percent of Peru's total vegetation cover.

The humid zones, comprised by the Amazon and Yungas regions, cover the largest area of the country and encompass the greatest vegetation diversity due to abundant rainfall, landscape variations, warm temperatures, and pronounced ecosystem dynamics such as seasonal floods. The humid forests in the Amazon's lower altitudes account for approximately 22 percent of Peru's total vegetation cover, while

the montane humid forests typical of Yungas region account for approximately 14 percent of the national territory.

TABLE 5: Vegetation Cover in Peru

Vegetation Type	Area	
	Hectares	Percentage of Total
Arid & Semi-arid Zones		
Forests, Scrub, and Mangroves		
Savanna dry forest	2,430,700	1.89
Hilly dry forest	151,400	0.12
Montane dry forest	1,052,400	0.82
Inter-Andean valley dry forest	310,600	0.24
Dry scrub	2,802,600	2.18
Dunes scrub	136,000	0.11
Hills vegetation	191,600	0.15
Mangroves	4,550	0.01
Sub-humid Zones		
Forests and Scrub		
Sub-humid montane forest	22,500	0.02
Inter-Andean valley sub-humid forest	384,500	0.30
Sub-humid scrub	3,737,800	2.91
Humid Zones		
Forests		
Meandering plain humid forest	3,690,200	2.87
Low terraces humid forest	1,754,900	1.37
Medium terraces humid forest	4,567,200	3.55
High terraces humid forest	1,297,700	1.01
Low hills humid forest	28,558,200	22.22
High hills humid forest	1,851,500	1.44
Montane humid forest	15,051,763	11.71
Swamps, Aguajales, Other		
Swamps	5,043,400	3.92
Aguajales (*Mauritia flexuosa* palm swamps)	1,415,100	1.10
Hydromorphic savanna	7,800	0.01
Pacales (predominance of *Bambu spp*. vegetation)	3,997,800	3.11
Scrub and Grasses (High Andes)		
Humid scrub	4,077,700	3.17
Grassland	19,711,400	15.34
Puna grassland	2,424,900	1.89
High Andes wetland	91,700	0.07
Queñoales (*Polylepis tarapacana* trees forest)	93,700	0.07
Other Vegetation Types		
Deforested areas	6,948,237	5.41
Cultivated areas of the coast	942,500	0.73
Coastal desert	12,857,500	10.01
Rivers, lakes, lagoons, snow peaks, and islands	2,913,710	2.26
TOTAL	**128,521,560**	**100.00**

2.7 ECOREGIONS

Bringing together vegetation, climate, topography and soils, World Wildlife Fund proposed a classification of Peru in 2013 that recognizes 11 Ecoregions (Map 6): [4]

1. Equatorial dry forest
2. Amazon Rainforest: low-altitude rainforests
3. Pacific tropical forest
4. Coastal Pacific desert
5. Cold Sea Peruvian (Humboldt) Current
6. Tropical sea
7. Moorland (high Andean meadows, i.e. *Paramo*)
8. *Puna* Grassland (high-altitude plains, valleys, and mountains)
9. Palm savanna
10. High Jungle - Yungas (high-altitude cloud forests of the Amazon Basin)
11. Highlands steppes

Annex E summarizes some important parameters for each.

MAP 6: Ecoregions of Peru

Source: http://antonietacorrrea.blogspot.com/2011/11/ecorregiones-del-peru.html - Correa, 2012

[4] World Wildlife Fund (WWF). *Ecoregions.* Retrieved January 2014 from http://worldwildlife.org/biomes. A full-page rendition of each map is presented in Annex D.

3 THE HUMAN ENVIRONMENT

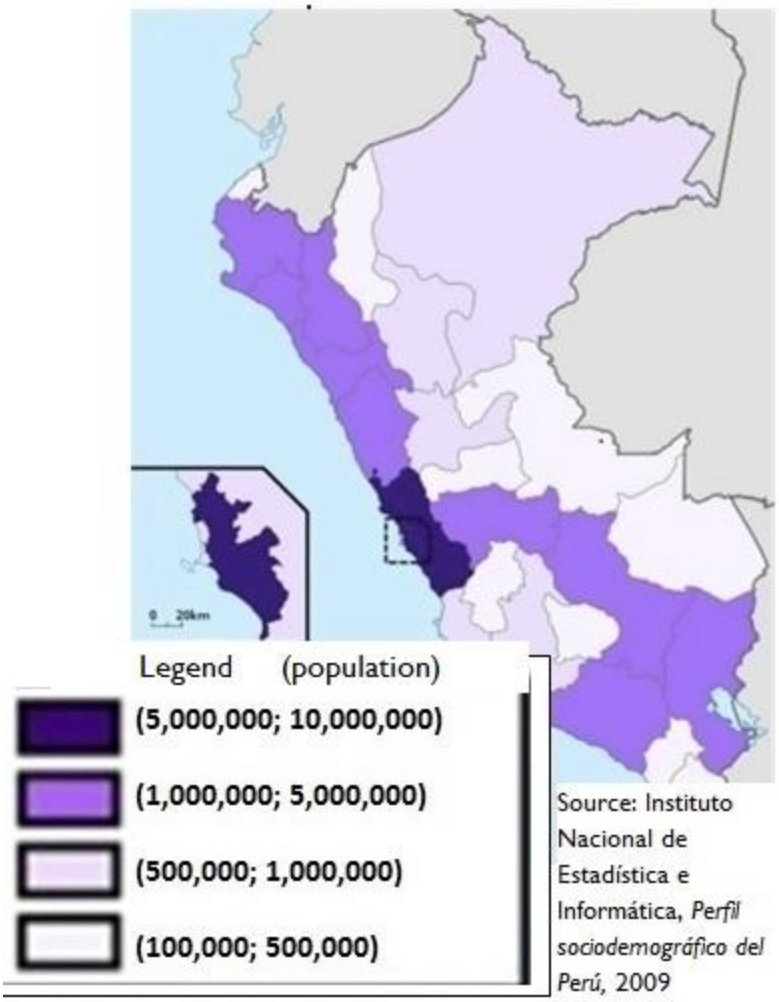
3.1 POPULATION

3.1.1 GENERAL

As of the last census, Peru's population was 28,220,764 people (INEI, 2008) and is predicted to grow to 33,079,000 people by the year 2020 (UN, 2012). The population growth rate in 2012 was 1.3 percent, representing an increase of 0.3 percent from 2008 (The World Bank, 2014).

According to the census, the coastal region houses 14,973,264 people (53.1 percent of total), the Andes house 8,770,738 (31.1 percent of total) and the Amazon houses 3,675,292 (13.0 percent of total) (INEI, 2007). Seven of the 23 departments in Peru collectively host 61.4 percent of the national population: Lima (9,541,000), Piura (1,815,000), La Libertad (1,814,000), Cajamarca (1,520,00), Puno (1,390,000), Junín (1,331,00), and Cusco (1,301,000) (INEI, 2013); Map 7). The census documented three departments with the highest annual per-capita growth rates (from 1993 to 2007): Madre de Dios (3.5 percent), Ucayali (2.2 percent), and the Lima metropolitan area (2.1 percent; [INEI, 2008]).

MAP 7: Population Distribution in Peru



Source: Instituto Nacional de Estadística e Informática, *Perfil sociodemográfico del Perú*, 2009

3.1.2 MIGRATION

Internal migration in Peru is significant, with most movement from the Andean Region to coastal cities and parts of the Amazon Basin, particularly Madre de Dios. Based on data from the last three decades, this trend appears to be slowing, albeit gradually. For the 2002-2007 period, internal migration was estimated at 4.5 percent; this rate reveals a reduction in migration from the 1988-1993 period, documented at 5.4 percent (Yamada, 2010). A major factor driving this decrease was the reversal of the intense violence that characterized the 1988-1993 period, catalyzing massive migration from five departments in the south and central Andes. Although rural to urban migration continues, it has decreased from a previous 11.3 percent (1988-1993) to 9.1 percent more recently (2002-2007; Yamada, 2010). During those same two periods, urban-to-urban migration increased from 46.3 percent to 53.5

percent, respectively (Yamada, 2010). Over 50 percent of internal migration continues to be within the coast or from the sierra and jungle regions to the coast.

The scarcity of productive lands, over-usage of land, and lack of assistance and credit were identified as causes of internal migration (Alva, 2007). Other causes mentioned by interviewed experts included the lack of income opportunities in the highlands and climate change effects. However, causes for internal migration can be very region-specific. For example, according to members of the Consorcio Madre de Dios (CMDD), migration to the department of Madre de Dios is due predominantly to the pull of gold mining.[5] For the 2002-2007 period, Madre de Dios had the highest rate of immigration at 15 percent; the runner-up was Lima with 5 percent immigration. By facilitating access to gold-mining areas, the recently constructed interoceanic highway has been a key contributing factor to migration in this region. Members of the CMDD went on to explain that, "there are economic opportunities in the Andes region, but nothing compared to the amount of money that one can make here from illegal mining." Only 10 of the 25 departments had positive net migration rates, suggesting that some present greater opportunities than others.

3.2 INDIGENOUS PEOPLES AND TERRITORIES

3.2.1 ETHNIC GROUPS AND INDIGENOUS POPULATION

According to the 2010 ethno-linguistic map of the National Institute of Development of Andean, Amazonian and Afro-peruvians (INDEPA), there are 76 ethnic groups in Peru, twenty of which have less than 500 members (INDEPA, 2010). Other reports place the number of ethnic groups in the country at between 43 and 71, and the number of spoken languages at between 43 and 67 (Solís, 2009 in: UNICEF and FUNIPROEIB Andes, 2009; Portocarrero, 2009 in: García et al., 2010). It is estimated that there are currently 15 tribes in voluntary isolation in the Peruvian Amazon (Map 8) (Survival International, 2014b). Estimates of the total indigenous population in Peru range from 13.9 percent, or 4,045,713 in 2007 (INEI-Peru, 2007 in: García et al., 2010) to 45 percent, or 13,566,571 in 2014 (CIA, 2014). According to the Economic Commission for Latin America and the Caribbean (CEPAL), in the year 2007, 4.1 percent of Peru's indigenous population was in the Amazon, 25.8 percent in the coastal region, and 70.1 percent in the highlands (CEPAL-CELADE, 2011). The lack of precision in the population figures presented here indicates that the current state of knowledge about indigenous peoples in Peru is lacking.

3.2.2 COMMUNITIES AND TERRITORIES

Legal Provisions

The government of Peru recognizes both rural communities and native communities as categories of human settlement. Rural communities refer to indigenous communities in the highlands, on the coast, and *riverside* indigenous communties in the Amazon. Native communities refer to the remaining indigenous communities in the Amazon region (Smith, 2013).

Article 88 of the Peruvian Constitution guarantees rural and native communities the right of land ownership in private or communal form, or any other form of association. Furthermore, Article 89 grants these communities legal existence and recognizes them as entities that are autonomous in their organization, communal work, and the use and free disposal of their lands. In addition, they are awarded economic and administrative autonomy within the framework established by law. The State respects the

[5] *Consorcio de Madre de Dios* staff, personal communication, January 22, 2014.

cultural identity of peasant and native communities in Peru. Law No. 29785 establishes the right of indigenous peoples to prior consultation in accordance with International Labor Organization (ILO) Convention 169 (AIDESEP, 2013a).

The Peruvian State grants community property titles only to autochthonous populations organized into rural and native communities. Article 10 of Law No. 26505 requires that "the rural and native communities should regulate their communal organization in accordance with the constitutional provisions and this Act. The ownership of land is inalienable, except in the case of abandonment."

In actual practice, however, that 60 percent of *titled* and *demarcated* indigenous communities are reported to be "ceded in use" (*cedidas en uso*), which means they can revert to the state for other uses, such as forestry (Smith, 2009, in: Servindi, 2009). This relates to article 66 of the constitution, which establishes that renewable and non-renewable natural resources are patrimony of the nation and the State is sovereign in their exploitation (transparenciaforestal.info, 2012).

With regard to indigenous communities that are not yet titled, Under Article 51(n) of Law No. 27867 (the Organic Law for Regional Governments), regional governments are the competent authority for promoting, managing, and administering land-titling processes. Given the potential variation in these processes across regions, the national government appointed the Ministry of Agriculture and Irrigation (MINAGRI) to define national objectives, priorities, guidelines, processes and standards for granting land title (*Defensoría del Pueblo*, 2013).

Native Communities

In 2012 there were 1,807 registered native communities of which 1,270 had title to their territory (see Table 6)(IBC, 2012). Loreto had the greatest number of registered communities (890) and communities with land titles (499). Legalized native communities occupy nearly 11 million ha in 2012.

TABLE 6: Titling of Native Communities in Peru

No.	Region	Total Titled Native Communities	Total Registered Native Communities Pending Title	Total Native Communities Awaiting Registration and Title	Total Surface Area (ha)
01	Amazonas	171	7	14	1,467,822.9149
02	Ayacucho	1	1	0	13.9951
03	Cajamarca	2	0	0	165,748.1200
04	Cusco	55	4	0	831,803.0408
05	Huánuco	8	5	1	85,637.9826
06	Junín	158	15	9	731,471.9216
07	Loreto	499	391	50	4,370,143.3598
08	Madre De Dios	23	5	4	380,777.7317
09	Pasco	98	25	4	442,489.2280
10	San Martín	29	34	13	216,015.3288
11	Ucayali	226	50	31	2,187,468.7282
TOTAL NACIONAL		**1,270**	**537**	**126**	**10,879,392.3515**

Source: IBC, 2012.

Additionally, ninety riverside communties in the Amazon were reported to be registered (but not titled) in 2013, with 2,400 awaiting registration and title (Smith, 2013).

While the process to formalize land tenure through legal communal title is ongoing, no communal property title to native communities has been granted since 2008 (Smith, 2013). The Interethnic Association for Development of the Peruvian Jungle (AIDESEP) estimates that as of December 2013, the number of native communities that had solicited and were awaiting official registration had increased to 310, while 594 were awaiting legal land title and another 262 had requested the expansion of their territories (Table 7)(AIDESEP, 2014d). Loreto had the greatest number of outstanding applications for official recognition and titling.

TABLE 7: Amazonian Native Communities Awaiting Formalization Processes in Peru

Department	Native Communities Awaiting Recognition	Native Communities Awaiting Formal Title	Native Communities Awaiting Expansion	Total
Amazonas	22	7	37	**66**
Ayacucho	0	5	1	**6**
Cajamarca	0	0	0	**0**
Cusco	3	5	15	**23**
Huanuco	1	6	6	**13**
Junín	12	15	27	**54**
Loreto	181	450	106	**737**
Madre De Dios	3	6	17	**26**
Pasco	9	23	16	**48**
San Martin	35	33	4	**72**
Ucayali	44	44	33	**121**
TOTAL:	**310**	**594**	**262**	**1,166**

Source: AIDESEP, 2014a.

Rural Communities

Unofficial 2010 data (*Organismo de Formalización de la Propiedad Informa*-COFOPRI, 2010 in: Castañeda & del Castillo, 2012) indicates that there are 6,069 registered rural communities, of which, 5,110 have communal title. The total area of registered communities is 23.64 million ha, which represents an increase of 66.83 percent from the 14.17 million ha., that were registered by Cenagro in 1994 (Castañeda & del Castillo, 2012). It also represents 66.82 percent of the total national agricultural area, 35.38 million ha., that was recorded by the III Cenagro (Castañeda & del Castillo, 2012).

TABLE 8: Titling of Rural Communities in Peru

No.	Region	Total Registered Communities	Total Titled Communities	Surface (ha)
01	Amazonas	52	52	691,917.6300
02	Ancash	350	331	1,708,081.7321
03	Apurimac	470	432	1,974,103.6632
04	Arequipa	104	95	1,415,774.5455
05	Ayacucho	654	477	2,806,989.4510
06	Cajamarca	104	82	347,493.0150
07	Cusco	928	796	2,676,970.6945
08	Huancavelica	592	518	1,644,205.6957
09	Huánuco	285	205	970,704.9602
10	Ica	11	4	71,478.0603

No.	Region	Total Registered Communities	Total Titled Communities	Surface (ha)
11	Junín	391	357	1,267,187.1397
12	La Libertad	120	112	469,282.3263
13	Lambayeque	28	17	444,184.2500
14	Lima	289	229	2,194,683.9926
15	Loreto	95	41	279,258.6617
16	Madre De Dios	0	0	----------
17	Moquegua	75	72	498,595.0825
18	Pasco	73	65	501,340.6097
19	Piura	136	125	921,164.4177
20	Puno	1,265	1,056	2,162,221.5505
21	San Martín	1	1	1,264.4000
22	Tacna	46	43	86,528.7300
23	Tumbes	0	0	----------
24	Ucayali	0	0	----------
TOTAL NACIONAL		**6,069**	**5,110**	**23,643,958.06**

Source: COFOPRI, 2010. in: Castañeda, P. & del Castillo, L., 2012.

The unofficial map below presents the distribution of rural and native communities in Peru, as well as the areas reserved for populations in voluntary isolation (Map 8). In total, native and rural communities (including the territorial reserves for people in voluntary isolation) cover 18.7 percent of Peru's land area (*Territorio Indígena y Gobernanza*, 2010).

Conflicts with extractive industries such as oil and gas, mining, and forestry are common and illustrate the limitations of legal protections for indigenous territories (Finer et al., 2014 and Environmental Investigation Agency, 2012). Illegal logging occurs within native communities, protected areas, and even within reserves for indigenous peoples in voluntary isolation (Fagan, 2010 Finer et al., 2014; Survival International, 2014a). Government approval of large projects and policies has taken place without appropriate informed consent as provided for in the Convention on Tribal and Indigenous Peoples (ILO Convention 169), and law enforcement capacity is weak (*Defensoría del Pueblo*, 2013; Finer et al., 2014; Vega Luna, 2013).

MAP 8: Distribution of Native and Rural Communities in Peru

Source: Smith, 2013

Indigenous Peoples, Forest Governance, and REDD+

There is debate among indigenous organizations as to the desirability of REDD+. To facilitate discussions on the topic, AIDESEP and the Confederation for Amazonian Ethnicities in Peru (CONAP) formed the REDD+ indigenous roundtable, intended to "articulate and express the interests, rights, cosmovisions and proposals of indigenous organizations in national REDD+ preparatory and implementation processes in Peru" (AIDESEP, 2013b).

The four objectives of Indigenous REDD+ are to:

1. "Ensure compliance with national and international obligations, with regards to the collective rights of indigenous peoples, including measures related to the historical debt incurred to recognize the collective territories of indigenous peoples.
2. "Adjust and make adequate the laws and policies related to the national and international obligations of Peru to indigenous peoples, including the law and regulation for prior consultation, environmental services, and the modification of forestry and wildlife law.
3. "Ensure that REDD+ policies, plans, and contracts incorporate specific cultural perspectives and respect the traditional forest management system.
4. "Take immediate measures to halt and control the speculative 'bubble' of REDD+ and carbon pirates and carbon sale initiatives that are pressuring and dividing communities in the Peruvian Amazon." (AIDESEP, 2014a)."

Building on these criteria, two of the principal conditions to secure indigenous support for REDD+ as stated in the Iquitos Declaration are the titling of indigenous territories, and formal recognition of the autonomy and rights of indigenous peoples, including prior and informed consent (AIDESEP, 2014c).

The July 2011 Forestry and Wildlife Law has important implications for REDD+ and indigenous territories overall, particularly as it affects land title and resource use rights. One of the primary concerns of indigenous groups, particularly AIDESEP, with regard to this law is that the forestry law or other legal norm should establish respect for indigenous territorial possession and recognition in accordance with ancestral and holistic management rights (tenenciaforestal.info, 2012).

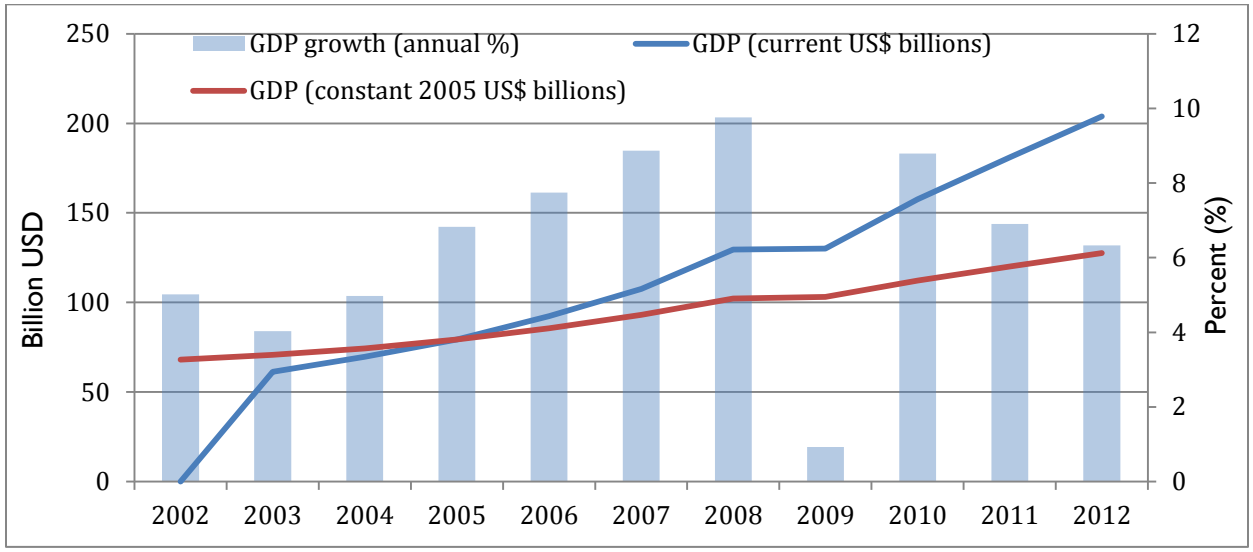
Decentralization provides for increased participation mechanisms and a dialogue between indigenous communities and local government, plus a greater opportunity for regional governments to hire indigenous professionals as government employees. Part of the budget for the Peru Forest Investment Program includes resources for promoting participation by and capacity-building for indigenous stakeholders under a recent inter-institutional cooperation agreement (between MINAM, AIDESEP and CONAP) (AIDESEP, 2014b). To date, coordination with MINAM has focused principally on collaborations for REDD+ initiatives, with a particular focus on resolving land tenure claims and developing participation mechanisms.

4 ECONOMY

Over the last five years, Peru has experienced strong economic growth, low inflation, macroeconomic stability, reduction of external debt and poverty, and significant advances in social and development indicators (The World Bank, 2013). The Peruvian economy has grown by an average of more than six percent annually since 2002. In 2012, GDP was approximately $200 billion USD (Figure 1) and per-capita income was $10,600 USD. While roughly 28 percent of the population still lived below the poverty line

in 2011, in actuality this rate represents a decrease of 23 percent from 2002 figures (CIA, 2014). Peru's poverty index is decreasing as a result of rapid economic growth combined with cash transfers and other government programs. Public debt as a share of GDP in 2012 was 19.8 percent; in response, the principal rating agencies (e.g. Standard & Poor's, Fitch, and Moody's) awarded Peru an investment-grade rating. Peru also weathered the 2008 crisis well, thanks to sound economic fundamentals and timely interventions. In 2009, economic growth was slow but positive at 0.9 percent; the next three years demonstrated an impressive recovery with growth rates of 8.8 percent, 6.9 percent and 6.6 percent in 2010, 2011, and 2012, respectively (The World Bank, 2013). During the last decade, Peru's exports have seen remarkable growth due to Free Trade Agreements (FTA) with partners such as the USA, Canada, Japan, and China. In 2012, total exports for Peru reached almost $46 billion USD (The World Bank, 2013).

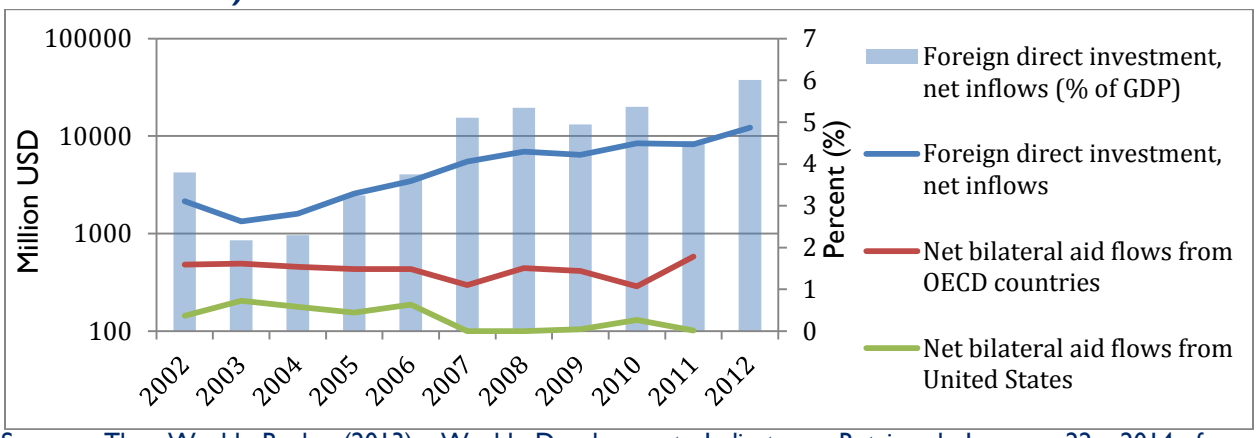
FIGURE 1: Gross Domestic Product and Percent Growth in Peru, 2002-2012.



Source: The World Bank. (2013). World Development Indicators. Retrieved January 22, 2014 from http://data.worldbank.org/

Economic growth has been driven in part by private investment, which exceeded $12 billion USD in 2012—representing almost six percent of the GDP (Figure 2). This rise in private-sector investment is occurring against a backdrop of relatively consistent bilateral aid contributions from Organization for Economic Cooperation and Development (OECD) member countries, such as those totaling approximately $580 million USD in 2011 (The World Bank, 2013).

FIGURE 2: Foreign Investment and Aid in Peru, 2002-2012 (Log-scale, Current USD in Millions)



Source: The World Bank. (2013). World Development Indicators. Retrieved January 22, 2014 from http://data.worldbank.org/

Private investment has been especially pronounced in the extractive industries (e.g., mining) that account for more than 60 percent of Peru's total exports. The most important of these commodities include copper, gold, lead, zinc, tin, iron ore, molybdenum, silver, crude petroleum and petroleum products, natural gas, coffee, asparagus and other vegetables, fruit, apparel and textiles, fishmeal, fish, chemicals, and fabricated metal products (CIA, 2014).

Since 2006, Peru has signed trade agreements with the US, the European Free Trade Association, and several other countries. In addition, Peru signed a collaborative trade pact with Chile, Colombia, and Mexico called the Pacific Alliance; this pact rivals Mercosur in combined population, GDP, and trade potential. Trade makes up roughly 50 percent of the GDP. Most of Peru's exports are destined for China (19.9 percent), and the US (15.7 percent) (CIA, 2014). This country's fast economic growth has serious implications for tropical forests and biodiversity. The following sub-sections describe economically important sectors related to the environment, along with the threats and opportunities that they present.

4.1 PRINCIPAL ECONOMIC SECTORS RELATED TO THE ENVIRONMENT

4.1.1 TOURISM/ECOTOURISM

Tourism is a major industry in Peru. In 2014, roughly 3.5 million tourists are expected to visit the country for cultural, recreational, and eco-tourism (Peru Tourism, 2014). Since 2008, tourism has earned Peru over $2 billion USD in revenue per year (INEI, 2014). In recent years, the number of visitors to protected areas has grown; in 2013, roughly 1.3 million Peruvian and foreign tourists visited the nation's protected areas from 900,000 in 2009, or 12.4 percent per year (SERNANP, as cited in ANDINA, 2014). Ecotourism and derivatives thereof (e.g. cultural, low-impact, nature-based, community-based tourism) offer one way of capturing and internalizing some of the economic value of forests and biodiversity. To illustrate: new eco-lodges and eco-tourism in the Madre de Dios region can create incentives for conservation on privately-held lands near game reserves, national parks, and indigenous territories (The Economist, 2008).

4.1.2 FISHERIES

The fisheries sector is a key component of Peru's economy, contributing to nearly two percent of the GDP. Peru is the world's top exporter of fishmeal, a staple food source used to fatten livestock from the Midwest United States to China. According to data from the National Fisheries Society (SNP), the industrial fisheries sector creates 121,000 direct and 100,000 indirect jobs (*Sociedad Nacional de Pesquería*, 2014). Marine fisheries are second only to the mining sector in terms of foreign revenues. In 2008, fisheries export earnings totaled $2.3 billion USD (*Sociedad Nacional de Pesquería*, 2014). The artisanal fisheries sector harvests an estimated 220 marine species along Peru's coast. There are some 200 artisan fishing settlements total, with recent estimates (2008) citing 721,000 tons harvested per year (*Sociedad Nacional de Pesquería*, 2014).

While data about freshwater fisheries are scant, an indication of their importance can be gleaned from data available for the Loreto Region. Annual fish captures in Loreto is estimated to be 80,000 tons. Fresh water fish is the main source of animal protein for the local population in Loreto (García, et. al., 2009). The bulk of this volume is made up of as little as 70 of the estimated 726 fish species that inhabit the Amazon region of Peru.

In Peru's lower Amazon near the border with Brazil and Colombia, commercial fishing focuses on large migratory catfish. Because the migratory habits and life history of these species are not well known, effective policies and regulations that ensure the preservation of this regional resource are elusive. For example, while it is known that large catfish migrate along the Amazon River's main channel, reproduction sites have yet to be pinpointed (IIAP, 2009). This, combined with the fact that a large proportion of landed catches contain specimens below reproductive size (IIAP, 2009), indicate that Peru's Amazon fisheries may already have surpassed sustainable extraction levels.

Although reliable data are not readily available, Peru's ornamental fisheries industry is also an important contributor to the economy, particularly the Amazon where 150 of 300 potential ornamental species are now used commercially. From 1994 to 2003, the number of specimens commercialized from the Loreto region alone oscillated from 8 million to over 16 million (Huanqui, 2005).

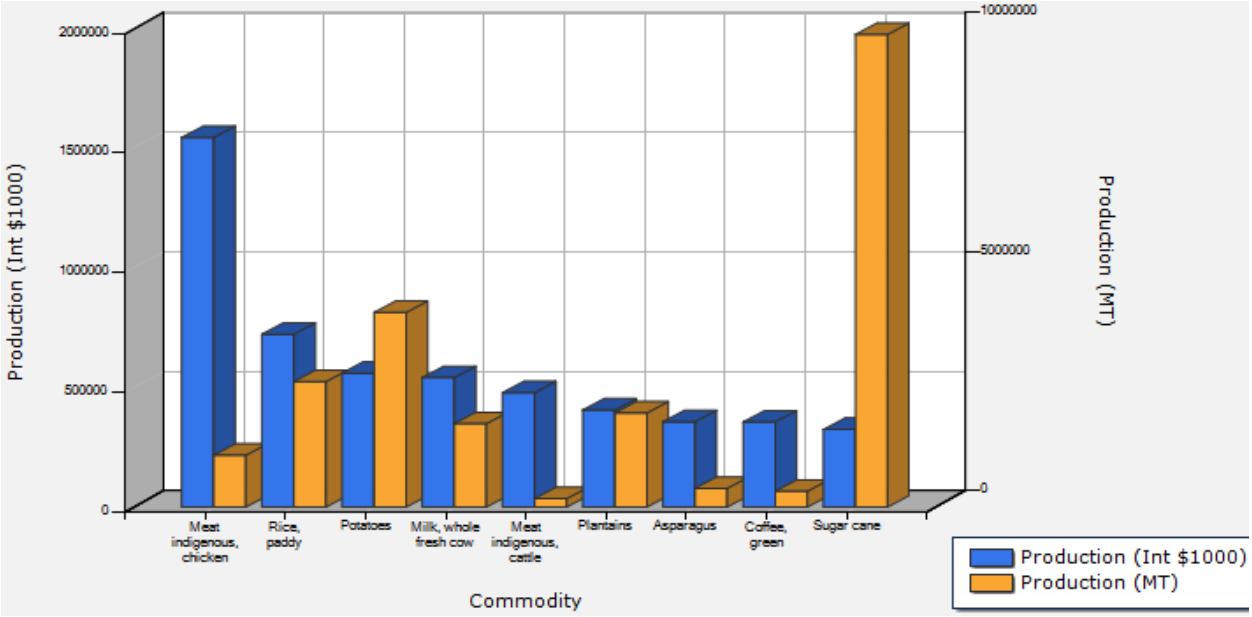
Most fishing activity in the Peruvian Andes is centered on Lake Titicaca. There are an estimated 5,400 fishermen in the Peruvian sector of Titicaca and a similar number in the Bolivian side (Global Nature Fund, 2014). As a result, fishery resources and ecosystem integrity are under extreme pressure from eutrophication, overfishing, sedimentation, and related imbalances such as excessive duckweed (*Lemma spp.*) growth (Global Nature Fund, 2014). Based on these factors, Lake Titicaca is now considered one of the most threatened lakes in the world.

The World Bank reports that predominant challenges to the successful management of Lake Titicaca are: lack of reliable data on water parameters, incomplete inventories of pollution hotspots, and outdated water resource management plans (The World Bank, 2012).

4.1.3 AGRICULTURE

From an economic value perspective, Peru's agricultural income has been dominated by meat, chicken, and rice in recent years (Figure 3). In terms of volume, however, sugar cane has been the most important crop (Figure 3).

FIGURE 3: Agricultural Commodity Production in Peru, 2011



Source: Food and Agricultural Organization (FAO). (2013). *Food and Agricultural Commodities Production.* FAOSTAT. Retrieved January 2014 from http://faostat.fao.org/site/339/default.aspx

Land used for agriculture in Peru expanded from 21.1 to 21.5 million ha from 2001 to 2011, an increase of less than two percent. Notably, this miniscule increase led to a near-doubling of crop and livestock production due to the country's focus on maximizing productivity and expanding the use of irrigation. During that same time frame, forest cover in Peru decreased from 53.9 to 53.0 percent of the total land area, a reduction equivalent to 11,800 km^2. These findings suggest that agricultural expansion is not a principal direct cause of deforestation, save for the specific case of oil palm (discussed in later sections).

4.1.4 INFRASTRUCTURE

Peru's construction industry grew at a rate of 15 percent in 2012 and was projected to continue expanding at an average rate of approximately 7 percent annually over the following five years (Business Monitor, 2013). Some of this growth in infrastructure investment is associated with the Initiative for the Regional Integration of South American Infrastructure (IIRSA). IIRSA's project portfolio up to the year 2013 encompassed an investment of $157 billion USD. Peru participates in 73 of those projects, of which 50 are within national borders and the remainder binational (21) or multinational (2). Transportation accounts for 88 percent of all IIRSA projects and 68 percent of the total investment, while energy accounts for 10 percent of projects and 32 percent of total investment. IIRSA has a profound impact on Peru's ecology, particularly in the Amazon region. New roads facilitate access and the transportation of people, arms and natural resources to and from previously intact areas. Hydropower dams disrupt the hydrological regimes of rivers, thereby altering the migratory patterns of important fish species such as the giant catfish.

Additional to IIRSA, Peru and Brazil signed the Peru-Brazil Energy Agreement in 2011. This agreement, encoded in Peruvian law (391/2011-PE), commits to supplying more than 6000 MW of power to Brazil over the next 50 years via the construction of 15 large dams in Peru, primarily on the Marañón and Ucayali rivers. Construction of the Inambari dam, one of the 15 slated, has been suspended due to irregularities in the EIA process and protests (Little, 2013).

4.1.5 MINING

According to the U.S. Geological Survey, Peru was the world's third-largest producer of copper, silver, zinc and tin; the fourth largest producer of molybdenum; the fifth largest producer of lead; and the sixth largest producer of gold in 2012 (Global Business Reports, 2013). Peru is also an important producer of phosphates, tungsten iron, and uranium (Stevenson et al., 2013). An estimated $53 billion USD is expected to flow into the country over the course of the next decade for mining initiatives, with $19.5 billion USD of those investments to be made in 2013 and 2014 (Stevenson et al., 2013).

While the environmental legacy of large-scale mining continues to be a concern, new regulations and improved corporate responsibility have helped mitigate the impact of formal mining operations on the environment. Nonetheless, mining legacy issues in Peru (e.g. runoff from tailings and retention ponds) continue to cause environmental damage, particularly in the highlands. At the other end of the spectrum, illegal mining represents a formidable and increasing threat to forests and biodiversity, particularly in the Amazon.

Informal and illegal mining[6] are responsible for the destruction[7] of 1,915 ha per year of tropical forest habitat in the Madre de Dios Region alone (Swenson et al., 2011). The global surge in gold prices of 360 percent since 2008 has catalyzed a dramatic increase in illegal gold mining in this region and throughout the country (Amazon Conservation Association, 2013). This expansion of illegal and informal mining has been associated with an exponential increase in the importation of mercury into the country—estimated at 42 percent from just 2006 to 2009 (CAMEP, 2013). Completion of the Interoceanic Highway in 2010 has facilitated the establishment of illegal and informal mining operations in Peru's Amazon; it is now estimated that roughly 70,000 miners are operating without legal permits.[8] Destructive mining methods raze trees, devastate habitat, contaminate waterways, and endanger public health. Exposure to methyl mercury can result in serious damage to the nervous system, reproductive system, and kidneys of fish, birds, and mammals (Casco Bay Estuary Partnership, 2007). Mercury can also affect the human reproductive system, inducing genetic mutations, and interfering with embryonic development (Chan et al., 2003).

[6] Illegal mining refers to mining in unauthorized areas; informal mining refers to mining in approved concessions that do not have all necessary permits and licenses.

[7] The term "destruction" is intentionally chosen over "deforestation" to illustrate that current artisanal mining practices destroy the capacity of tropical forests to regenerate by changing the land base itself, rather than its use or vegetation cover.

[8] Julio Guzman, personal communication, January 2014.

4.1.6 OIL AND GAS

Peru has 579 million barrels of proven oil reserves, making it the seventh-largest crude oil resource in Central and South America (Carter, 2013). Much of Peru's proven oil reserves are onshore and the majority of these are located in the Amazon region. Proven natural gas reserves in the country are 12.7 trillion cubic feet, representing the fourth-largest resource in Central and South America (US Energy Information Administration, 2013). Crude oil extraction in Peru has been declining since the mid-1990s, but the country's total hydrocarbon production has been bolstered by increases in the output of natural gas. As a result, total liquid fuel production has shown steady increases over the past decade, arriving at an average of 160,000 barrels per day (bbl/d) in 2012; more than half of this figure was natural gas (US Energy Information Administration, 2013).

MAP 9: PeruPetro Concession Block Map & Conservation Areas

Source: PeruPetro, 2014

Oil exploration and extraction in Peru's Amazon region impact tropical forests and biodiversity by facilitating access to new areas, a first step that inevitably leads to land-use changes and increases in the harvesting of flora and fauna. Spills associated with oil and gas extraction and transport also frequently lead to the contamination of soils and water resources.

Map 9 delimits the concession blocks administered by PeruPetro, which cover substantial portions of the coast and Amazon basin. In an attempt to attract more foreign investment, the National Agency of Hydrocarbons (*i.e.,* PeruPetro) launched a bidding round in May 2013 for nine oil blocks located in four offshore basins (US Energy Information, 2014). The agency aims to auction more than 30 blocks in the near future, but plans have been delayed by local groups protesting the potential impact of oil development on their communities. To illustrate the reach of this potential impact, one company in a single concession currently plans on drilling 185 wells and installing a 207-kilometer pipeline through the rainforest (Hill, 2013).

4.1.7 FORESTRY

The forestry sector accounted for 0.54 percent of Peru's GDP ($436 million USD) in 2011 (Ramírez Arroyo et al., 2011). While the country was nearly self-sufficient in 1998, Peru now has a $4 billion USD trade deficit in forest products (Ramírez Arroyo et al., 2011). Nonetheless, these figures do not reflect the value of non-timber forest products (NTFPs) sold in markets throughout Peru, or of the ecosystem services (Table 9) that the forestry sector provides.

TABLE 9: Market and Non-market Forest Ecosystem Services in Peru

Ecosystem Service	Market Status
Provisioning Services	
Food	
Shade-Grown Crops	Market for coffee
Livestock	Informal (no export) market
Wild Foods	Informal (no export) market
Fiber	
Timber	Formal and informal (no export) markets
Wood Fuel	Informal
Genetic Resources	No market
Natural Medicines, Pharmaceuticals	Informal (no export) market
Freshwater	Limited to Payments for Ecosystem Services
Regulating Services	
Air Quality Regulation	No market
Climate Regulation	Limited market for REDD+ projects
Water Regulation	Potential Market - Power companies, Irrigation schemes, water companies and municipalities
Erosion Regulation	Potential Market - Power companies
Water Purification and Waste Treatment	Potential market- bottling companies, municipalities
Disease Regulation	No market
Pest Regulation	No market
Pollination	Potential market - agribusiness
Natural Hazard Regulation	Government (local, national), extractive industries
Cultural Services	
Spiritual and Religious Values	No market
Aesthetic Values	Tourism
Recreation and Leisure	Tourism

5 CLIMATE CHANGE

5.1 CLIMATE CHANGE VULNERABILITY

Peru meets seven of the nine criteria used by the United Nations Framework Convention on Climate Change (UNFCCC) to prioritize developing countries for climate-related assistance: countries with low-lying coastal areas; countries with arid and semi-arid areas, forested areas and areas prone to forest degradation; countries with areas prone to natural disasters; countries with areas prone to drought and desertification; countries with areas of high urban atmospheric pollution; countries with fragile ecosystems, particularly mountainous; and countries whose economies are highly dependent on income

generated from the production, processing and export, and/or consumption of fossil fuels and associated energy-intensive products (United Nations Framework Convention on Climate Change. 2014).

Important sectors of the country's economy, such as agriculture, energy, and fisheries are highly vulnerable to climate change. This means that about 15 percent of Peru's GDP and the economic activities of approximately one-third of its population are sensitive to climate change (Inter-American Development Bank, 2013). Further, it is often the regions that are most dependent on climate-sensitive economic activities that also present high levels of poverty (*Ministerio del Ambiente del Perú*, 2014). Consequently, if climate adaptation and vulnerability-reduction measures are not taken, impacts to these economic sectors could contribute to massive population displacement from more (e.g. Andes) to less vulnerable (e.g. Amazon) regions.

Based on historical averages, Peru is experiencing statistically significant changes in climatic parameters. According to Peruvian government research, the frequency and intensity of unusual hydro-meteorological phenomena (e.g. drought, heavy rains, floods, frost, hail) has increased more than six-fold from 1997 to 2006 (*Ministerio del Ambiente del Perú*, n.d.). This climatic change exacerbates the effect of other anthropogenic drivers of environmental degradation.

5.2 CLIMATE THREATS TO BIODIVERSITY AND TROPICAL FOREST

Climate change is now having a significant impact on Peru's economy and ecology, as evidenced by the following trends:

Loss of Peruvian Glaciers and Decreased Fresh Water Sources - Over the past 30 years, Peru has lost 22 percent of its glacial cover. Because glaciers are the source of 98 percent of the country's water, it is estimated that in 40 years Peru's freshwater resources will be just 60 percent of what they are today (*Ministerio del Ambiente del Perú*, n.d.). Declines in the availability of water from glacial melt will critically affect sanitation, agriculture, the generation of hydropower, and mining, amongst others. Along the coast, changes in hydrological regimes of glacier-fed rivers will have marked effects on riparian gallery forests and woodlands. Unless Peru is pro-active in its adaptation to glacial reduction, the country's socio-economic mainstays are bound to be fundamentally disrupted (*Ministerio del Ambiente del Perú*, 2010).

The Cascading Effects of Biological Community Displacement - Changes in precipitation and temperature dynamics are already being felt by Peru's ecosystems. For example, warmer temperatures are causing species to migrate to higher elevations, increasing competition for ecological niches between resident species and new arrivals (United States Environmental Protection Agency, 2013). This phenomenon is especially common among predators, species upon which ecosystem integrity often hinges. Changes in the distribution of biological communities over time will also lead to the loss of species and ecosystems that are unable to adapt to their new settings. As individual species of flora and fauna are lost, the pace of ecosystem change accelerates. While the experts interviewed agree that both species and habitat displacement are now taking place, there is as of yet insufficient research available to quantify the extent and/or rate of these changes.

Soil Erosion and Infertility - Climate change in Peru is associated with an increase in heavy rainfall events, which can contribute to soil erosion and infertility, particularly in degraded vegetation and deforested areas. Erosion accelerates the degradation and delays the recovery of vegetation cover because it affects soil fertility, along with water retention and infiltration properties. Vegetation

resilience decreases as plant cover declines, becoming more susceptible to pests such as fungi, bacteria, viruses and insects.

Impact on Crops and Agrobiodiversity – The potential loss of crops such as corn, potatoes and rice means that Peru's primary food sources may be at risk. As evidenced by an International Potato Center study, Andean potato farmers have moved their fields up 150 meters over the past 30 years to escape agricultural diseases and pests caused by increased temperatures in the lower altitudes (International Potato Center, 2012). This study strongly suggests that monocultures are becoming more vulnerable to pests in their yields and resilience. Further, the loss of local varieties of potatoes and other traditional crops (e.g. corn) is reducing Peru's adaptation potential as it loses the agrobiodiversity that forms the crux of resilient production systems.

5.3 CLIMATE CHANGE ADAPTATION

In 2012, Peru's Ministry of Economics and Finances invested $37.3 million USD (approximately 0.1 percent of the GDP) to develop several programs on climate change adaptation. At that time, the future impact of climate change on the Peruvian economy was estimated at between one and four percent of the GDP by the year 2030, unless adaptation measures were adopted (Baca, 2013). The IDB estimates that as a general rule, an investment today of one percent of the GDP in adaptation measures will produce a payback of five percent in the GDP by 2030 (IPCC, 2007). From a financial perspective, it clearly behooves the Peruvian government to increase its investment in climate change adaptation.

Several regions of Peru have completed assessments of vulnerability to climate change, including the identification of potential mitigation measures and adaptation strategies. Projects include capacity-building for rural producers to strengthen regional risk-reduction strategies.

Since 2012, Peru has financed climate adaptation programs (see Annex H) in the following areas:

- Training programs in the adaptation and mitigation of climate change
- Creation of improved information technologies
- Strategic planning to promote integration of climate change programs
- Management of watersheds and other water basins
- Revival of ancestral practices for restoration and preservation
- Mitigation programs and projects
- Cost Analysis of climate change impacts
- Introduction of environmental awareness within government institutions and private sector
- Control and monitoring of deforestation, weather observation networks, and agricultural databases (see Section 5.4.2 "REDD+" below)
- Carbon-trading market opportunities (see Section 5.4.2 "REDD+" below)

5.4 FOREST DEGRADATION, DEFORESTATION AND CO_2 EMISSIONS

Peru contributes less than one percent of global greenhouse gas (GHG) emissions. From 1994 to 2000, its GHG emissions grew at an annual rate of 3.6 percent; however, this rate of emissions increase slowed to 1.7 percent from 2000 to 2009 (*Ministerio del Ambiente del Perú*, 2013). As per the results of UNFCCC negotiations, Peru is a member country of the Association of Independent Latin American and

Caribbean States (AILAC), a group that supports the establishment of legally-binding climate agreements (Edwards & Roberts, 2013).

Nearly 40 percent of Peru's total emissions (55 million tons of CO_2 equivalent) are the result of deforestation and forest degradation. This figure represents 12 percent more than the emissions caused by the energy sector, the second biggest source of emissions in Peru (*Ministerio del Ambiente del Perú*, 2013). Peru's recent reduction in the growth rate of GHG emissions is attributed to efforts to address the underlying causes of deforestation in the country. Reducing emissions from deforestation and forest degradation (*i.e.,* REDD+) therefore can be an effective way to mitigate climate change and help conserve biodiversity. Two governmental initiatives are currently underway to harness this potential: The National Forest Conservation Program and REDD+.

5.4.1 THE NATIONAL FOREST CONSERVATION PROGRAM FOR CLIMATE CHANGE MITIGATION

The National Forest Conservation Program for the Mitigation of Climate Change (PNCB; in Peru, *Programa Nacional de Conservación de Bosques*) aims to conserve 54 million ha of forest, equivalent to 42 percent of the country's total land area. To date, 48 communities, 2,325 families and 4 regional governments (San Martin, Amazonas, Pasco and Loreto) are participating in the program, with 2,525,735 ha) of forest enrolled. The PNCB currently has an annual budget of approximately $1.5 million USD to provide economic incentives for conservation; based on forest now enrolled, this figure translates into less than one USD per ha. The bulk of targeted PNCB forests are located in natural protected areas (30 percent), titled native communities territories (20 percent), and forest concessions (17 percent), with the remainder divided amongst territorial reserves, colonist communities, wetlands, and regional conservation areas (*Ministerio del Ambiente del Perú*, n.d).

5.4.2 REDD+

Peru's REDD+ system is now under construction. Toward the reduction of deforestation and forest degradation, both institutional and regulatory frameworks for the agriculture sector are being reformed by MINAGRI (The REDD Desk, 2014). To date, Peru has been an active promoter of REDD+. Its engagement with the World Bank's Forest Carbon Partnership Facility (FCPF) has facilitated important advances toward the development of a national REDD+ strategy. Peru's REDD+ Country Readiness Preparation Proposal (R-PP) to the FCPF (*Ministerio del Ambiente del Perú*, 2011) was approved in March 2011, and a revised version is currently under review.

Since 2010, Peru has also been a pilot country in the Forest Investment Program (FIP).[9] In August 2013, AIDESEP) and CONAP were strategically incorporated into the country's FIP Steering Committee. The FIP proposal was finalized in October 2013; however, its presentation to donors in Washington is pending. Finally, Peru has been a partner country of UN-REDD since 2011.

Peru's planning toward a national REDD+ strategy is bolstered by significant donor and NGO support. The main agency responsible for all REDD+ activities in Peru is MINAM, which in turn coordinates the implementation of those activities through different institutions including SERNANP and PNCB. REDD+

[9] The Forest Investment Program (FIP) is a program of the Strategic Climate Fund (SCF), which is one of two funds under the multilateral banks' (*i.e.* The World Bank, Asian Development Bank, European Bank, African Development Bank and Inter-American Development Bank) Climate Investment Funds (CIF). The FIP supports developing country efforts to reduce deforestation and forest degradation, in doing so reducing their emissions and enhancing their forest carbon stocks (REDD+).

in Peru also involves (MINAGRI) due to its role as national forest authority. Once established, the National Forest Service (*Servicio Nacional Forestal y de Fauna Silvestre*, SERFOR) will also play a crucial role in the country's REDD+ initiatives. Because they are legally responsible for the sustainable use of natural resources, issuance of permits, enforcement of National Forest Policy, and authorization of forest concessions in each region, decentralized regional governments will be key to the successful implementation of REDD+. Peru's civil society has carved out important spaces for dialogue on REDD+. These include the REDD+ Group-Peru (*Grupo REDD+ Perú*), the National Indigenous REDD+ Roundtable (*Mesa REDD+ Indígena*), the Regional REDD+ Roundtables, the Inter-regional Amazon Council (CIAM), the Regional Environmental Commission (CAR), and the Municipal Environmental Commission (CAM). These groups promote the involvement of public and private institutions, plus indigenous people in decision-making processes for REDD+ and other climate change issues.

Peru's Readiness Preparation Proposal (R-PP) stipulates that it has chosen a nested approach to REDD+. It is expected that reference scenarios and the national forest monitoring system will be constructed in line with this approach. The baseline scenario will be developed with the regional level as the unit of analysis, beginning with regions with the highest technical capacity and data availability. The national reference level will be developed "bottom-up" by aggregating regional emissions forecasts. The R-PP highlights the need to strengthen capacities at the regional level in order to establish sub-national reference scenarios, and proposes a participatory process for their development in which regional REDD+ roundtables and other key local stakeholders play a central role. Madre de Dios and San Martin have been selected as pilot regions for the development of these scenarios according to MINAM guidelines. The R-PP estimates that it will take at least five years for Peru to define its national reference scenario.

As of late 2013, Peru still lacked a national monitoring, reporting and verification system (MRV) for the reduction of REDD+ emissions (Che Piu & Menton, 2013). However, several pilot initiatives related to the development of this MRV are underway, supported by the German Development Bank (KfW), the Gordon and Betty Moore Foundation, and the Japan International Cooperation Agency (JICA).

Recent reviews by The REDD+ Desk (2014) and CIFOR (International Institute for Sustainable Development, 2014) have identified an extensive array of limitations hindering the development of a national REDD+ strategy in Peru, including:

1. Insufficient resources and capacity for forest administration, supervision, and control by regional governments;
2. Lack of effective participation by local, regional and national actors in the development of a national strategy;[10]
3. Overlaps and gaps in funding by donors;
4. The difficulty in multi-institutional coordination in the context of a government that has been significantly restructured in recent years;
5. Lack of inter-sector coordination and conflicts with the objectives of the agricultural and extractive sectors driving deforestation;
6. Overlapping or unresolved claims to land tenure and resource use;
7. Lack of land-use regulation, inventory and zoning, as well as baseline data for Peruvian forests;
8. Gaps in the legal framework for regulating carbon rights and REDD+ mechanisms, especially for beneficiaries and costs;

[10] Creation of a Coordinating Body of Forests and REDD+, run by an inter-sectoral directorate (OCBR), is planned to improve coordination among actors at the national, regional, and local level.

9. The need to ensure consultation with—and participation by—indigenous peoples;
10. Insufficient enforcement of existing laws or ambiguous laws for forest protection, plus lack of institutional capacity for forest management;
11. Lack of clear development policies for the Amazon, as well as lack of a national development plan, leading to contradictions between projects at the two levels;
12. Poor governance in the forest sector and a consequent high risk of poor oversight and administration in REDD+ activities;
13. Technical analyses to develop methodologies required for the national measure, report, and verification (MRV) system for REDD+, such as a national land use change-monitoring system.

There has been limited progress since 2011 in addressing many of these needs. Despite continued efforts to promote participatory stakeholder dialogue, a consensus on national strategy is reported to be far from achieved. A US State Department-sponsored initiative to renew stakeholder dialogue, scheduled to begin in early 2014, may help to accelerate the process.

In the absence of a REDD+-enabling framework and UNFCCC sanctioned rules, Peru has forged ahead with the development of projects aimed at voluntary carbon markets, including those supported by USAID. Peru's Second National Communication to the UNFCCC (*Ministerio del Ambiente del Perú*, 2010) lists 19 activities with REDD+ project potential. MINAM refers to 30 projects that are directly or indirectly linked to REDD readiness and emission reductions (*Ministerio del Ambiente del Perú*, 2014). These projects are being implemented primarily by national and international NGOs with private sector participation. Peru's current REDD+ projects have been, or aim to be, validated under a variety of standards, which include: Climate, Community and Biodiversity Standard (CCBS), Voluntary Carbon Standard (VCS) and Carbon Fix Standard (The REDD Desk, 2014). Unfortunately, there is currently little coordination and communication between different REDD+ projects, precluding opportunities for mutual learning and information exchange. This coordination is needed to avoid duplication and incompatible or even divergent project deliverables (Che Piu & Menton, 2013).

Peru's experiences to date indicate that high transaction and project preparation, verification, certification, and monitoring costs make participation in voluntary carbon markets unlikely to be economically viable. This is especially true at smaller scales, at least until a standard and streamed-lined methodology that significantly reduces annual operating costs is adopted. At this stage, donor support and early private sector involvement are crucial.

6 INTERNATIONAL COOPERATION ON THE ENVIRONMENT: PRINCIPAL DONORS AND EMPHASIS

Peru's environment in general, and in particular the Amazon, attracts considerable attention from international donors (bilateral, multilateral, and private foundation) and non-governmental organizations (NGOs, both national and international) primarily focused on assisting with poverty reduction, sustainable development, and environmental conservation. Annex F of this document identifies important institutions in each of these groups, detailing their specific objectives and areas of intervention.

Additionally, a column of more in-depth observations perceived to be of potential relevance to USAID/Peru country strategy development has been included.

7 POLICIES AND LEGAL AND REGULATORY FRAMEWORK

7.1 INTERNATIONAL CONVENTIONS, AGREEMENTS, TREATIES, PROTOCOLS, STRATEGIES, AND ACTION PLANS

Peru is a party to most international instruments that are pertinent to biodiversity and tropical forest conservation. These include:

- The Convention on Biological Diversity;
- The Convention on Wetlands of International Importance (Ramsar Convention);
- The Convention on International Trade in Endangered Species (CITES);
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
- The United Nations Environment Program (UNEP) Minamata Convention on Mercury;
- The International Tropical Timber Agreement;
- The International Treaty on Plant Genetic Resources for Food and Agriculture;
- The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP);
- The International Labor Organization, Convention 169 on Tribal and Indigenous Peoples;
- The Convention for the Protection of the Marine Environment and the Coastal Zones of the Southeast Pacific;
- The Protocol for the Conservation and Administration of Marine and Coastal Protected Areas of the Southeast Pacific;
- The World Heritage Convention;
- Convention for the Conservation and Management of the Vicuña;
- The Inter-American Convention for the Protection and Conservation of Sea Turtles;
- The Amazon Cooperation Treaty (ACT).

In addition to these international treaties, Peru also participates in and has approved a number of regional strategies and action plans, including:

- The Regional Biodiversity Strategy for the Tropical Andean Countries (*i.e.,* Bolivia, Colombia, Ecuador, and Peru)
- ACT's Regional Action Plan for Biodiversity in the Amazon (involving Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Surinam, and Venezuela)

7.2 NATIONAL CONSTITUTION, STRATEGIES AND PLANS

The Political Constitution of Peru (*Congreso de la República del Perú*, 2014) — This cornerstone legislation sets the tone for an ensuing battery of laws and regulations relevant to biodiversity and tropical forests. The following articles are of particular importance:

- Article 2 states that every person has the right to enjoy a "balanced" environment appropriate to the development of his/her life.
- Article 66 establishes that renewable and non-renewable natural resources are part of the nation's heritage. Conditions for resource use-rights or concessions to private entities and organizations are specified in associated laws. A concession "title" grants its holder *bona fide* use rights, subject to the conditions specified in pertinent legal instruments.
- Article 67 specifies that the State will adopt a national environmental policy and promote the sustainable use of natural resources.
- Article 68 stipulates that the state is obliged to promote the conservation of biodiversity and natural protected areas.
- Article 69 establishes that the State is to promote the sustainable development of the Amazon region with adequate legislation.
- Article 89 recognizes that peasant and native communities are legal entities, and that their land rights are imprescriptible.[11] The State respects the cultural identity of colonist and native communities.

Therefore, the constitution makes it clear that environmental conservation and management are important due to the benefits they can offer Peruvian society. As written, there is little room for what may be perceived as the innate value of biodiversity in-and-of-itself.

The National Environmental Policy *(*NEP) — Fifteen years elapsed from the time that Peru's constitution was adopted to the elaboration of the constitutionally mandated NEP in 2009. This instrument's overarching objective is to achieve the conservation and sustainable use of Peru's natural heritage with efficiency, equity, and social well-being, prioritizing the integrated management of natural resources. The following policy objectives are pertinent to this document:

1. Conserve and sustainably use biodiversity and renewable and non-renewable natural resources.[12]
2. Establish conditions for controlled access to, and use of, genetic resources, along with the equitable distribution of their benefits.
3. Achieve integrated management of the country's hydrologic resources.
4. Achieve the planned occupation and use of Peru's territory through economic and ecological zoning analyses, within a framework of legal security and conflict prevention.

[11] Imprescriptible is a legal term meaning "unable to be taken away by prescription or by lapse of time."
[12] It should be noted that sustainable use of non-renewable resources is an oxymoron.

5. Achieve integrated and sustainable management of fragile ecosystems, including the humid tropical forests.
6. Achieve climate change adaptation for the country's population and implement mitigation measures that facilitate sustainable development.
7. Implement valuation, evaluation and financing instruments for the conservation of natural resources, biodiversity, and environmental services.

The National Biodiversity Strategy (CONAM, 2001) — Peru's first biodiversity strategy was produced in 2001, with an overall vision reflecting the utilitarian role that the country's constitution ascribes to its biodiversity, as follows:

> *"In 2021, Peru will be the country that obtains the best benefits of its biodiversity for its population, conserving it, using it sustainably, and restoring its components for the satisfaction of basic necessities, well-being, and the generation of wealth for current and future generations)."*

The updated 2014-2021 draft strategy (*Ministerio del Ambiente del Perú*, 2010) advances a vision that, while still anthropocentric, tones down the focus on "benefit maximization" and raises the importance of traditional knowledge:

> *"By 2021, Peru conserves and uses its mega-biodiversity rationally, including the revaluing of associated traditional knowledge, for the satisfaction of basic necessities, well-being, and sustainable development of current and future generations".*

The new draft strategy has six objectives:

1. Improve the condition of biodiversity, maintaining integrity of the ecosystem services that it provides.
2. Increase the contribution of biodiversity to national development, improving Peru's competitiveness and providing equitable distribution of the benefits.
3. Reduce direct and indirect pressures on biodiversity and ecosystem processes.
4. Strengthen the capacity of all the three levels of government with respect to sustainable biodiversity management.
5. Increase knowledge and improve technologies toward the sustainable use of biodiversity, and specifically revalue the traditional biodiversity knowledge of indigenous peoples.
6. Strengthen the cooperation and participation of all sectors of the population for biodiversity governance.

These six objectives are in line with the perspectives expressed by the great majority of individuals that the team interviewed. The first two reflect a practical approach to biodiversity conservation whereby benefits to society are the overarching aim. The latter four outline the changes that need to take place to achieve Objectives 1 & 2.

In addition to its National Biodiversity Strategy, MINAM has prepared a proposal for a National Wetlands Strategy (*Ministerio del Ambiente del Perú*, 2014). This strategy centers around four strategic aims: 1) to reduce the vulnerability of wetland ecosystems, 2) to strengthen the regulatory framework and capacity for wetland management, 3) to strengthen participatory wetland management, and 4) to include the traditional knowledge of indigenous peoples and local populations in wetland management.

Notably, the differences in vision between the 2001 and 2014 strategies mark a clear shift toward the participation and inclusion of civil society in managing Peru's natural resources.

7.2.1 REGIONAL BIODIVERSITY STRATEGIES

Since 2003, and with the advent of the current constitution, Peru has embarked on a process of decentralization in terms of policy, administration, and economy. Regional Government Law No. 27867, Article 53 stipulates the roles and functions of regional governments in matters related to the environment. Under this article, regional governments are to: "*formulate, coordinate, conduct, and supervise the application of regional strategies for biodiversity and climate change within the framework of the respective national strategies.*" Seven regional governments have developed their own biodiversity strategies to date: Amazonas, Loreto, Cajamarca, Junín, Madre de Dios, San Martín, and Ucayali. Most of these were developed between 2004 and 2006.

Between 2006 and 2009, independent efforts to create biodiversity strategies were made in the Amazon departments of Loreto, Ucayali, San Martin, Madre de Dios and Amazonas, and Highland departments of Junín and Cajamarca. Unlike the Amazon departments mentioned, the highland departments have an approved Regional Biodiversity Ordinance. Biodiversity Strategies were approved in 2013 in Puno and Piura, which also have a Regional Biodiversity Ordinance.

7.3 LAWS, REGULATIONS, DECREES, AND OTHER LEGAL INSTRUMENTS

The strategic and policy documents described above are accompanied by a number of laws and regulations that address specific aspects of biodiversity and tropical forest conservation and use, summarized here:

- The Law for the Conservation and Sustainable Use of Biodiversity (Law No. 26839) provides a legal framework for the implementation of the Biodiversity Convention within Peru.
- The Natural Protected Areas Law (Law No. 26834) provides a legal framework for the management and conservation of protected areas as per Article 68 of the Peruvian Constitution.
- The Forest and Wild Fauna Law (Law No. 29763) creates a new institutional framework for the administration of Peru's forests, including establishment of the National Forest and Wildlife Service (SERFOR).
- The Law for the Prevention of Risks Derived from the Use of Biotechnology (Law No. 27104) regulates the use and release of genetically-modified organisms, and Law No. 29811 establishes a 10-year moratorium on the importation and production of genetically-modified organisms in Peru.
- The Environmental Impact Assessment System Law (Law No. 27446) creates a system for evaluating the environmental impact of economic activities. This law forces every public or private project that has an impact on the environment to secure an environmental certification before implementation commences.
- The Environmental Crimes Law (Law No. 29263) modifies various articles in the Peruvian Penal Code as related to environmental crimes such as the illegal trafficking of plants and animals, illegal harvest of aquatic species, and illegal activities that cause the degradation of natural forests, amongst others.
- The Law for the Sustainable Use of Medicinal Plants (Law No. 27300) regulates and promotes the sustainable use of medicinal plants.
- The Law for the Promotion and Development of Aquaculture (Law No. 27460) regulates and promotes aquaculture in marine, costal, and freshwater ecosystems as a source of food, employment and income. These goals are to be achieved in harmony with the environment and conservation of biodiversity.

In addition to these legal instruments, there are currently ongoing discussions within the Congress' Commission of Andean, Amazonian, and Afro-Peruvian Peoples, Ecology and Environment on forthcoming legal instruments such as the Ecosystems Services Law and the Climate Change Law.[13]

7.3.1 PRINCIPAL GOVERNMENT ENTITIES WITH A ROLE IN THE ENVIRONMENTAL SECTOR

- **The General Comptroller of the Republic** (*La Controlaría General de la República*, 2014) is the branch of the national controls system responsible for ensuring the efficient and economic use of State financial resources. This office created the Environment and Cultural Heritage Management Agency under Resolution No. 345-2—2-CG in order to plan, organize, direct, execute, and evaluate the activities of decentralized public institutions and investment projects. This is achieved through environmental audits, the prioritization of critical natural and national heritage areas (e.g. protected areas, watersheds, archaeological sites), and the enforcement of adherence to international agreements.
- **Regional and Local Governments** (*Portal del Estado Peruano*, 2014) are responsible for the establishment of local Natural Resources and Environmental Management Administrative Units. These administrations are responsible for local forests, protected areas, and overall environmental management. Regional and municipal governments also approve the scope, composition and function of regional and municipal environmental committees. The Ministry of Environment is directed to play a supportive role to these decentralized governments in environmental matters.
- **Ministry of Agriculture and Irrigation (MINAGRI)** (*Ministerio de Agricultura y Riego*, 2013) has as its scope of management agricultural and grazing lands, river channels and banks, and forest resources (*i.e.,* flora and fauna). Through its General Forestry and Wildlife Directorate (DGFFS; soon to be dissolved and transformed into Peru's National Forest Service, SERFOR), MINAGRI is responsible for the elaboration of policies, strategies, regulations, plans, programs and national projects as related to the sustainable use of forest resources and wildlife. The General Forestry Directorate has three sub-units: the Directorate for Forestry and Wildlife Promotion, the Directorate for Forestry and Wildlife Management, and the Directorate for Forestry and Wildlife Control and Information. The Regional Directorates for Agriculture are in charge of implementing the dispositions of Peru's National Environmental Management System.
    - **The National Water Authority (ANA)** (*Autoridad Nacional del Agua*, 2014) is a sub-entity of MINAGRI. Its role is to ensure the multi-sectorial sustainable use of water resources. Principal functions include: 1) formulation of the National Hydrologic Resources Strategy, 2) administration and formalization of water-use rights, 3) equitable distribution of water-use rights, 4) control of water resource quality, and 5) mitigation and resolution of water conflicts.
- **Ministry of Environment (MINAM)** was created in 2008 to promote the environmental sustainability of Peru by conserving, protecting, and restoring its ecosystems and natural resources. The creation of MINAM marked a watershed event in Peru's environmental institutionalization, catalyzing a series of institutional changes that are ongoing. This led to some confusion in mandates with other Peruvian Ministries such as MINAGRI, which was previously responsible for forest resources and wildlife outside protected areas. Today, MINAM is the entity responsible for designing, establishing, executing, and supervising all actions associated with National Environmental Policy. Six environmental institutions are ascribed to the auspices

[13] It is important to note that Peruvian Congress passed Law No. 30215 (*Ley de Mecanismos de Retribución por Servicios Ecosistémicos*) on June 28, 2009.

of this governmental entity: the Peruvian Amazon Research Institute (IIAP), the Environmental Oversight and Evaluation Agency (OEFA), the Geophysical Institute of Peru (IGP), the National Hydrological and Meteorological Service (SENAMHI), the National Natural Protected Areas Services (SERNANP), and the recently created National Service for Environmental Certification (SENACE).

  - **The Peruvian Amazon Research Institute (IIAP)** (*Instituto de Investigaciones de la Amazonía Peruana*, 2014) aims to contribute to the improvement of socio-economic conditions of populations in Peru's Amazon Basin through research aimed at sustainable development. This is Peru's premier public research institute on the Amazon.
  - **Environmental Oversight and Evaluation Agency (OEFA)** (*Organismo de Evaluación y Fiscalización Ambiental*, 2014) is responsible for monitoring the application of environmental laws and regulations, as well as sanctioning infractions.
  - **The National Natural Protected Areas Service (SERNANP)** (Servicio *Nacional de Áreas Naturales Protegidas por el Estado*, 2014) is responsible for administering Peru's National Natural Protected Areas System (SINANPE), including both technical and legal enforcement roles. While ascribed to MINAM, SERNANP has its own budgetary and functional autonomy.
  - **The National Service for Environmental Certification (SENACE)** was still in its early stages of implementation at the time of this writing. Through SENACE, the Ministry of Environment now has authority to revise and certify the environmental impact assessments (EIA's) of large projects, irrespective of sector. This is a marked shift from prior protocol, under which individual ministries were assigned to the task of EIA's and associated monitoring and mitigation for all projects in their sector. Determination of whether or not an organization requires an EIA is guided by the National System of Environmental Impact Assessment (SEIA; Law No. 27446, Article 2), which establishes project-specific EIA requirements, steps, and scope in Peru. SENACE is now a fundamental component of SEIA.

- **Sea Institute of Peru (IMARPE)** (*Instituto del Mar del Perú*, 2008) undertakes research on marine and coastal areas in tight coordination with the Ministry of Environment. Currently, IMARPE is in charge of the government-sponsored Coastal-Marine Biodiversity Program. IMARPE is also responsible for the environmental monitoring of Peru's coasts and territorial waters. Their monitoring and research is slanted toward marine production (i.e. aquaculture).
- **National Institute for Agricultural Research (INIA)** (*Instituto Nacional de Innovación Agraria*, 2014) implements a program for the management and conservation of agro-biodiversity.
- **Peruvian Antarctic Institute (INANPE)** coordinates, conducts, and oversees Peru's policy on the Antarctic.
- **Council on Science and Technology (CONCYTEC)** (*Consejo Nacional de Ciencia, Tecnología, e Innovación Tecnológica*, 2014) is a decentralized public institution ascribed to the Ministry of Education. Its mission is the promotion, coordination, and guidance of scientific and technological research. CONCYTEC can and should play an active role in promoting applied research to guide environmental management. Currently, however, there is no formally-articulated research program to bring together the academic and public institutions responsible for conservation and biodiversity management.
- **National Institute for the Development of Andean, Amazonian and Afro-Peruvian Peoples (INDEPA)** is ascribed to the Ministry of Culture. One of its functions is to coordinate the actions necessary to conserve traditional biodiversity knowledge with regional governments, as per the Law on Protection of Access to Peru's Biodiversity (Law No. 28216).
- **Commission for Andean, Amazonian and Afro-Peruvian Peoples, Environment and Ecology** (*Comisión de Pueblos Andinos, Amazónicos, y Afroperuanos, Ambiente, y Ecológica*, 2010) is

ascribed to Peru's National Congress. This Committee has currently four working groups: 1) Native Peoples and Inter-culturalism, 2) Territorial Planning, 3) Modification of Environmental Laws, and 4) Promotion of Investment in Environmental Matters.

- **Public Prosecutor's Office Specialized in Environmental Matters** (*Fiscalía de la Nación*, 2013) created in 2008 and functioning since 2010, is responsible for preventing and investigating environmental crimes. The Prosecutor's Office has branches in 20 judicial districts throughout Peru. Its creation was catalyzed by the signing of the FTA. The establishment of this specialized Prosecutor's Office is an important change in Peru's institutional environmental framework. During its first year, the office had 600 ongoing environmental crime cases; by 2014, this number had reached 10,500. Actual convictions for environmental crimes are a magnitude of difference lower, however: in 2010, there were only three and today there are a total of 15.
- **Public Defender's Office** (*Defensoría del Pueblo*, 2013) is an autonomous governmental institution created under the 1993 Constitution. Its mission is to defend the constitutional rights of individuals and communities. This office includes a division responsible for the environment, public services, and indigenous peoples; amongst other rights, this division ensures the right of all Peruvian citizens to a sound environment. Toward this aim, the Public Defender's Office ensures that the government meets its administrative obligations as they pertain to the environment.
- **Ministry of Production – Vice-Ministry for Fisheries** (*Ministerio de la Producción*, 2014) oversees the administration and control of exploitation of aquatic biota, plus the cultivation of aquatic species with economic value.
- **Ministry of International Trade and Tourism (MINCETUR)** (*Ministerio de Comercio Exterior y Turismo*, 2014) is relevant to the environment based on its objectives to establish sustainable tourism as a means for socioeconomic development in Peru. MINCETUR is also responsible for the environment section of the US-Peru Trade Promotion Agreement, a task that may be better suited for Peru's environmental authority (*i.e.,* MINAM).
- **The National Committee for Development and Life without Drugs** (*Comisión Nacional para el Desarrollo y Vida sin Drogas*, 2014) is a decentralized public agency ascribed to the Presidency of the Ministerial Council. This agency is relevant due to its Office for Environmental Conservation and Rehabilitation of Degraded Ecosystems, which is mandated to develop income-generating activities with local communities in watersheds prone to illicit crop cultivation. The activities must be compatible with biodiversity conservation and deter the increase in illicit crop coverage. The same office also promotes rehabilitation of areas degraded by illicit crops cultivation.
- **The Forest and Faunal Resources Supervisory Agency (OSINFOR)** is ascribed to the Presidency of the Ministerial Council. OSINFOR is the national entity responsible for the supervision and oversight of the sustainable use of forestry and wildlife resources, as well as their conservation. Such use derives from forest-use right titles granted by the Forest Authority through concessions, permits and authorizations. OSINFOR was created by Legislative Decree

According to the SEIA, every activity included in Peruvian Environmental Regulations is classified into one of the following categories:

a) Category I - Environmental Impact Assessment: projects which do not cause significant negative environmental impacts.

b) Category II - Semi-detailed Environmental Impact Assessment: projects which may cause moderate environmental impacts, but negative effects can be eliminated or minimized via reasonable measures. Projects in this category require a detailed Environmental Impact Assessment (EIA-d).

c) Category III - Detailed Environmental Impact Assessment: projects whose characteristics, size, and/or location can produce significant and quantitatively or qualitatively negative environmental impacts. Requires a thorough analysis to review impacts and propose corresponding environmental management strategy. Projects in this category require a detailed Environmental Impact Assessment (EIA-d).

No. 1085 as a government agency an as an executing public entity. It was assigned to the Presidency of the Council of Ministers (PCM) and is Headquartered in Lima, and has seven decentralized offices in Chiclayo (Lambayeque), Tarapoto (San Martin), Iquitos (Loreto), Atalaya and Pucallpa (Ucayali), La Merced (Junín) and Puerto Maldonado (Madre de Dios) (*Diario El Peruano*, published on June 4, 2014). The agency also oversees regular inspections of resource use licenses and concessions, and may apply fines and terminate resource use rights if associated terms are not fulfilled (*Organismo de Supervisión de los Recursos Forestales y de Fauna Silvestre*, n.d.).

Individuals interviewed by the team expressed concerns about the implementation efficacy of the environmental impact assessment process. For example, stakeholders in the public and NGO sectors noted that consultations with indigenous communities tended to be superficial and did not meet the standards implicit in the International Labor Organization (ILO) Convention 169, to which Peru is a signatory. Concerns were also expressed about provisions in the SEIA law that can result in civil or criminal action against government officials for failing to provide comments or approve EIAs within established time frames. This measure compromises the thoroughness of the review and consultation process prior to approval. Finally, there is widespread concern that the findings identified through EIA's and the public consultation process are not taken seriously when there is high-level political support for a project.

In summary, Peru has an extensive institutional system with an extensive legal and policy framework. However, the newness of Peru's official environmental sector and the incipient nature of the decentralization process mean that there are institutional and legal weaknesses that have to be resolved to improve Peru's environmental governance.

7.3.2 OBSERVATIONS OF LEGAL AND INSTITUTIONAL FRAMEWORK

Peru's environmental institutions are new. MINAM was created in 2008. The concomitant establishment of a number of ancillary institutions now comprise Peru's new public environmental sector. This is an important step toward improving Peru's hitherto weak environmental governance. However, having structures in place is only one step in that direction; these institutions have to function well, be subtended by sound legal and regulatory frameworks, be guided by sound policies, and have the human and capital resources with which to function.

While Peru has enacted environmental legislation recently and is revising its policy instruments, there are fundamental weaknesses in the implementation of these instruments and in the functioning of the government bureaucracy. The devolution of environmental competencies to regional governments, while sound in principle, has proven to be a serious challenge in practice. Some examples follow.

First, according to Peru's constitution all natural resources belong to the nation. The state grants ownership or resource use titles according to a set of criteria. In order to secure title to a forested area, the aspiring titleholder has to "improve" the parcel of land. In a manner reminiscent of the 1960's in other South American countries, cutting down the forest is still considered an "improvement" in Peru. This is a perverse incentive that is behind some of the country's deforestation.

Second, mining concessions, forest concessions, and oil and gas exploration concessions are allocated on a sector basis. This means that any given area may have a number of competing concessions for different resource use categories, and logically leads to conflict due to overlaps in the legally conceded use rights of those categories amongst parties. Third, while Peru's decentralization has gone ahead on paper, and environmental management responsibilities have been delegated to regional governments, both human and financial resources at the regional level are inadequate to carry them out. For example, during the

team's visit to Madre de Dios, it became apparent that Regional Forestry Directorate personnel had not been paid in months and electricity had been cut for lack of payment. In this region, there are only 50 personnel available to help approximately 5,200 informal miners comply with existing legislation (Samardzich, C., 2014). Although this is more personnel than any other region, it is insufficient to adequately carry out the required process.

Fourth, the lack of a "public service law" means that government staff works on short-term contracts. Continuity in these posts often hinges on the whim of political appointees. Further, limited opportunities for promotion in the environmental sector lead to a high level of personnel turnover. Individuals trained while serving government institutions eventually leave for more attractive positions in the private sector or other government entities. It is worth noting that this high personnel turnover undermines efforts to enhance the capacity of environmental institutions to carry out their mandate.

Fifth, as in most developing countries, the environmental sector is underfunded. While great progress has been made, funding for protected areas management falls short by about 50 percent of the actual need.

Sixth, in conjunction with low available funding, cumbersome government procurement regulations and lack of administrative capacity in the environmental sector preempt budget assignation from being fully utilized. For example, every procurement in excess of $3,000 USD is subject to an open bidding process. This partly explains why in 2013, MINAM executed a mere 23 percent of its assigned budget,[14] and also reflects the limited administrative capacity of environmental sector institutions. To circumvent this problem, SERNANP has delegated its procurement process to PROFONANPE, which has a team dedicated exclusively to this task.

Seventh, institutional overlaps, conflicts, and scope-creep occur throughout the system. For example, the ANA is responsible for allocating water rights, while the Vice-Ministry of Fisheries is responsible for hydro-biological resources. This problem mirrors the overlapping concessions issue referred to above.

[14] Cesar Ipenza, Personal Communication, January 2014.

8 BIODIVERSITY AND TROPICAL FORESTS: STATUS AND TRENDS

8.1 PERU: A GLOBAL BIODIVERSITY POWERHOUSE

Peru is among the 10 most biodiverse countries on the planet.[15] It ranks 1st, 2nd, 3rd and 5th in terms of estimated fish diversity (2,000 species; Vie et al., 2009) and documented bird (1,736 species), amphibian (332 species) and mammal diversity (460 species), respectively (Convention on Biological Diversity, 2014). The country hosts 116 Important Bird Areas (IBAs; Devenish et al., 2009) and encompasses large expansions of two global biodiversity hotspots:[16] the Tropical Andes and the Tumbes-Chocó-Darien. Peru also houses two natural World Heritage sites (Huascarán and Manu National Parks), two mixed World Heritage Sites (Historic Sanctuary of Machu Picchu and Rio Abiseo National Park) and 13 Ramsar sites.[17]

Together with Ecuador and Bolivia, Peru is among the most important world centers of plant domestication and agro-biodiversity (Vavilov, 1926). Native varieties of potatoes, cassava, semi-perennial cotton (*Gossipium barbadense*), and a number of spices originated here, providing the raw genetic material for several of the world's most important crops. The combination of ecological (plants) and ethnic (humans) diversity in this region led to the emergence of a multitude of local crop varieties. For example, a subset of 187 wild potato species gave rise to an estimated 4,000 varieties of potatoes (*Solanum tuberosum*) now grown in the Andes region (International Potato Center, 2014). The Amuesha indigenous people's group in the upper Amazon basin of Peru recognized 700 cassava varieties, that when grouped with multivariate cluster analyses were classified into 39 well-defined phenotypes (Salick et al., 1997).

The importance of Peru's agro-biodiversity is magnified due to the need to adapt to climate change. Given the unpredictability of future climates at the local level, the best adaptation strategy is to maintain a range of options from which adaptation interventions can be selected. The maintenance of agro-biodiversity from which crops and cropping systems can be selected in response to changing conditions is critical to the well-being of future generations.

8.1.1 THREATENED AND ENDEMIC SPECIES

The International Union for Conservation of Nature (IUCN) Red List is the only well-established indicator of the status of species conservation at national and global levels. Because of modifications in the total number of species assessed and adjustments in methodology, changes in the number of threatened species over time occur; the IUCN Red List is therefore an imperfect but useful indicator of trends.

In Peru, changes in the number of threatened species in major groups indicate a downward trend in biodiversity. Today, there are 636 species known to be threatened (Table 10) (International Union for Conservation of Nature, 2013); this figure is likely an underestimate based on the limited reach of

[15] Peru's ranking according to the literature varies from 4th to 8th most biodiverse country.
[16] To qualify as a hotspot, a region must meet two strict criteria: contains at least 1,500 species of vascular plants (>0.5 percent of the world's total) as endemics, and it has lost at least 70 percent of its original habitat.
[17] The Convention on Wetlands of International Importance (Ramsar) is an inter-governmental treaty that provides the framework for national action and international cooperation in wetland conservation and use.

species assessments in Peru. This is particularly true in the case of freshwater fishes, as Peru has the largest number of species in the world. While IUCN has yet to conduct a comprehensive assessment of freshwater species in South America, a number of recent developments in the region (e.g. large dam construction, increasing fishing pressures) are likely to threaten the actual diversity. This is particularly true for large migratory bottom-feeders due to their ecology.

In Peru, 44 percent of plant species and 8 percent of animal species assessed by IUCN are threatened. Care should be used in the interpretation of this data because: 1) the selection of species to be assessed is not random, 2) the assessment process in Peru is lagging compared to other countries, and 3) a comprehensive assessment of freshwater species in South America, including Peru, has not been completed.

TABLE 10: Threatened Species in Peru

Group	Threatened (2008)	Threatened (2013)
Amphibian	96	102
Mammal	53	55
Bird	93	123
Reptile	6	9
Fish	10	21
Mollusk	0	4
Plant	275	318
Other	3	4
Total	536	636

Source: International Union for Conservation of Nature (IUCN). 2013. The IUCN Red List of Threatened Species, Version 2013.2. Retrieved November 2013 from http://www.iucnredlist.org

Threatened species of "charismatic megafauna" that occur in Peru include: the Yellow-tailed woolly monkey (*Oreonax flavicauda*), Puna rhea (*Rhea pennata garleppi*), Tundra peregrine falcon (*Falco peregrinus tundrius*), White-winged Guan (*Penelope albipennis arrau*), Green turtle (*Chelonia mydas)*, Hawksbill turtle (*Eretmochelys imbricata)*, Olive ridley turtle (*Lepidochelys olivacea)* Leatherback turtle (*Dermochelys coriacea)*, Spectacled caiman (*Caiman crocodilus*), Black caiman (*Melanosuchus niger*), and Orinoco crocodile (*Crocodylus intermedius*).

Peru's global biodiversity importance derives in part from its high level of endemism. The large proportion of threatened endemic species in Peru is of particular concern. For example, 36 percent of endemic bird species and 30 percent of endemic mammal species are now classified as threatened (Table 11) (IUCN, 2013).

TABLE 11: Threatened Endemic Species in Peru

Group	Total Assessed Endemics	Threatened Endemics
Birds	104	37
Amphibians	244	74
Mammals	56	19
Cycads	2	2
Crabs	7	0
Cacti	91	29
Total	504	161

Source: International Union for Conservation of Nature (IUCN). 2013. The IUCN Red List of Threatened Species, Version 2013.2. Retrieved November 2013 from http://www.iucnredlist.org

In short, Peru is a mega-diverse country of global biodiversity importance. Although limited, data available indicate that the country is losing its species diversity at a fast rate. This applies to both native faunal species and traditional agro-species that used to be an integral part of Peru's indigenous production traditions. If unabated, this biodiversity loss will compromise Peru's ability to adapt to an unpredictable climate future.

8.1.2 OTHER INDICATORS OF BIODIVERSITY LOSS

Aside from the IUCN Red List, there are a number of other indicators of biodiversity decline in Peru. First, some of Peru's most important marine fisheries appear to now be either fully- or over-exploited. These include the South American sardine (*Sardinops sagax*), the Peruvian anchoveta (*Engraulis ringens*) and the Jack mackerel (*Trachurus declivis*; FAO, 2005). Strong evidence also exists that Amazonian fisheries are in decline, based on smaller catch sizes, increasing proportions of small individuals, and unchanging volumes despite increased fishing efforts (IIAP, 2009). Bush meat species appear to be following the same pattern. Conversations with market sellers of game meat in Loreto suggest declining availability in spite of the improved forest access that has resulted from new roads. Several interviewed specialists agree that Peru's tropical forests are largely depopulated as a result of uncontrolled hunting, a theme that is treated in section 9.3.

8.2 TROPICAL FORESTS

8.2.1 FOREST CATEGORIES, DEFORESTATION, AND FOREST DEGRADATION

Peru has a total of 73.3 million ha of forest cover (Servicio Nacional de Áreas Naturales Protegidas por el Estado, n.d.). The country´s forests are classified into 11 tenure and administrative classes (Table 12). Of Peru's total forest cover, 30.4 percent remains to be placed in one of these classes. This segment is consequently vulnerable to land speculators and the expansion of agriculture, particularly oil palm when promoted by large, influential economic groups. Classified forests are comprised predominantly by protected areas, communal title, and permanent production forests; the remaining 8.5 percent is comprised by a handful of less prominent administrative classes (Table 12).

TABLE 12: Forest Classes in Peru, Including Non-classified Forests

Forest Type	Millions of ha	Percentage of Total
Forests without category or special protection (state land)	22.25	30.4
Forests in protected areas	16.30	22.2
Forestlands under indigenous communal title	10.60	14.5
Production forests	9.20	12.4
Production forests in reserves	8.80	12.0
Titled community forests on the coast	2.25	3.1
Territorial reserves for indigenous people in voluntary isolation	1.75	2.4
Forests in colonist communities in the Amazon	1.20	1.8
Forests in regional conservation areas	0.70	1.0
Under titled to mountain (Sierra) communities	0.08	0.1
Forests in private conservation reserves	0.04	0.1
TOTAL	73.3	100.0

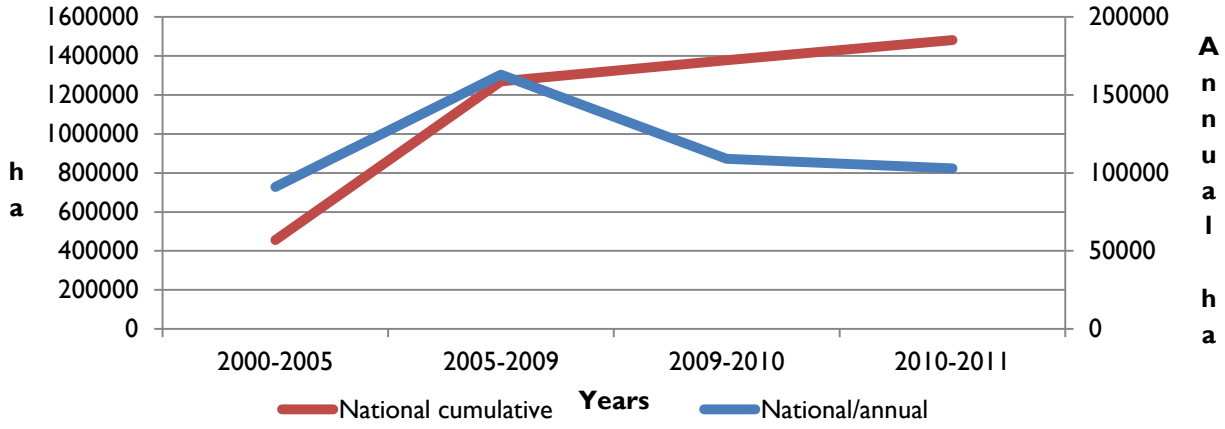
Source: *Servicio Nacional de Áreas Naturales Protegidas por el Estado* (SERNANP). (2011). *Sistema Nacional de Áreas Naturales Protegidas por el Estado – SINANPE.* Retrieved January 2014 from http://www.sernanp.gob.pe/sernanp/archivos/biblioteca/mapas/ ListaAnps_20012014.pdf

The third of Peru's forests that lack legal protection against land speculators and agricultural expansion will be a key component of measures to mitigate further forest loss. It is from this area that licenses for oil palm and other types of land-use concessions are granted.

Figure 4 shows annual and cumulative deforestation (ha) at the national level from 2000 to mid-2011 as per remote sensing data conducted by MINAM (Carnegie Institute of Science, 2014). During this period, Peru lost a total of 1,482,000 ha of forest, equivalent to an average annual deforestation rate of 0.16 percent, or 134,727 ha per year. Most of this deforestation took place in the Amazonian departments of Peru. Direct causes for this trend are addressed later in the document. Governmental figures place cumulative forest loss as of the year 2000 at 7,172,554 ha, or about nine percent of Peru´s original forest cover (INEI, 2013).

According to the Amazon Network of Georeferenced Socio-environmental Information (RAISG), deforestation has sharply increased in Amazon Basin countries outside of Brazil, especially in Peru. Updated forest cover maps for Bolivia, Colombia, Ecuador, Guyana, French Guyana, Peru, Suriname and Venezuela reveal an increasing trend in forest clearing since 2004. Of these countries, Peru had the largest loss of forest cover in 2012 at 162,000 ha, an increase of 67 percent from 2011 (Butler, 2013).

FIGURE 4 Deforestation in Peru, 2000-2011



Source: Carnegie Institute of Science. (2014). *Peru releases first national forest monitoring maps using CLASlite.* Retrieved January 2014 from http://claslite.carnegiescience.edu/en/success-stories/peru-national-monitoring.html

8.2.2 BUSH MEAT AND THE EMPTY FOREST SYNDROME

Information on hunting and the bush meat trade is fragmentary and outdated (Nasi et al. 2011). For this reason, recently written articles rely on old figures, such as those provided by (Ojasti, 1996); while indicative of general trends, these data do not reflect the current situation.

The list of species hunted provided by Ojasti is long. In terms of frequency of kills, it is dominated by anteaters *(Tamandua spp.*), armadillos (*Dasypus spp.*), large primates, coatis *(Nasua spp.)*, tapirs (*Tapirus terrestris*), peccaries (*Tayassu pecari,* and *T. tajacu*), deer (*Mazama spp.*) and agoutis (*Agouti paca*). Although the available information on birds is less detailed, parrots, macaws, and toucans are clearly important game species. The most heavily harvested reptiles are the caiman and river turtles, particularly *Podocnemis spp.*

Nasi et al.'s extensive review on bushmeat (2011) revealed documented evidence of intensive hunting pressure in different areas of Peru. In the Tambopata-Candamo Reserve of Madre de Dios, for example, every primate species except for the saddle-backed tamarin (*Saguinus fuscicollis*) has disappeared due to hunting and human disturbance (Naughton-Treves et al., 2003).

Bushmeat is both sold and used for subsistence purposes (Nasi et al., 2011). Generally speaking, smaller species are consumed locally and larger species are sold in nearby city markets. For example, primates and other bush meat were observed to be sold openly in the Iquitos market. Recently, there has been an increase in the hunting of smaller species; this shift appears associated with the increased area now in secondary forests, and the increasing participation of women and children in hunting activities (Cronkleton, 2013).

Of all faunal groups hunted, primate species are the best documented. Care for the Wild International (CWI) and Pro-wildlife (2007) report that large and medium-sized primates have been heavily affected by hunting in Peru. Increased forest accessibility as a result of the road network expansion, power lines, forest concessions, and pipelines, among others have all contributed to increasing hunting pressure, leading to the depletion or local extinction of primate species (CWI & ProWildlife, 2007).

Two decades ago, Redford (Redford, 1992) described how the overharvesting of wildlife for food and the pet trade, plus the reduction of their food resources and other critical habitat requirements, were catalyzing the depletion of Amazonian wildlife populations. Several of Redford's examples were from Loreto. The depletion of wildlife leads to the "empty forest" syndrome, whereby key ecological processes such as seed dispersal and faunal population regulation begin to unravel in the absence of the wildlife populations critical to their maintenance. Over time, this wildlife loss leads to pronounced changes in the composition and structure of tropical forests (Denslow, 1987). Field observations in markets and the testimony of Peruvian wildlife experts consulted during the team´s visit confirm that the country´s forests continue to be depopulated.

8.3 THE NATIONAL SERVICE FOR PROTECTED AREAS (SERNANP) AND THE NATIONAL PROTECTED AREAS SYSTEM (SINANPE)

8.3.1 SERNANP ESTABLISHMENT AND FUNCTION

Previously under the Ministry of Agriculture, Peru´s protected areas system was placed under the authority of recently-created SERNANP in 2008. While autonomous, SERNANP is ascribed to the Ministry of Environment. SERNANP's key objectives are to establish and manage Peru's system of natural protected areas through an integrated and participatory approach, and to sustainably manage biodiversity and the ecosystem services that provide benefits to society (*Servicio Nacional de Áreas Naturales Protegidas por el Estado*, n.d.).

The principal functions of SERNANP are:

- To manage the National System of Protected Areas (SINANPE) and ensure that it functions as a unified system.
- To establish technical and administrative criteria and procedures for the establishment and management of SINANPE.
- To guide and support the management of SINANPE, which is carried out on-the-ground by decentralized regional governments, private property owners, and private conservation area

managers.

- To establish mechanisms for administering, monitoring, and controlling areas within SINANPE, including disciplinary actions (e.g. sanctioning, equipment confiscation, detention, and closure or suspension of activities in protected areas).
- To ensure coordination amongst all national government entities, regional governments, and local governments that may act, intervene or participate, directly or indirectly, in SINANPE management.
- To review all regulatory projects that involve an area within SINANPE.
- To develop management plans for SINANPE that clearly incorporate financial sustainability criteria.
- To promote citizen participation in the management of SINANPE.

SERNANP currently employs over 1,000 park rangers, administrative personnel, and managerial staff.[18] Field personnel are paid salaries that range from $357 to $640 USD per month. This compares unfavorably with salaries paid to personnel with similar duties by the Brazilian Ministry of Environment and the Colombian National System of Protected Areas (*Ministerio de Ambiente de Colombia*, 2014).

Exclusive of donor-funded projects, two primary sources of funding exist for SERNANP: 1) $14,604,485 USD of the Peruvian National Budget and 2) $3,324,741 USD via income generated by SERNANP itself (e.g. Protected Areas entry fees) (SERNANP, 2014). The annual budget for SERNANP in 2014 ($17,929,227 USD) represents an increase of $6 million USD over the 2010 budget; this amount finances all of the institution's activities, with the exception of specific donor-funded initiatives.

SERNANP´s annual budget allocation is low compared to the Brazilian System of Federal Conservation Units; at approximately $133,600,000 USD for the year 2014 (*Camará dos Deputados*, 2013), the Brazilian budget is roughly 7.5-times that of SERNANP. In Colombia, the 2014 budget for protected areas management is $54,551,000 USD (*Ministerio de Hacienda y Crédito*, 2014), more than three times that of SERNANP. While SERNANP´s budget allocation translates to $0.81 USD per protected area ha, similar management and conservation requirements for a protected area in Madagascar were calculated at $0.270 USD per ha (Olsen et al., 2011). Bruner et al. (2004) estimated that effective protected area management in developing countries requires between $0.90 and $9.00 USD per ha. While SERNANP's budget is still clearly inadequate, the situation has nonetheless improved substantially from that of the 1990's, when Peru's allocated budget for protected areas was $111,000 USD per year (Leverington et al., 2008).

TABLE 13: Protected Natural Areas in Peru: SINANPE

Category	Number	Surface Area (ha)
National Park	13	8,170,747.54
National Sanctuary	9	317,366.47
Historical Sanctuary	4	41,279.38
National Reserve	15	4,652,851.63
Wildlife Refuge	3	20,775.11
Landscape Reserves	2	711,818.48
Communal Reserves	10	2,166,588.44
Protection Forests	6	389,986.99
Hunting Blocks	2	124,735
Total National ANPs	64	16,596,149.04
Regional Conservation Areas	15	2,405,558.82
Total Non-private Conservation Areas	79	19,001,707.86
Reserve Area under study	13	2,924,455.79

[18] Marco Pastor Rojas, personal communication, January 2014.

Category	Number	Surface Area (ha)
Private Conservation Areas	70	259, 446.13
Total PAs in SINANPE	162	
Land Surface in SINANPE		21,759,045.11
Coastal-marine Surface in SINANPE		401,556.29
Total Area in SINANPE		22,160,601.40

Peru has placed 16.93 percent of its territory in protected areas—more than the global target of 10 percent (SERNANP, 2014)—nonetheless, there remain gaps in ecological coverage. For example, dry forests and deserts areas are under-represented, as are high-altitude forests in the Yungas ecoregion, and coastal and marine protected areas. In 2009, Peru established a system of Islands, Islets and Guano Points as part of SINANPE; SERNANP has no personnel skilled in marine protected area management, however.

8.3.2 PROTECTED AREAS CATEGORIES AND COVERAGE

Peru's national protected areas system is composed of 162 units in 12 administrative categories (Table 13, Map 10). National protected areas are comprised by nine of the 12 categories; the remaining three are regional conservation areas, study reserve areas, and private conservation areas. Several or Peru´s protected areas have been globally recognized for their natural or cultural importance. These include four World Heritage sites (Machu Picchu, Huascaran, Manu and Abiseo River National Parks) and the following 13 Ramsar sites:

- Pacaya Samiria National Reserve
- Paracas National Reserve
- Mejía Lagoons National Sanctuary
- Lake Titicaca
- Junín National Reserve
- Tumbes Wetlands Sanctuary
- Villa Swamps
- Pastaza River Wetland Complex
- Bofedales and Laguna de Salinas
- Laguna del Indio - Dock of the Spaniards
- Lucre- Huacarpay Wetlands

MAP 10: Protected Areas in Peru

Source: http://alexanderflorezgonzales.blogspot.com/2013/09/mapa-de-areas-naturales-protegidas-para.html - SERNANP, 2013

- Las Arreviatadas Lagoons
- San Pedro de Vice Mangrove

Regional Conservation Areas (RCA's) have been under creation in different Peruvian Departments (e.g. Loreto, Ucayali, Piura, San Martin) since 2011 (Table 14). The management norms established for areas under national administration also apply to RCA's.

The effectiveness of protected area management in avoiding deforestation in the Madre de Dios region was recently assessed (Vuohelainen et al., 2012). While all of the protected areas studied had positive management effectiveness scores, those with the highest scores were ecotourism and conservation concessions. This pattern and the decreased deforestation rates that resulted were attributed to a combination of good relations with surrounding communities and forest monitoring activity. Native community reserves had the lowest scores, with deforestation being primarily driven by internal resource use and population growth. Weak local governance and immigration were identified as important underlying factors decreasing the effectiveness of protection; as such, conservation outcomes are strongly influenced by circumstances that go beyond protected area management capacity. It is also clear that the conservation status of a given protected area in Peru depends on the intensity of the pressures it faces: remote and inaccessible areas with limitations for deforestation-based land uses are likely to be better conserved than areas with high population growth and income opportunities such as mining.

TABLE 14: Regional Conservation Areas in Peru

Regional Conservation Area	Department	Surface Area (ha)
Escalera Range	San Martin	149,870.00
Ventanilla Wetlands	Lima	275.45
Albúfera de Medio Mundo	Lima	687.71
Tamshiyacu Tahuayo Communal Area	Loreto	420,080.25
Vilacota Maure	Tacna	124,313.18
Imiria	Ucayali	135,737.52
Choquequirao	Cusco	103,814.39
Raymondi-Titankayocc Puya Forest	Ayacucho	6,272.39
Ampiyacu Apayacu	Loreto	434,129.54
Alto Nanay-Pintoyacu-Chambira	Loreto	954,635.48
Angostura Faical	Tumbes	8,794.50
Huacrupe - La Calera Forest	Lambayeque	7,272.27
Moyán – Palacio Forest	Lambayeque	8,457.76
Huaytapallana	Junín	22,406.5
Salitral – Huarmaca Dry Forest	Piura	28,811.86
TOTAL		**2,405,558.80**

9 DIRECT THREATS TO TROPICAL FORESTS AND BIODIVERSITY

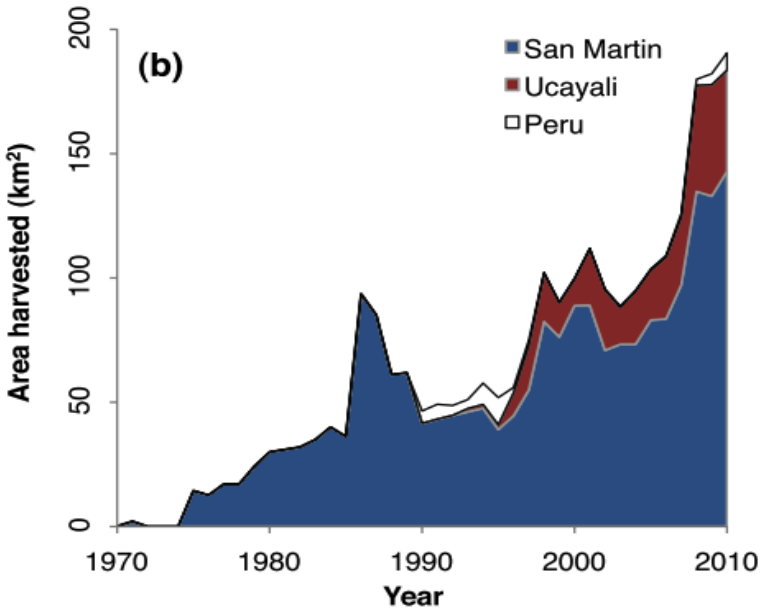
9.1 PREAMBLE

This section is based primarily on information gathered through open interviews with over 50 knowledgeable individuals. Their opinions and insights are subtended by information extracted from secondary sources. While there was a consensus amongst interviewees as to the direct threats for biodiversity and tropical forest loss and degradation, opinions diverged with respect to the relative importance of different root causes.[19] This pattern can likely be attributed to differences in individual backgrounds and geographic regions of interest.

9.2 DEFORESTATION AND LAND-USE CHANGE

Deforestation associated with land-use change is a direct threat to tropical forest and biodiversity loss. In the tropics, land-use change is being driven by a series of factors; chief among them is the spread of oil palm and illicit crops. Land speculators also use forest clearing as a way to claim possession. As mentioned earlier, deforestation is still considered a valid form of "land improvement" under Peru's legal framework. In Peru, land-use change accounts for the bulk of the estimated 134,727 ha per year of annual forest loss (further discussed below).

FIGURE 5: Oil Palm in Peru, Area Harvested Over Time



Source: Gutierrez-Velez et al. (2011). High-yield oil palm expansion spares land at the expense of forests in the Peruvian Amazon. *Environmental Research Letters* 6(4): 1-6.

9.2.1 OIL PALM

The increase in areas dedicated to oil palm cultivation is a particularly serious threat to Peru's tropical forests and biodiversity. Oil palm production has grown more quickly

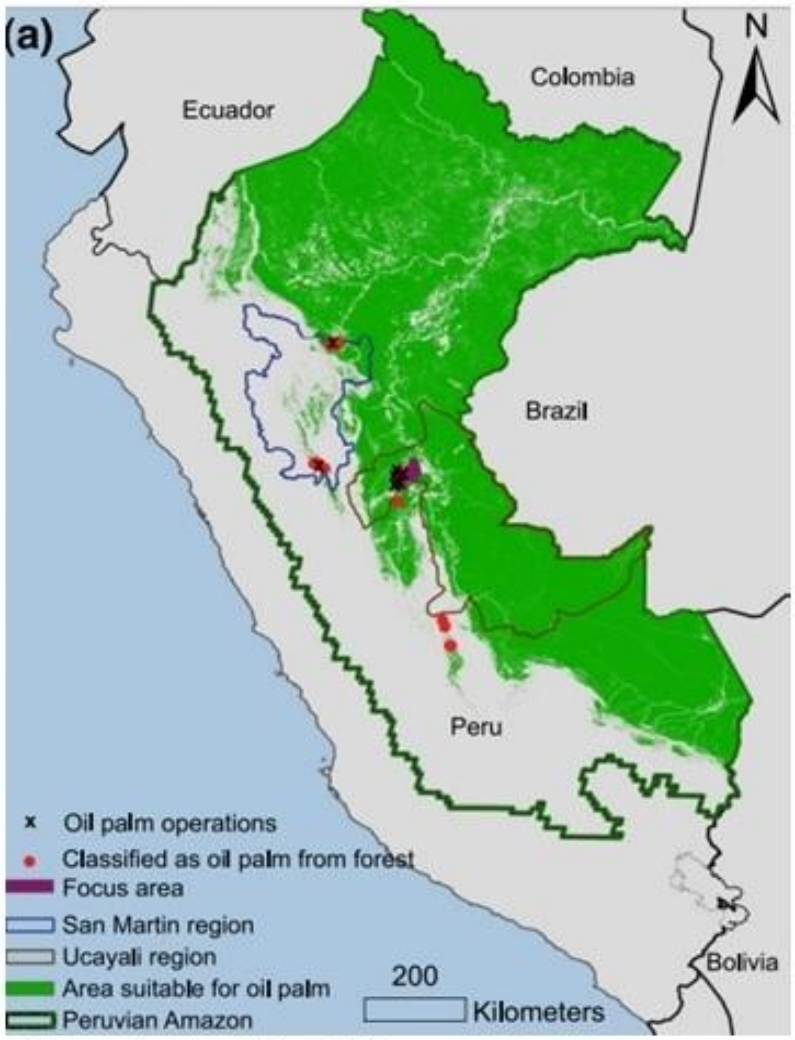
[19] We have chosen to use the term "direct threat" for the actions and processes (e.g. overexploitation) that have a direct negative impact on either tropical forests or biodiversity. Addressing a direct threat solves the specific problem at hand. We use the term "root cause" to refer to processes, weaknesses, and trends (e.g. weak governance) that are the source of direct threats. Generally speaking, addressing a "root cause" solves a cluster of related direct threats. In short, "direct threat" refers to what is taking place and "root cause" addresses why the threat exists in the first place. At times this distinction is blurred.

than other Peruvian crops as a result of incentives for cultivation. Several of the most important incentives include tax exemptions for oil palm investment in the Amazon and a decree that establishes a minimum of five percent biodiesel content for all diesels sold in Peru (*Organismo Supervisor de la Inversión en Energía y Minería*, 2007). In response, the area under oil palm production doubled in the past decade and was approaching 200 km^2 in 2010. Oil palm in Peru is currently concentrated in the Ucayali and San Martin regions, where plantations have expanded dramatically in recent years (Figure 5).

Because large expanses of Peru's Amazon are suitable for oil palm cultivation (Map 11) and economic returns are high, the expansion of this crop poses a critical threat to biodiversity and tropical forests unless effective safeguards are put in place.

Oil palm cultivation is now expanding into some primary tropical forest areas of Peru. Based on spatio-temporal analyses of Landsat 7 and 8 imagery from 2012 to 2013, a palm-driven deforestation rate of roughly 100 ha per week has been quantified in the Loreto region (Figure 6) (NASA, 2013). As of early September 2013, at least 1,000 ha had been cleared near Tamshiyacu (Loreto), resulting in an estimated emission of 150,000 tons of carbon to the atmosphere.

Map 11: Area Suitable for Oil Palm Production in the Peruvian Amazon



Source: Gutierrez-Velez, 2011

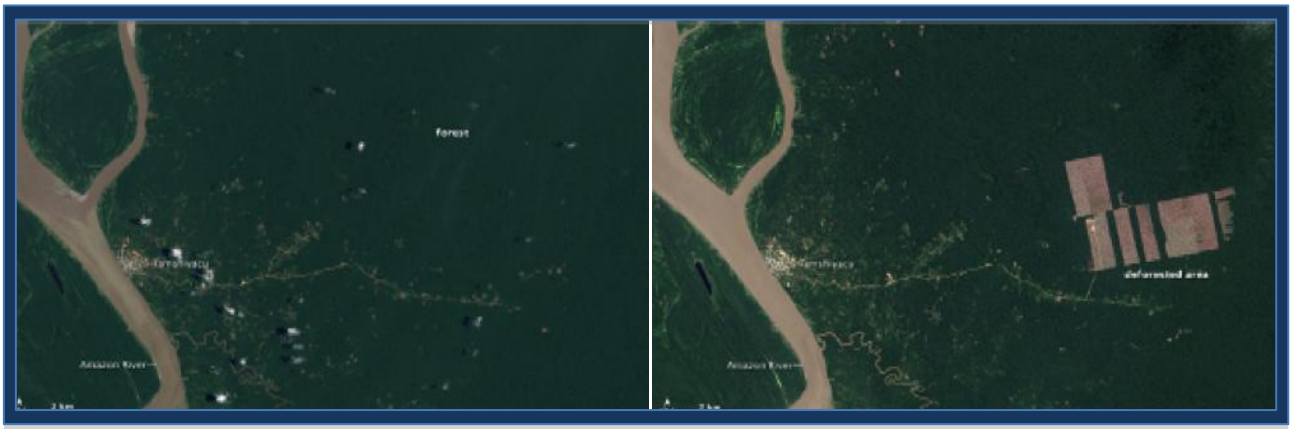
Between 2000 and 2010, Peru saw an expansion of 20,450 ha in oil palm plantation; 97 percent of that expansion occurred between 2006 and 2010, indicating a steep increase in cultivation (Gutierrez-Velez et al., 2011). Seventy-two percent of the expansion was found to be directly responsible for 1.3 percent of Peru's total deforestation from 2000-2010 (Gutierrez-Velez et al., 2011).

The specific impact oil palm cultivation on tropical forests hinges on a number of factors, among them the location and scale of the enterprise. Small- and medium-holder oil palm plantations accounted for 80 percent of the expansion in cultivation near Pucallpa in Ucayali, but only 30 percent of it was at the expense of old growth forest (Gutiérrez-Vélez et al., 2011). In stark contrast, 75 percent of the expansion of industrial-scale plantations in that same area involved the clearing of old growth forests (Gutiérrez-Vélez et al., 2011). A number of factors help to explain why corporate

interests prefer forested land for new plantations: 1) the existing possession claims and uncertain land tenure typical of areas that have degraded forests; 2) the ease of establishing large plantations and securing tenure in state-owned land outside of classified forests; and 3) the reduced chances of complications with local inhabitants and communities.

Four years have elapsed since these data were collected. Given the Peruvian government's support for oil palm and the resources available to industrial producers, it is likely that the true expansion of oil palm cultivation into Peruvian old-growth forests is underestimated here.

FIGURE 6: Deforestation and Oil Palm in Loreto, Peru; 2012-2013



Source: National Aeronautics and Space Administration (NASA) Earth Observatory. (2013). *Landsat 8 detects new deforestation in Peru*. Retrieved January 2014 from http://earthobservatory.nasa.gov/IOTD/view.php?id=82076

9.3 OVEREXPLOITATION

While quantitative evidence is limited, there was widespread agreement among individuals interviewed by the team that overexploitation is a direct threat to Peru's forests and biodiversity.[20] There are three ways in which overexploitation can take place: 1) excessive consumption in terms of amount, 2) consumption at sensitive times (e.g. reproductive period) during the life cycle of the organism in question, and 3) over-consumption of a resource upon which the species in question depends (e.g. water, food). Herein, the overexploitation of three types of natural resources is considered: fisheries, timber, and bushmeat. It is worth noting, however, that the overexploitation of other kinds of natural resources (e.g. medicinal plants) is also highly probable.

As indicated previously, three of Peru's important commercial pelagic fish species—*Sardinops sagax, Engraulis ringens*, and *Trachurus declivis*—are considered to be fully- or overexploited, with large fluctuations in catch being attributed to overfishing and unusual climate events (FAO, 2005). The same may be said for the South Pacific hake (*Merluccius spp.*), a demersal species. Freshwater species also show signs of overexploitation. In Loreto, the average size of freshwater catch has decreased, while the proportion of individuals below reproductive size per catch has increased (IIAP, 2009).

Despite scarce and outdated data, there is evidence to support the assertions of interviewed experts that wildlife populations in Peru's forests are in decline due to overharvesting, particularly those of larger ungulates (e.g. *Tapirus terrestris*) and primates (e.g. *Ateles spp. Logothrix spp. Alouatta spp.*). Peru's

[20] Defined here as the extraction of a renewable resource at rates that exceed its regenerating capacity.

marine environment is also subject to overexploitation. In spite of a ban, dolphin hunting off the coast of Peru is widespread (Council on Hemispheric Affairs, 2013). A recent (2013) expedition by national marine conservation NGO *Mundo Azul* documented the deliberate slaughter of dolphins by artisanal fishermen for shark bait and human consumption (BlueVoice.org., 2007). Based on the size of the responsible Peruvian fleet and interviews with fishermen, Mundo Azul researchers estimate that as many as fifteen thousand dolphins follow this pattern annually. An unknown additional number is killed via driftnet fisheries. Mangel et. al. (2010) concluded that the Peruvian coast is likely one of the principal areas of greatest worldwide impact with respect to small cetacean by-catch.

Overharvesting is also having a negative effect on Peru's timber resources, pushing CITES-listed species towards local extinction. About 80 percent of all the commercial timber harvested, sold, and exported from Peru is illegal (Environmental Investigation Agency, 2012). Ironically, the concessions system that Peru put in place to foster sustainable timber management has become an instrument for laundering illegally-harvested logs from protected areas and indigenous territories. Concessions may either purchase wood from illegal loggers to meet quotas or sell permits to illegal loggers for profit. Illegal timber species harvested include CITES-listed mahogany (*Swietenia macrophylla*) and cedar (*Cedrela odorata*; Finer et al., 2014). As a result of the decline of better known species, loggers are now also taking aim at lesser known species (e.g. copaiba, *Copaifera* spp.; ishpingo, *Ocotea* spp.; shihuahuaco, *Dipteryx* spp.; capirona, *Calycophyllum* spp.) that are important components of the Amazon ecosystem as habitat and food sources to primates, birds and other fauna. Between 2008 and 2010, one hundred and twelve shipments of illegally-logged cedar and mahogany were documented entering the United States, imported by 20 different companies. The high profitability of this illegal timber trade drives the continued exploitation of threatened species: the same cubic meter of mahogany that sells for $1,700 USD in Peru can be sold for $11,000 USD in the United States. The exportation of these species by Peru and their importation by US companies is in clear contravention of forest annexes in the Peru-United States FTA and the Lacey Act.

9.4 ILLEGAL AND INFORMAL GOLD MINING

Illegal and informal mining in Peru is a serious threat to tropical forests and biodiversity, as well as people. While primarily concentrated in Madre de Dios, this activity has now expanded to the Departments of Ucayali, Loreto, Amazonas, Puno, Arequipa, Lima, La Libertad, and Piura. In Madre de Dios, 99 percent of the estimated 1,546 informal mining operations take place within protected areas, their buffer zones, or indigenous territories (Brack et. al., 2011). Of these operations, only 16 had required environmental licenses. Over the past several years in Peru, it is estimated that mining has destroyed between 50,000 and 70,000 ha.[21] Whereas mining destruction in terms of area is small relative to land-use change, the intensity of its damage and contamination of waterways with mercury, diesel, and gasoline may have irreparable and widespread consequences. Gold mining as practiced in Peru's Amazon entails deforestation, destroys topsoil essential for forest regeneration, releases large amounts of sediment that degrade aquatic habitat and kill fish, and releases large amounts of mercury that go on to affect the nervous and reproductive systems of animals, fish and people. It is estimated that in Madre de Dios alone, 50 tons annually of mercury—a potent neurotoxin even in small doses—are used to segregate and amalgamate gold from the alluvium (Brack et al. 2011). About 1,500 liters of machine oil are spilled daily in the process. Large specimens of many of the region's preferred fish species contain an average of 2.5 times the maximum levels of mercury considered safe by the World Health Organization (0.5 parts per million; Brack et al., 2011).

[21] This statement is based on interviews with government officials and NGO personnel in the Madre de Dios Region. It is important to note that no official figures are currently available.

Mining creates conflict over land-use rights, Miners intent on accessing gold have illegally invaded communities and private properties (CAMEP, 2013) At the moment, there are virtually no gold-mining operations in the Amazon that meet all legal requirements. Informal miners have shown little interest in meeting the requirements for formalization, particularly obtaining environmental permits.[22]

In summary, alluvium mining as practiced by illegal and informal miners in Peru leaves behind a devastated landscape that is unable to regenerate and filled with contaminated waterways, food sources and populations. To make matters worse, mining is a principal attractor of migrant populations from the Andes to the Amazon, thus contributing to another source of pressure on Peru's forests and rivers.

9.5 INFRASTRUCTURE AS A DIRECT THREAT

Infrastructure may be both, a direct threat or a root cause of biodiversity and tropical forest loss. When the physical structure itself negatively affects ecosystems in a direct way, infrastructure is a direct threat. For example, land clearing for oil wells is a direct threat to forests that results from the presence of the oil infrastructure itself. A road that facilitates access to previously inaccessible areas has effects that go beyond the forest cleared to build the road: hunters, colonists and miners can now reach remote areas that have hitherto experienced less pressure, and have greater market access Hence, besides the direct impact caused by the presence of the structure itself, the road triggers a number of deforestation-catalyzing processes. In the latter example, the road is a root cause of both deforestation and biodiversity loss. This section addresses the direct impact of large infrastructure projects, particularly in the Amazon.

There are two regional development initiatives that will have a profound infrastructure impact on Peru's Amazon: the Initiative for the Regional Integration of Infrastructure for South America (IIRSA) and the Peru-Brazil energy agreement. While the dimensions and scope of both, were discussed earlier in this document (Section 4 "Principal Economic Sectors Related to the Environment"), they deserve a mention here due to their projected reach and predominance in the category of infrastructure as a direct threat to Amazonian forests and biodiversity. For example, IIRSA's infrastructure aims focus on dams and roads in terms of financial resources and number of projects; Peru is slated to participate in 73 of these projects under the initiative.

The Peru-Brazil agreement spans a time frame of 50 years and commits Peru to providing a 6,000 MW of hydropower to Brazil via the construction of 15 large dams in the headwaters of the Amazon's principal tributaries (Little, 2013). Dams may have serious direct impacts on biodiversity and tropical forests. First, they change the hydrological regimes of rivers. Annual floods are crucial in the Amazon for the maintenance of vegetation, soil fertility, fish reproduction, and seed dispersal, amongst other key ecological processes. Dams block the migration of large fish species and change the sediment load of rivers and streams. Further, organic matter trapped underwater produces methane, a powerful greenhouse gas. The construction and operation of dams requires personnel housing, roads, and transmission lines, further incentivizing the colonization of previously pristine areas. Finally, dams may result in the economic and physical displacement of resident populations, undermining traditional norms and cultural practices.

Power lines, ports, oil and gas pipelines, and urbanization are other forms of infrastructure that pose a direct threat to Peruvian biodiversity and tropical forests; these structures, however, are more of a concern due to the other processes that they indirectly facilitate (e.g. pipelines can lead to oil spills and

[22] This statement is based on interviews with government officials and NGO personnel Madre de Dios.

new oil concessions). Finally, it is important to recognize that impacts on tropical forests and biodiversity are not limited by political boundaries. Large infrastructure projects often affect multiple neighboring countries. For example, dams built in Brazil can affect the migration of fish into Peru, and dams in Peru can change the hydrologic regimes of rivers in all countries downstream.

9.6 HABITAT DEGRADATION

The degradation of critical habitat is one outcome of illegal mining, the cultivation of illicit crops, land-use change, land and river contamination, and the alteration of natural cycles such as the annual floods typical of large rivers in the Amazon. For example, the construction of large dams changes the regular flood regimes of rivers. These floods are fundamental components of the reproductive system of most fish species and other aquatic fauna in large Amazonian river systems, as they increase the availability of shelter and food through habitat expansion (Carvalho et al., 2007). Other examples include the negative effect of mercury contamination from gold mining on fish species' growth rates (Siangas et al., 2012), and the reduced availability of food and shelter for forest fauna that is caused by selective removal of valuable timber species.

9.7 URBAN MARKETS AND MASS PRODUCTION

As previously indicated, Peru is one of the most important worldwide centers of crop plant origin and domestication. Examples of crops native to Peru include the potato (*Solanum tuberosum*), tomato (*Solanum lycopersicum*), maize (*Zea mays*), sweet potato (*Ipomoea batatas*), ají pepper (*Capsicum baccatum*), and cotton (*Gossypium barbadense*). As the site of origin, Peru harbors a great diversity of local varieties for each of these species. This diversity, however, is succumbing to several different factors, chief among them the linkage with an urban market that economically favors large quantities and homogeneity, offering no incentive for diversity (Garcia-Yi, 2014). Fast-food chains are an excellent example of this problem, demanding consistency and homogeneity in the raw material they use to prepare products. While efficient, this business practice is fundamentally incompatible with the maintenance of agrobiodiversity. The result is that when farmers participate in urban markets, the number of local varieties declines precipitously (Garcia-Yi, 2014).

10 THE ROOT CAUSES OF BIODIVERSITY AND TROPICAL FOREST LOSS AND DEGRADATION

10.1 PREAMBLE

The identification of root causes for environmental problems is not clear-cut. The choice of root causes is partly determined by the questions being asked and the scope of the problem. For example, if the problem at hand is climate change, the root causes are society's addiction to hydrocarbons as an energy source, uncontrolled population growth, and over-consumption of goods and services. In short, it is the global economic development paradigm.

In today's globalized world, Peru is affected by global processes but has little control over them. Likewise, there is little that USAID/Peru can offer in terms of assistance to change these global processes. Peru can, however, mitigate and direct how global processes affect its environment and society. To do so, it has to address the root causes of particular sets of direct environmental threats over which it has management control. It would be futile to assume a quixotic posture by confronting a problem that is out of reach. Untangling root causes may at times be a nuanced process. For example, infrastructure, identified as a root cause of deforestation and biodiversity loss, plays a central role in catalyzing population movements within Peru; this internal migration in turn leads to a number of direct threats to tropical forests and biodiversity loss (e.g. land-use change, overexploitation of resources).

The root causes discussed below were selected based on two criteria: 1) each must be the cause of not one, but a set of related direct threats (e.g. deforestation, overexploitation); and 2) each must be within the management interests and capacity of Peru's society and government, and conducive to the objectives and limitations of USAID support.

10.2 ENVIRONMENTAL GOVERNANCE

Peru's growing economy and increasing global integration affects the country's social and ecological fabric. For example: 1) high gold prices in the global market create incentives for mining expansion in the Amazon, catalyzing migratory movements from the highlands, turning farmers into miners, and leaving behind severely degraded landscapes contaminated with mercury; 2) the global demand for fossil fuels causes energy companies to search and exploit for oil and gas in the once-pristine areas where remaining oil and gas reserves are located; 3) the increase in national hydropower facilities to meet regional electricity demands leads to dam construction, changing the hydrological regimes and ecology of river systems; 4) global and national markets for palm oil catalyze the expansion of palm plantations at the expense of primary forests; and 5) the global demand for tropical hardwoods creates an incentive to expand logging out of designated concessions and into protected areas and indigenous territories.

While these trends and processes are improving the economic well-being of Peru's population in the short-term, they are undermining the ability of the country's ecosystems to continue delivering the goods and services upon which that economic development and quality of life depend in the first place. Climate change effects act as a threat multiplier, compounding the problem.

In Peru's case, economic growth can be reconciled with tropical forest and biodiversity conservation *provided that the country enhances its environmental governance* and is able to plan, guide, regulate, monitor and control the effects of economic activities on the environment. Resolving the weaknesses in Peru's environmental governance would help to mitigate multiple direct threats to tropical forests and biodiversity, such as illegal logging, illegal mining, and the overexploitation of fishery resources and bush meat, among others. A sound environmental governance system will also importantly help the country cope with climate change effects, global factors over which Peru has no control.

The moment is opportune. As previously described, over the past several years Peru's government has taken some definitive and vital steps toward improving the country's environmental governance. Chief among them was the creation of MINAM and associated environmental institutions such as SERNANP, the Public Prosecutor Office's Office Specialized in Environmental Matters, SENACE, and SENAFOR (ongoing), among others. Peru has also signed the free trade agreement with the US (including an environmental annex), has prepared its National Environmental Policy, and is in the process of updating its National Biodiversity Strategy. These actions mark a change in the way that the country's government and a growing segment of civil society view the environment, creating an opportunity for USAID to work with Peruvians to enhance their environmental governance and help to stem the loss of biodiversity and tropical forests.

10.3 INFRASTRUCTURE AS A ROOT CAUSE

Infrastructure was discussed above as a direct threat. Herein, it is addressed as one of the root causes of tropical forest and biodiversity loss, particularly in the Amazon region.

As discussed in section 4, Peru's economy is growing fast and economic growth requires infrastructure. In the Amazon, in tandem with an expanding oil and gas industry, informal and illegal gold mining is now an integral part of the Peruvian landscape. Moreover, Peru is committed to IIRSA, a regional infrastructure integration effort that emphasizes transportation and energy. The country has also entered into a bi-lateral energy agreement with Brazil that commits it to significantly develop its hydro-electricity generating capacity. This agreement will entail the construction of extensive cross-border transmission lines, meaning that in the near future Peru's Amazon will be crisscrossed with power lines, pipelines, and roads. Some of its most important rivers, such as the Ucayali and Marañón, will be dammed.

It is a well-established fact that the expansion of infrastructure in forested areas generates a number of threats to tropical forests and biodiversity. First, the construction and operation of the infrastructure creates jobs, attracting people from other parts of the country. This increase in population augments the demand for forest products: timber, fish, bush meat, and others. Urban areas grow and with them come the problems associated with urbanization such as sewage and garbage treatment and disposal. Second, the individuals that initially came to construct the infrastructure often choose to stay. In the absence of other job opportunities, many settle along roads where they establish small farms, hunt, and fish. Generally speaking, these new arrivals have limited knowledge of the environment or affinity with it. The consequences of this process to tropical forests and biodiversity in Ecuador are now well known (Little, 2013) and were documented over thirty years ago in Brazil (Morán, 1981): rampant deforestation and increasing pressures on available natural resources (*i.e.*, through hunting, fishing, timber, etc.). This new colonization also creates the potential for conflicts with autochthonous populations and encroachment into protected areas. Third, roads and pipelines facilitate access for hunters and illegal loggers, along with transport for forest products. The increasing demand for forest products in urbanized areas

creates an incentive for the overexploitation of bush meat, fish, timber, and medicinal plants, among others.

While expansion of Amazonian infrastructure cannot be stopped, it can be regulated and its impact mitigated by effective governance.

10.4 MIGRATION AND POPULATION GROWTH

Peru is experiencing a period of large population movements. However, it should be noted that the last census (conducted in 2007; INEI, 2008) took place before the beginning of Peru's current economic boom. It is likely that internal migratory trends have changed considerably since then.[23]

The 2007 census revealed a strong migratory tendency into urban areas and some departments in the Amazon. For example, during the preceding five-year period, the Lima-Callao metropolitan area received over 600,000 people primarily from the Andes region; during that same period, the population in Madre de Dios increased by 14.8 percent (Yamada, 2010). While the urban-rural migration trend continues unabated (Hoffman and Grigera, 2013), there is a strong likelihood that migratory trends involving rural areas have changed in response to the economic opportunities that Amazonian megaproject construction and operation, mining, and hydrocarbon exploitation and exploration are now creating. Internal migration entails the movement of people from one social and ecological setting to another. As noted above, new arrivals tend to have little knowledge of or empathy for their new environmental setting, do not belong to any particular community, and often remain indefinitely.

Given Peru's plans for the expansion of infrastructure in the Amazon, the region's oil, gas and mineral resources, national population growth, and the degradation of soil resources in the highlands, immigration into the Amazon will continue to increase (Hoffman and Grigera, 2013). Resultant increases in population will lead to urban expansion and the emergence of new settlements, which in turn will spur encroachment into indigenous territories, increases in hunting and fishing pressure, contamination, and deforestation, amongst other consequences.

While growing economic opportunities in the Amazon region and urban centers tend to draw people in, the degradation of highland agricultural systems in the Andes region is a factor pushing them out. For example, approximately 445,000 ha of agriculture are estimated to have been lost from 1995 to 2007 in the departments of Puno, Apurimac, Junín, Huánuco, Cajamarca and San Martin (Hoffman and Grigera, 2013).

Whereas the internal migration of Peruvians may be difficult to stop, effective environmental governance can nonetheless mitigate its negative effects on the environment. Moreover, the magnitude and rate of these movements can be reduced if living conditions improve in the places that are losing population through emigration.

10.5 UNDERVALUING OF TROPICAL FORESTS AND BIODIVERSITY

Viewed from a sectoral perspective, tropical forests cannot compete economically with conventional land-uses, particularly oil palm. Based on this fact, there is now a recognized need to capture the full value of forests through more holistic economic valuation approaches that incorporate a broad

[23] 2014 census results published by INEI were not available at the time of study.

spectrum of the environmental goods and services provided by forest ecosystems. Furthermore, it is necessary to capture the full costs of the environmental externalities of conventional land-uses in economic valuations, such as the destruction of key habitat areas, water contamination, and species loss. Some of the most important components that should be included when calculating forest values include NTFPs, ecosystem services (particularly carbon sequestration), the regulation of regional hydrological cycles, and soil erosion control.

10.6 CLIMATE CHANGE

The potential impacts of climate change on tropical forests and biodiversity were discussed in depth in section 5. Climate change will lead to ecological changes that, while predictable in general terms, are very unpredictable at the local level and over short time frames.

11 ADDRESSING ROOT CAUSES OF FOREST AND BIODIVERSITY LOSS: PROGRAMMATIC OPPORTUNITIES FOR USAID AND OTHER DONORS

11.1 STRENGTHEN ENVIRONMENTAL GOVERNANCE

Virtually every direct threat to Peru's tropical forests and biodiversity can be mitigated by enhancing the government's capacity to plan, monitor, guide, and control the effects of a rapidly evolving economy and shifting social and demographic landscape on ecosystems. While Peru's government has taken some definitive and fundamental steps toward improving the country's environmental governance, much remains to be done to consolidate these reforms. A distillation of the opinions and information derived from the interviews, literature review, and field visits led the assessment team to the following set of priority needs that USAID could address to enhance this process:

Improve Environmental Management Knowledge – There is widespread agreement among specialists that the information and knowledge available for sound environmental management and conservation is inadequate, along with the capacity to analyze that information. This applies to virtually all categories of information. Some of the most important include: 1) biological processes; 2) resource inventories and monitoring; 3) integrated geo-referenced databases (e.g. concessions, community titles); 4) ecosystem valuations; and, 5) socioeconomic trends and dynamics. Therefore, USAID could consider an explicit knowledge-generation component within its Peru portfolio. Recommendations as to the specific types of knowledge and information management capacity that USAID should support will require an information needs assessment. However, the following list became apparent through interviews, literature reviews, and observation: 1) basic knowledge on the current state of hunting and fishing (e.g. volumes, species, value chain).; 2) enhanced knowledge on the management effectiveness of protected areas and indigenous territories; 3) enhanced knowledge on the life cycles of economically and ecologically valuable freshwater species (e.g. large migratory catfish); 4) skills for the economic valuation of ecosystem services; 5) creation or improvement of geo-referenced databases on natural resources, as a basis for modeling of relationships between potential drivers and environmental impact;

6) ecological (e.g. migratory patterns, key habitat requirements) and management (e.g. sustainable harvest levels) knowledge of important game species in selected locations, especially indigenous territories; 7) improved knowledge on the market potential of different forest products such as *camu-camu*, *copaiba*, and *ungurahua* oil. This knowledge-centered program component should be linked with institutional capacity-building and be conducted in association with Peruvian research institutions, and can also be used in policy design and decision making, e.g.: forest management plans and harvesting species.

Help Select Regional Governments Meet Environmental Governance Mandates – Peru's Decentralization Law designates a number of key environmental responsibilities to regional governments. Paramount amongst them is promoting the sustainable use of forest resources and biodiversity. In spite of the existing legal framework, however, regional governments are unable to exercise these responsibilities due to fundamental deficiencies in financial, technical and administrative capacity. Facilitating the development of this capacity with select regional governments, perhaps those that are part of CIAM, would contribute tangibly to the implementation of legal environmental mandates in Peru. A final decision as to which regional governments USAID should engage with will require further analyses and consultations. However, to leverage impact, selected regions should at least: 1) harbor tropical forests, indigenous territories, and protected areas; 2) offer conditions that enable success in initiatives such as motivated indigenous organizations and governments with a demonstrated interest in resource conservation; and 3) bring together the conditions necessary to capture the economic potential of forests and biodiversity. Priority technical aspects of regional environmental governance that require improvement include: wildlife management, fisheries, tourism management, environmental law, ecosystem management and planning, environmental impact assessment, community relations, conflict resolution, protected area management, analyses of geo-referenced information for planning, proposal development, and management of existing government programs such as REDD+ and the National Forest Conservation Program. Further, due to their administrative and financial deficiencies, regional governments often have difficulties securing funding resources from the central government and other sources. Confusion also exists with respect to the roles of regional, municipal and central government units in environmental governance. Nonetheless, given Peru's focus on decentralization, whatever support USAID renders to improve regional-level governance will assist with better environmental governance.

Support Consolidation of Peru's Evolving Public Institutional Framework for the Environment – Peru's overhaul of its environmental sector is evolving. Many of the relevant institutions are new while others, such as the Peruvian Forest Service (SERFOR), are still under formation. These institutions need assistance to become functional entities. While the exact type of assistance required should be established through a needs assessment and tailored to each institution, some potential areas of focus include: 1) administrative processes including funds procurement and financial management; 2) proposal development and donor reporting; 3) improving information availability and information management capacity; 4) strategic planning; 5) climate change, particularly REDD+; 6) environmental law; 7) protected area management, particularly for the marine protected areas; and 8) environmental impact assessment.

Prioritization from a Biodiversity Perspective – The distribution of biodiversity in Peru is far from homogeneous due to interactions of rich topographical and climatic variations with species dispersal capabilities and natural history. The Yungas highland tropical forests, concentrated on the eastern Andean slopes, are renowned centers of endemism and biodiversity. As home to the headwaters of multiple Amazonian tributaries, this ecosystem is also crucial in Peru's hydrological regimes and planned hydropower development. Based on these factors, conservation of the Yungas should be an essential part of climate change adaptation strategies for Peru and the Amazon basin. The Yungas offer a range of

opportunities for the development of PES schemes: carbon sequestration, climate adaptation, and biodiversity conservation. Finally, the Yungas region is a preferred ecosystem for illicit crop cultivation, and has experienced a seven-fold increase in forest loss in recent years (Butler, 2014). While USAID has worked in the San Martin region of highland tropical forests, it has done so primarily from an alternative development perspective. Based on the same lines of argument, Peru's freshwater ecosystems should be another program priority. In addition to housing the planet's highest freshwater fish diversity, these areas are similarly threatened by human impact (e.g. mercury contamination) and present further opportunities for PES development.

Amazon Basin Collaborative Research Program – Many of the problems affecting Peru's portions of the Amazon basin originate elsewhere, such as dam construction in Brazil, oils spills in Ecuador, and fishing practices along the Amazon and tributaries that affect migratory species. On the other hand, some processes that take place in Peru, such as illegal gold mining and oil exploration, have repercussions in Amazonian regions of neighboring countries. Solving these problems will require basin-wide collaboration subtended by an adequate body of knowledge on regional processes; this body of knowledge does not yet exist. While most Amazon basin countries have research and academic institutions that focus exclusively on the Amazon's ecosystems, there has not yet been an effective effort to develop collaborative basin-wide research programs. Hence, the need for creation of a research program that brings together Amazon-centered institutions in the neighboring basin countries (e.g. Sinchi Institute (Colombia), IIAP (Peru), INPA (Brazil), CPATU (Brazil)) to investigate shared problems that require collaborative solutions. Some immediate potential research areas include the status and behavior of large migratory catfish species, mercury contamination impact assessments, and relationships between upstream precipitation and downstream hydrologic regimes. Since there are considerable differences in the level of knowledge about sustainable use and management of forest resources among basin countries, this network of research and academic institutions can serve as an innovative mechanism for knowledge exchange. Cases in point include country-specific differences in knowledge about fruits (*camu-camu*, a*çai*) and oils used for cosmetics (*copaiba*), among many others.

Consolidate the Governance and Management of Indigenous Territories - Peru's indigenous territories cover a greater proportion of its total land area than state-run protected areas. Indigenous people have a deep understanding of this territory as well as residing in it. Furthermore, there are indigenous territories in the CIAM regions that are near or adjacent to protected areas and harbor equivalent biodiversity. Given the resource and personnel limitations of government environmental institutions, the formation of alliances with indigenous peoples to conserve forests and biodiversity is strategic on several levels. Therefore, USAID should consider a program to enhance the governance of indigenous territories. The components of such program could include: 1) territorial consolidation in which limits are established and demarcated, a vigilance system is set-up, border conflicts are resolved, and any outstanding steps for full legalization are completed; 2) capacity-building at both, the individual and institutional level, prioritizing administrative, technical, and political skills; 3) improved livelihood options, which may include a broad spectrum of activities such as enhancing the profitability of NTFPs, REDD+, ecotourism, and improved management of faunal resources for subsistence purposes.

Assist Peru in Establishing a Civil Service Law – At present, Peru does not have a civil service law. The vast majority of employees in the public service sector operate on short-term contracts, providing a disincentive for becoming well-trained public service employees. Provided Peru's government is amenable to the proposal, USAID could help to develop a civil service law that creates and regulates public service careers, thus creating incentives for public employees to enhance their performance and pursue long-term positions where continuity can be leveraged to maximize progress. Of special importance, this should include potential for career advancement for civil servants in areas related to environmental governance. At present, many civil service positions related to environmental governance

do not offer sufficient opportunity for professional advancement, and many talented civil servants choose to accept promotions to positions unrelated to environmental governance.

11.2 MITIGATE THE IMPACT OF INFRASTRUCTURE ON BIODIVERSITY AND TROPICAL FORESTS

Conduct a Strategic Environmental Impact Assessment of the Amazon Basin – Currently, there are a myriad of projects planned and under execution in the Amazon basin (discussed in previous sections). While environmental impact assessments are conducted at the project level for each, the impact of these initiatives combined is more than the sum of its parts. A critical gap in knowledge regarding the combined and synergistic effects of Amazonian megaprojects and development initiatives exists. This gap preempts basin-wide strategic planning and makes effective dialogue among neighboring countries difficult. Ideally, a strategic environmental assessment (SEA) should be conducted at the basin level; however that may be out of the management scope or interests of USAID. Alternatively, Peru could lead an SEA of planned development initiatives in its section of the Amazon basin, helping to catalyze discussions and illustrate the specific challenges and opportunities of current projects. This may help move the region toward a unified environmental approach for conservation and development of the Amazon basin.

Enhance SENACE Capacity – Peru's SENACE will play a critical role in ensuring that the negative environmental impacts of Amazonian mega-projects are avoided, mitigated, and equitably compensated. This newly-created institution currently receives capacity-building assistance from the German government; however, the needs are many. USAID could join forces with GIZ to enhance SENACE's capacity for developing EIA scopes of work, assessing the quality of EIAs, conducting audits, and monitoring the implementation of mitigation measures. At the regional level, a need to enhance the understanding of technical personnel about the EIA process has been established; other requirements may be identified through an institutional needs assessment.

11.3 MITIGATE THE IMPACT OF MIGRATION AND POPULATION GROWTH ON BIODIVERSITY AND TROPICAL FORESTS

Support Planning and Environmental Management Efforts of Regional and Municipal Governments - Should the Amazon's population continue to grow at a fast rate, regional and municipal governments will have to guide the way in which the additional population inter-phases with the environment. Effective urban and land-use planning coupled with environmental management measures would help to reduce the negative impacts of population growth on tropical forests and biodiversity. For example: 1) at the municipal scale, environmental planning may reduce the ecosystem impact of solid waste and sewage ; or 2) at the regional level, land-use planning may help to set aside high conservation value areas (HCVA) such as critical habitat for threatened species a priori to the establishment of conflicting infrastructure development. Planning based on robust geo-referenced data will also help to avoid overlaps in resource-use rights and potential conflicts between colonists and native communities. This effort should be strategically focused in the CIAM regions. In the short-term, and in preparation for the next strategy period, USAID could assist the Ucayali and Loreto regions to undertake their economic and ecological zoning (ZEE).

Raise the Environmental Awareness of Urban Populations - The market demands of urban populations have direct impacts on tropical forests and biodiversity in Peru. However, urban populations are often not aware of or interested in this connection. Bush meat is widely sold in regional capitals

irrespective of season or species. Pink dolphin oil is sold as a magical love potion, along with parts of primates sold as miraculous cures for a host of diseases. This local urban consumption creates the incentive that is behind much of the overexploitation of Peru's forest resources. The need to educate urban populations about this cycle of degradation is clear; environmental awareness campaigns should begin in schools but also extend to the general public via government- and NGO-sponsored initiatives.

Improve Ecological and Economic Performance of Small-scale Agriculture in the Highlands[24] - According to the 2007 census, 15 out of 25 Peruvian regions had net negative migration. As previously indicated, internal migratory trends are largely from rural areas in the Yungas and Andean highlands to urban centers on the coast (e.g. Lima-Callao) and some regions of the Amazon (e.g. Madre de Dios). People migrate in response to pull and push factors. Generally speaking, in Peru's case the pull is the perception of greater economic opportunity and better services in either urban areas or regions experiencing rapid development. Push factors include reduced economic opportunities and the marginal performance of agricultural production systems, amongst others such as below-standard public services (i.e. education and health). Over the past several years, USAID has focused on improving the performance of commodity crops (e.g. cacao, coffee, oil palm) under its alternative development program (USAID/Peru, 2012). In this program, the emphasis has been on market linkages and agribusinesses. Because small-scale Peruvian agricultural production systems produce a mixed variety of crops and animals for subsistence and commercialization, a shift in USAID focus from single crops to overall performance of integrated production systems may be more effective. This could be accomplished through the application of permaculture principles in addition to more conventional agro-forestry practices. The improved overall performance of small-scale agriculture would help to mitigate the "push" that forces them to seek improved livelihoods.

11.4 CAPTURING THE FULL VALUE OF TROPICAL FOREST ECOSYSTEMS

Quantify and Demonstrate the Economic Value of Tropical Forests – It is clear from the language of Peru's constitution, environmental strategies, and legal framework that biodiversity and tropical forests are viewed through an anthropocentric lens. For Peru's government to invest in the environment, it has to internalize the fact that the conservation of biodiversity and tropical forests directly benefits society. The argument for conservation has to be made from a pragmatic perspective, and by utilizing a vocabulary (*i.e.* economics) that is understood by the decision-makers that influence budget decisions. This will first require financing studies that calculate the economic benefits of ecosystem services to society and tangibly demonstrate through field-level experiences how they can be captured. The time is opportune, as Peru is currently developing a PES law that will help to internalize ecosystem service values. Promotion of the ecosystem service and ecosystem valuation concepts through forums targeted at decision-makers outside the environmental sector will also be necessary.

Reframe Tropical Forests as Generators of Multiple Services and Goods – Traditionally, Peru has viewed its forests primarily as producers of single commodities or services (e.g. timber, Brazil nuts, tourism destinations). Most existing forest concessions and management plans are for single products. Viewed in this manner, it is difficult for tropical forests to compete economically with conventional deforestation-based land uses such as cattle or oil palm. There is a pronounced need for initiatives designed to capture the full value of services and products delivered by tropical forests, including their

[24] USAID has been very successful in improving livelihoods in San Martin through an integrated development approach. If within the management interest of the agency, this approach should be replicated in other areas. This section addresses only the rural component because of its more direct linkage with forests and biodiversity.

role in climate mitigation. It is especially important for these initiatives to focus on revamping the value chains of NTFPs; for example, by forming alliances with the private sector to expand NTFP markets in Peru's urban centers. Possibilities here are many and include forest fruits, oils, fibers, and products with medicinal properties. While environmentalists tend to focus on the negative impacts of infrastructure, better access to market and communications in fact facilitates a prime opportunity to capitalize on the full value of NTFPs. Another relevant economic approach to deforestation is to establish the framework necessary to allow Peru to participate effectively in the carbon market. This would include multiple aspects of REDD+ readiness. Some of the most important are: developing regional-level forest-related emission baselines; enhancing indigenous understanding of REDD+ and the new PES Law; supporting efforts to establish a national MRV system, and clarifying the legal framework and REDD-related mandates of public institutions with influence over a national REDD+ system.

11.5 TAKE STEPS TO ADAPT SINANPE TO CLIMATE CHANGE

Integrate Conservation and Climate Adaptation Planning - Peru's protected areas system was developed without climate change considerations. Consequently, there is now a clear need to integrate conservation and adaptation planning as tools for preserving the biodiversity resident in protected areas nationwide, including indigenous territories. The point of departure for this process would be a vulnerability assessment of Peru's SINANPE to climate change. Based on that, an adaptation plan could be developed. It is imperative that it be done in a participatory manner.

Reduce Anthropogenic Pressures on Protected Areas - Peru's protected areas are under a myriad of pressures, both from within (e.g. illegal logging, hunting) and without (e.g. contamination of rivers by mining and urban areas). Ecosystem resilience is a function of ecosystem health, defined here as the ability to maintain ecological processes despite external shocks and pressures. Under analogous natural conditions, it is widely accepted that diverse ecosystems are more resilient[25] than ecosystems where diversity has been reduced. Ecosystem health and resilience are also a matter of scale, with large ecosystems possessing more of each than small ecosystems; this pattern is again linked to diversity, through species-area relationships. Anthropogenic pressures (e.g. hunting, illegal logging) on the ecosystem units that make up Peru's SINANPE reduce their biological diversity; roads, pipelines, power lines, farms, settlements, and dams decrease their size through fragmentation. In other words, anthropogenic pressures indirectly render Peru's protected areas less resilient and more vulnerable to climate change. Efforts to reduce or remove them will therefore enhance protected area resilience by stemming species loss and the alteration of key ecological interactions. Given the large dimensions of Peru's SINANPE, there is a need to focus efforts on carefully selected areas that amalgamate the conditions for a successful intervention.

[25] There are a myriad of definitions for resilience. Herein, resilience is defined as the ability of an ecosystem to recover its fundamental ecological processes following unusual and/or extreme events, shocks, and pressure.

12 OPPORTUNITIES FOR ADJUSTMENTS AND ADDITIONS TO USAID/PERU'S CURRENT PROGRAM ON BIODIVERSITY AND TROPICAL FOREST CONSERVATION

A central objective of this tropical forest and biodiversity assessment for Peru is to inform current and future USAID planning. The ongoing 2012-2016 USAID/Peru CDCS emphasizes the role of natural resource management in sustainably meeting human development needs (USAID/Peru 2012). The findings of the current assessment indicate that this focus is both warranted and in line with Peru's view of tropical forests and biodiversity, as expressed in the country's constitution, environmental strategies, and laws.

On the other hand, given the changes that have taken place since the 2012-2016 CDCS was developed, there is a need for USAID to adjust its environmental program in order to leverage new opportunities and address new threats. While section 11 of this report suggests a number of potential focal areas for USAID/Peru's forthcoming 2017-2021 strategy, the current mission could begin posturing for an efficient transition to the next strategy period. This can be achieved by initiating activities recommended for full implementation in USAID/Peru's next program, and undertaking specific analysis in anticipation of facilitating the next set of environmental projects.

It behooves USAID/Peru to include in its next country strategy a development objective (DO) that explicitly addresses biodiversity. Peru is reputedly the 4th most biodiverse country in the world, and this biodiversity merits special attention. Furthermore, ecosystem resilience, largely hinged on biodiversity, goes hand-in-hand with climate change adaptation. As such, USAID/Peru would be wise to consider an "ecosystems-based" climate change adaptation program. Finally, Peru's principal source of emissions is land-use changes and the country has a considerable REDD+ potential. USAID can help Peru to reduce its emissions while simultaneously conserving biodiversity and tropical forests through a REDD+-focused landscape program.

Table 15 lists specific interventions that could be integrated into the current mission's portfolio within the constraints of the USAID/Peru results framework. These interventions have been selected to address some of the predominant root causes of forest and biodiversity loss in Peru, and may serve to help USAID/Peru transition into its next strategy period. Because environment is cross-disciplinary theme by nature, there are activities listed under USAID non-environment DOs that are relevant to biodiversity and tropical forests. The following list is not exhaustive.

TABLE 15: Potential Activities for Integration into the Current CDCS, as a Bridge to the 2017-2021 Strategy Period

Development Objective	Intermediate Result	Recommended Activities	Root Cause of Tropical Forest and Biodiversity Loss (Rationale)
• **DO1:** Alternatives to illicit coca cultivation increased in targeted regions	• **IR1.1:** Value chain for licit crops strengthened	• Evaluate the commercial potential of selected NTFPs in areas affected by illicit coca cultivation. • Begin to diversify from a focus on single commodity crops (e.g. cacao, coffee) to an integrated approach that enhances the resilience and profitability of small-scale production systems, preferably in buffer zones. Apply permaculture principles. • Assess the potential for REDD+ projects in areas affected by illicit coca cultivation. • Support the development of PES schemes centered on forest ecosystem services, such as regulation of hydrological cycles, water provision and quality, sediment retention, and carbon sequestration.	• **Migration and population growth** (to reduce motives for migration by augmenting income opportunities).
• **DO2:** Management and quality of public service improved in the Amazon Basin	• **IR2.1:** Improved government capacity to provide quality public service	• Help CIAM member governments clarify regional environmental mandates. • Explore the possibility of helping Peru develop a civil service law.	• **Weak environmental governance** (mandates between governmental tiers are unclear, causing overlap and conflict; lack of civil service law undermines morale/performance and fosters rapid turnover).
	• **IR2.2:** Increased citizen engagement in decision-making and oversight	• Support citizen participation (e.g. workshops, assemblies) in the elaboration of Economic and Ecological Zoning plans (ZEE's) for CIAM regions, with an emphasis on indigenous groups.	• **Weak environmental governance** (ZEE elaboration acts as tool to enhance citizen engagement in public service sector).

Development Objective	Intermediate Result	Recommended Activities	Root Cause of Tropical Forest and Biodiversity Loss (Rationale)
• **DO3:** Natural resources sustainably managed in the Amazon Basin and glacier highlands	• **IR3.1** Capacity for environmental governance and natural resource management (NRM) improved.	• Strengthen the capacity of newly-established regional environmental authorities (REA) and analogues in the CIAM region. • Help Loreto to establish a regional environmental authority (or analogue). Help Madre de Dios and Ucayali regional environmental authorities to begin operating. • Provide support to the Ucayali and Loreto regions for the elaboration of each region's ZEE. Work with the IIAP. • Support Loreto region's strategic environmental assessment (SEA) process. • Introduce regional governments to concepts and methods for incorporating climate adaptation into regional planning.	• **Weak environmental governance** (REAs are key strategy partners; ZEEs provides a framework for improved environmental management).
	• **IR3.2:** Environmentally-sustainable livelihoods expanded	• Identify the commercial potential of non-conventional forest products (forest fruits, oils, fibers, and products with medicinal properties) and tourism in selected CIAM regions. • Assess the potential for REDD+ projects in indigenous territories and degraded areas.	• **Undervaluing of tropical forests and biodiversity** (Capturing the full economic value of forests acts as counterweight to non-sustainable uses).

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ANNEX A LIST OF PERSONS CONTACTED

Name	Title	Institution
Victor Merino	USAID Peru Mission Environmental Officer	USAID Peru
Jeffery Cohen	Director, Programs and Development Projects, Regional Program Office	USAID Peru
Jason Girard	Regional Environmental Advisor for South America	USAID Peru
Mónica Romo	Environment Officer	USAID Peru
Jeremy Boley	Environment Foreign Service Officer	USAID Peru
Samuel Chincaro	Program Officer	USAID Peru
Beatriz Torres	Environment Officer	USAID Peru
Patricia Fernández-Dávila Messum	Executive Director	CIMA (Center for Natural Areas Conservation, Research and Management), Lima
Tatiana Pequeño	Institutional Development Director	CIMA (Center for Natural Areas Conservation, Research and Management)
Fernando León	Regional Assessor	GIZ (German Society for International Cooperation), Lima
Melisa Luyo	Representative	DEVIDA (National Commission for Development and Life without Drugs), Lima
Margarita Suárez Alvites	Forestry Specialist	DEVIDA (National Commission for Development and Life without Drugs), Lima
Danny Wilson Nugkuag Cabrera	Legal Advisor	AIDESEP (Asociación Interétnica de Desarrollo de la Selva Peruana)
Julio Guzmán	Public Attorney, Expert in Environmental Crimes	MINAM (Ministry of Environment of Peru), Lima
Constantino Aucca	President	ECOAN (Andean Ecosystems Association), Lima
Jaime Nalvarte	Executive Director	AIDER (Association for Research and Integral Development), Lima
Alberto Paniagua	Executive Director	PROFONANPE (Peruvian Trust Fund for National Parks and Protected Areas), Lima
Pedro Gamboa	Executive Chief	SERNANP (National Service of Natural Protected Areas by the State), Lima
Luis Campos	Scientist	IIAP (Peruvian Amazon Research Institute), Lima
Pablo Benavides	General Manager	ASAMRE (Environmental Support and Waste Management Cia. Ltda.), Lima
José Álvarez	General Director	Biological Diversity Department of MINAM (Ministry of Environment of Peru), Lima
José Ríos	Forestry Expert	DEVIDA (National Commission for Development and Life without Drugs), Lima

Annex A: List of Persons Contacted

Name	Title	Institution
Karina Ramírez	Director Forestry and Wildlife Expert	CITES, General Directorate of Forestry and Wildlife, MINAGRI
Dennis del Castillo	Director of the Pro-forests Department	IIAP (Peruvian Amazon Research Institute), Iquitos
Kember Mejía	Director of the Amazon Biodiversity Research Program	IIAP (Peruvian Amazon Research Institute), Iquitos
Humberto Cordero	Technical Team Coordinator	MINAM (Ministry of Environment of Peru), Puerto Maldonado
John Flores Leiva	Area Chief of the Tambopata National Reserve	SERNANP (National Service of Natural Protected Areas by the State), Puerto Maldonado
Marcos Pastor Rojas	Senior Advisor	SERNANP (National Service of Natural Protected Areas by the State), Lima
Deyvis Huamán	Representative	AIDER (Association for Research and Integral Development), Puerto Maldonado
Francisco Román	CMDD Assistant, University of Florida Scientist	CMDD (Madre de Dios Consortium), Puerto Maldonado
Rafael Rojas	CMDD Assistant, University of Florida Scientist	CMDD (Madre de Dios Consortium), Puerto Maldonado
Gabriel Alarcón	UNAMAD (Madre de Dios Amazon University) Representative	CMDD (Madre de Dios Consortium), Puerto Maldonado
Tania Gutiérrez	PEM (Madre de Dios Special Project) Technical Assistant	CMDD (Madre de Dios Consortium), Puerto Maldonado
Gorkad Suara	Bioremediation and Forest Recovery Assistant	CMDD (Madre de Dios Consortium), Puerto Maldonado
John Farfán	UNAMAD (Madre de Dios Amazon University) Mining Department Representative	CMDD (Madre de Dios Consortium), Puerto Maldonado
Roxana Casilla	UNAMAD (Madre de Dios Amazon University) Environmental Education Representative	CMDD (Madre de Dios Consortium), Puerto Maldonado
Armando Portacaguana	Monitoring Technical	CMDD (Madre de Dios Consortium), Puerto Maldonado
Nemín Bejar	Climate Change Program Assistant	CMDD (Madre de Dios Consortium), Puerto Maldonado
Wendy Cueva	UNAMAD (Madre de Dios Amazon University) Infrastructure Representative	CMDD (Madre de Dios Consortium), Puerto Maldonado
Rosario Sevillano	Indigenous Peoples and Natural Resources Assistant	MINAM (Ministry of Environment of Peru), Lima
Christian Hudwalcker	Journalist and Mining Entrepreneur	Independent, Lima
Bruno Sanguineti	CMDD Program Manager, University of Florida	CMDD, Puerto Maldonado
Rosario Gómez	Coordinator of Economics in the Natural Resources and Environment Area	Universidad del Pacífico Research Center, Lima
Luciana Puentes	Corporate Social Responsibility	Pacífico Seguros Insurance Company, Lima
Gastón Pantoja	Water Resources Director	National Water Authority (ANA), Lima
Carlos Reynel	Forestry Senior Professor	National Agrarian University (UNA),

Annex A: List of Persons Contacted

Name	Title	Institution
		Lima
Joel Paitán	Forestry Specialist	Sierra del Divisor Reserve - National Service of Natural Protected Areas by the State (SERNANP), Pucallpa
Arcemio Calle	Chief	Alto Purús National Park National Service of Natural Protected Areas by the State (SERNANP), Pucallpa
Rafael Pino	Chief	Purús Communal Reserve, SERNANP (National Service of Natural Protected Areas by the State), Pucallpa
Enrique Neyra	Chief	El Sira Communal Reserve, SERNANP (National Service of Natural Protected Areas by the State), Pucallpa
Franz Tang	Manager	Natural Resources Administration, Ucayali Regional Government (GOERU), Pucallpa
Óscar Melgarejo	Ucayali Regional Coordinator	Perú Bosques Project, Chemonics International - USAID, Pucallpa

ANNEX B BIOGRAPHICAL SKETCHES OF TEAM MEMBERS

Joao S. de Queiroz, Team Leader and Conservation and Development Specialist. Mr. de Queiroz is a senior biodiversity and conservation specialist. He has over 27 years of experience in Africa and Latin America, having completed both long-term and short-term assignments in 17 countries in East, Southern and West Africa, 10 Central American countries and 8 South American countries. He has conducted USAID Tropical Forest and Biodiversity Assessments in Peru, Benin, Angola, and Vietnam and coordinated others as NRM manager Natural Resources Management (NRM) Advisor and Strategic Objective Team Leader (Environment and Natural Resources Management) with USAID's Regional Economic Services Office for East and Southern Africa (REDSO/ESA). Dr. Queiroz was the Chief of Party for the USAID-Financed BioREDD project in Colombia from 2011 to 2012. From 2008 to 2011 he was the Regional Director for South America for the International Union for Conservation of Nature (IUCN) responsible for its regional office in Quito and program development and implementation throughout South America. He also has extensive experience working with indigenous communities in Ecuador and Bolivia. From 1998 to 2002, he was the Climate Change and Biodiversity Advisor for USAID's Central America Environmental Program (USAID/G-CAP). From 1995 to 1998, He holds a PhD in International Range Management and has completed post-graduate training in environmental impact assessment and environmental auditing and management systems (University of London, University of Cape Town), as well as climate change and development (Harvard). Dr. Queiroz is fluent in English and Spanish and is a US citizen.

Scott Solberg, Alternate Team Leader & Quality Control: Economic Anthropologist, Environmental Management and Reg. 216 Specialist. Mr. Solberg is Sun Mountain's Environmental and Social Systems Specialist, based in Quito, Ecuador. He holds two master's degrees in 1) International Agricultural Development and 2) Community Development from the University of California Davis, and is currently a PhD candidate at the Universidad Simon Bolivar (Ecuador) in Administration, and dissertation research on Environmental Risk Management Systems in Ecuador. He has 30 years of field experience in analysis of agricultural, environmental and livelihood systems in Africa, Asia and Latin America, and has led or been a principle technical advisor in dozens of initial environmental Examinations, environmental impact assessments, livelihood assessments, PERSUAPS and or other similar environmental studies. He has also been deputy team leader in a number of tropical forestry and bio-diversity assessments in Bolivia, Mexico and five Caribbean nations over the last two years. Mr. Solberg is a dynamic leader, trainer and manager with over twenty-six years of experience in program design, implementation and evaluation, adult education and technology transfer, organizational development, environmental assessment, natural resource management and disaster risk reduction in Latin America, Asia and Africa. Mr. Solberg has extensive experience planning and leading workshops, was the CARE Environmental Point Person for six years in Latin America and is currently the Environmental Management and Training Specialist for the USAID Global Environmental Management Support (GEMS) Contract. Mr. Solberg is a United States citizen.

Daniel Griswold: **Social and Environmental Assessment Specialist.** Mr. Griswold is Sun Mountain's Social and Environmental Assessment Coordinator and holds a degree in International Development from McGill University. He has been a key team member and project coordinator for Tropical Forest and Biodiversity Assessments in Bolivia, Mexico and Vietnam. He also has been team leader or member for more than two dozen socioeconomic and environmental assessments in Latin America, Africa and Europe in accordance with national, USAID and IFC environmental regulations and procedures, and has also served as the project manager for environmental compliance and internal

auditing for an industrial project under national and IFC environmental standards. Mr. Griswold is currently the project manager for ongoing environmental compliance support to UNOPS Haiti and is a key team member for ongoing environmental management support to a large five year food security program in the DRC. Through the USAID GEMS contract, he provides environmental compliance backstopping support to USAID and contributes to developing environmental guidance material. He is also currently co-manager for the development of a cloud-based Regulation 216 environmental compliance platform for the USAID LAC region that will include semi-automated environmental review and best practice guidance.

Francisco Silva, Environmental Assessment and Management Specialist. Mr. Silva is currently Sun Mountain's Senior Environmental Monitoring and Compliance Specialist and has worked in environmental assessment, auditing, monitoring and compliance for numerous projects developed in Ecuador, Peru, Colombia, Venezuela, Honduras, México, Puerto Rico, United States of America, Albania, Libya, Yemen, Mozambique, many of them in sensitive and protected areas. He graduated as a biologist in Quito-Ecuador, from the Pontificia Universidad Católica del Ecuador (PUCE). His bachelor thesis was developed in the fields of ecology and ornithology, in Yasuní National Park, where he lived for more than year. He has more than thirteen (13) years of experience in environmental consulting, management and coordination of projects, environmental monitoring and compliance for WALSH Ecuador/USA/Peru, Ecology and Environment-USA (E&E) (2000 - 2008, 2009 - 2013), Ecuambiente Consulting Group-Ecuador (2008 - 2009), ASAMRE-Peru/Ecuador (2013), and Sun Mountain International (2013-2014). He has worked in numerous projects and studies in oil and liquefied natural gas exploration, development, production transport and storage, electric transmission lines, power generation, wind energy (Galapagos Islands and Mexico), construction of airports and air navigation systems, cruise ship operation, gold, silver and copper mining, cement processing, fiber optics cable installation, implementation of biodiversity and worldwide sustainable development guidelines, standards and principles.

Charles Hernick, **Ecologist and Environmental Policy Specialist.** Mr. Hernick is an Associate ecologist/economist at The Cadmus Group, Inc. Mr. Hernick has six years of ecology field- and laboratory-based research experience. He is an expert on USAID environmental compliance requirements, including FAA Sections 118 and 119, most recently demonstrated through his management of a tropical forestry/biodiversity and climate change vulnerability assessment for 10 Caribbean countries. He has conducted environmental impact assessments and led associated stakeholder consultations. Building off of an environmental assessment in Tanzania, Mr. Hernick presented the poster "Implications of an Ecosystem Services Review for the Kilombero Valley, Tanzania" at the IAIA Biodiversity & Ecosystem Services Symposium. He is also an expert on mitigating the financial risks associated with environmental liabilities (i.e., polluter pays principle/financial assurance). Mr. Hernick has a B.S. in Ecology from the University of Minnesota and a M.A. in International Relations and Environmental Policy from Boston University.

Cesar Ipenza, Environmental Legislation and Protected Areas Specialist. Mr. Ipenza is a is a Peruvian Lawyer currently working with the Peruvian Society for Environmental Law (SPDA) in the Program Citizenship and Socio Environmental Affairs. He has previously worked on similar biodiversity studies, including the Agreement on Biological Biodiversity in Peru and was the main legal counsel for this initiative. He is specialist in environmental law with research skills and knowledge in Community, Indigenous Peoples, Natural Resources, Environment, and National and International Environmental Legislation. He has experience in the Peruvian Government Sector and in Civil Society in conducting participatory and analytical processes in the areas of biodiversity, natural resources, mining and hydrocarbons, and land and indigenous peoples. He has experience in planning, design, development and management of cooperation projects related to sustainable proposals of indigenous and local peoples and of environmental issues. He has shown the capacity and ability for efficient teamwork. He also has

experience in training technical groups in the area of Environmental Law, and has the knowledge to implement social responsibility programs in various sectors and in impact, advocacy and transparency of extractive industries. He worked until August 2011 as an advisor to the Minister of Environment of Peru, where he managed to push extremely important issues for the conservation of one of the most diverse tropical forests in the world, this included the regularization of informal mining in Madre de Dios, issues related to the right to consultation of indigenous peoples, initiatives related to protected areas, among others. He has also been negotiating the environmental issues of Peru in the Convention on Biological Diversity.

Lucio Hernán Batallanos Rodriguez, Environmental and Agricultural Engineer. Mr. Batallanos has over 40 years of experience working on sustainable development and agriculture projects, including work with palm and cocoa as alternatives for ex-coca growers, throughout Peru. He has extensive experience as an expert consultant leading technical teams and environmental assessments for the Government of Peru and local and international organizations. He has performed upper-level management and directive positions in both public and private institutions and has extensive experience working in consultation with local and regional Peruvian government stakeholders. Between May 2003 and September 2011, he was Manager of Environmental Conservation and Degraded Ecosystem Recovery for the National Commission for Development and Life without Drugs (DEVIDA). His repertoire further includes 1972-73 hydrological assessments of the Majes, as well as more current evaluations on soil degradation as an impact of coca cultivation, the 2012 environmental audit on USAID/Peru's Alternative Development Program, and the 2013 Environmental Mitigation Plan and Report for the Peru Cocoa Alliance being implemented by CARANA Corporation.

Amy E. Rogers, Applied Ecologist and Conservation Finance Specialist. Ms. Rogers is a specialist in tropical forest regeneration ecology and the design of conservation finance innovations. Ms. Rogers holds concurrent positions as Director of the International Tropical Timber Organization's "Forest for A Living" pilot project, Senior Fellow at the Pinchot Institute for Conservation, and Research Associate at the UCLA Center for Tropical Research, and is also a freelance consultant. She has 16 years of experience working in Latin America on a range of conservation initiatives that spans from marine conservation management to reforestation design to forest regeneration science to sustainable community development. She has extensive experience in project management and the effective leadership of interdisciplinary teams. Ms. Rogers holds a PhD in Ecology & Evolutionary Biology from UCLA, a Master's in Ecology & Systematic Biology from San Francisco State University, and a Bachelor's in Biology from University of California - Santa Cruz. She has received numerous awards for her work, including the 2010 Luis F. Bacardi Advances in Tropical Conservation Award, selection as a Switzer Foundation Environmental Fellow, and the US Dept of Education's GAANN Predoctoral Fellowship.

ANNEX C SCOPE OF WORK OF RECORD

BIODIVERSITY ANALYSIS UPDATE FOR PERU
SCOPE OF WORK:

I. OBJECTIVES

The purpose of this tropical forest and biodiversity conservation needs assessment in Peru is to comply with section 118 and 119 of the Foreign Assistance Act (FAA) of 1961, as amended, and country strategy guidelines under ADS 201.3.9.2 (heretofore the '118-119 assessment'). The FAA 118-119 assessment will identify the threats to the country's forest and biodiversity resources, as well as the necessary steps for the sustainable management of those resources. The 118-119 assessment will be carried out in a manner that engages all relevant stakeholders (i.e. indigenous communities, private businesses, government officials, and others) and incorporates their views on the issues and necessary actions. This assessment will serve as a planning tool to assist USAID/Peru in better integrating environmental issues into its overall program.

II. BACKGROUND

A. POLICIES GOVERNING ENVIRONMENTAL PROCEDURES

FAA Sections 118 and 119, which addresses US bilateral foreign aid programs, require that a Tropical Forestry and Biodiversity Assessment be conducted in conjunction with the development of new foreign assistance strategies and programs. The purpose of this legal requirement is: 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/Peru conducted a full 118/119 analysis completed in 2002 to inform development of the FY 2002-2006 country strategy plan. This analysis was later updated in August 2007 in anticipation of a follow-on strategy that was postponed.

Peru has the second largest Amazonian forest (after Brazil), the longest Andean mountain chains, 71 percent of the world's tropical glaciers, and 84 of the 117 life zones identified worldwide. It is considered one of 17 Mega diverse countries and is ranked as the 12th country in the world in terms of number of endemic non-fish vertebrate species, as well as the 14th country in terms of endemic vascular plant species. Forests cover approximately 53 percent of the country, most of which is broad leaf tropical forest. The diverse ecosystems of Peru are represented in 79 protected areas of national interest, and numerous others of departmental and municipal interest.

Since the 2007 update, the political, institutional and economic situation in Peru has changed considerably, particularly with the decentralization process, the creation of the Ministry of Environment and the laws and regulations regarding Prior consultation and Indigenous issues, and forests resources and wildlife. Also, new threats to deforestation such as illegal logging and mining have accelerated their pace. Given these changes, and in preparation for the implementation of the Mission's 2012- 2016 Country Development Cooperation Strategy (CDCS), USAID/Peru seeks to conduct a new 118-119 assessment.

C. USAID'S PROGRAM IN PERU

The CDCS Goal is that Peru's stability and democracy be strengthened through increased social and economic inclusion and reductions in illicit coca cultivation and the illegal exploitation of natural resources. Given Peru's development context, the challenges and opportunities it faces, and the evidence that supports potential success, USAID's strategy focuses on realistic results within its manageable interest. The Mission has prioritized three integrated Development Objectives (DOs):

DO-1: Alternatives to illicit coca cultivation increased in targeted regions
DO-2: Management and quality of public services improved in the Amazon Basin
DO-3: Natural resources sustainably managed in the Amazon Basin and glacier highlands

III. STATEMENT OF WORK

In addition to the assessment scope as defined in FAA sections 118/119 and stated above, GEMS will take the following into account in preparing the assessment:

1. Sustainable management of forest resources involves a wide-range of actors at all levels of government and civil society. Many times, this wide-range of actors present divergent views on the main issues. The goal should not be, though, a simple recounting of the many and varying views, but rather to synthesize those views in a way that allows USAID/Peru to work effectively and, above all, with respect for the diversity of opinions in the country. Consultation may use different methods such as: interviews with key individuals, surveys among the main NGOs working in the forest/biodiversity sector, and stakeholder workshops with government officers and representatives from communities, private sector enterprises, and indigenous groups.

2. A revision of USAID/Peru's 118/119 assessment need not duplicate already-existing information. Instead, the assessment should use the previous assessment as a point of departure and focus more on what has changed in Peru from the time of the previous analysis to the present (change analysis).

3. Peru's Second Communication on Climate Change to the UNFCCC should also be taken into account in this assessment and complement additional analysis, if needed, to cover climate change issues in relation to tropical forests and biodiversity.

4. USAID/Peru is specifically interested in addressing environmental issues regarding mercury contamination from alluvial gold mining as a threat to the direct causes of the loss of biodiversity and tropical forests, its impact along the trophic chain, and what options for environmental remediation exist. Also, an analysis of existing barriers to reduce/control the aforementioned contamination, as well as of specific activities designed to remove or reduce those barriers.

5. Review USAID publication "Best Practices for Biodiversity and Tropical Forest Assessments", April 2005 [http://pdf.usaid.gov/pdf_docs/PNADE673.pdf], which provides USAID's Agency-wide guidance

and best practices on the preparation of 118-119 assessments.

A. TECHNICAL APPROACH

GEMS will conduct a mixed-method assessment utilizing rapid appraisal techniques and a triangulated information collection approach to minimize perceptions of perceived and actual bias. Specifically, we will organize our work in three phases:

- Phase 1: Document Review, Fieldwork Planning and Work Plan
- Phase 2: Kickoff meetings with USAID, Fieldwork, Present and Discuss Preliminary Findings to USAID
- Phase 3: Prepare Draft Assessment Report, Incorporate USAID Comments, Final Report Submission

During all phases we will coordinate with USAID/Peru and Washington staff, as appropriate, to ensure the assessment incorporates lessons learned from past USAID experience and responds to USAID strategic priorities and realities.

Phase I

During this phase we will conduct a thorough document review to identify key issues and information gaps for further study during the fieldwork phase. We will then plan fieldwork activities and develop our work plan based on findings from the document review and preliminary discussions with USAID.

Document review will include documents recommended by USAID, as well as additional topical reports identified through a literature review and consultations with Peruvian experts. Our team will include at least one Peruvian expert with extensive experience and understanding of natural resource governance and conservation in Peru with knowledge of and access to important topical studies pertinent to this review. The topical focus of the document review will be based on the proposed content of the final assessment report, presented below. This document review will ensure that our team has a foundational understanding of existing USAID activities and the situation of biodiversity and tropical forests in Peru prior to beginning fieldwork.

Fieldwork planning will include an initial identification and evaluation of key topics and information gaps identified during the document review and preliminary discussions with USAID. Topics and gaps may include natural resource management initiatives; laws and policies; conservation status; impacts and threats; priority areas and actions for tropical forest and biodiversity conservation in Peru; and transboundary issues; among others.

We will then contact Peruvian experts and stakeholders of interest to the assessment to schedule interviews. One or more participatory workshops may be organized if deemed appropriate by USAID/Peru staff. Planning will also include preparation of interview guides and a draft report structure to ensure that fieldwork by all team members is closely coordinated.

Work Plan: We will develop a draft work plan based on our fieldwork planning, which we will share with USAID for review and recommendations prior to the kickoff meeting at the beginning of phase II.

Phase II

Phase II will focus on fieldwork to gather, ground-truth and evaluate information on the current

situation of Peru's tropical forests and biodiversity. We will also conduct a preliminary analysis of results to present to mission staff at an exit briefing at the conclusion of fieldwork, before the report is drafted.

Kickoff Meeting: We will begin Phase II by meeting with USAID/Peru personnel involved in strategic planning for 2016-2020 to ensure the assessment scope is consistent with USAID planning and needs. The objective of the meeting will also be to ensure that the team has a solid understanding of Mission program goals and objectives under its proposed updated strategy, perspectives of this assignment and specific interests for the team, and to confirm protocol on approaching USAID partners and host country organizations with respect to this assignment. This meeting will also be an opportunity for USAID/Peru to clarify any sensitivity related to the assessment.

Fieldwork: The field assessment will include stakeholder interviews, identification of additional documents and, potentially, participatory stakeholder workshops. It is anticipated that the USAID/Peru mission project portfolio will provide an initial set of stakeholder conservation activities that are relevant to the assessment. SMTN will use this initial set of projects to make contacts and identify additional activities ongoing in the country. It is also anticipated that USAID/Peru mission staff will assist the team in contacting key stakeholders to arrange interviews and possibly workshops. A preliminary list of experts, who will be contacted for interviews or participation in workshops, will be assembled in collaboration with USAID and key in-country contacts.

Interviews and possible workshops will be key to evaluating the perspectives of different stakeholders regarding the drivers of tropical forest and biodiversity conservation, the success of ongoing conservation actions and USAID programs and the actions needed to promote tropical forest and biodiversity conservation in Peru.

These consultations can also help to identify areas of consensus and conflict among different stakeholder groups that will inform recommendations for USAID collaboration with different stakeholders and participation in existing initiatives.

Global Climate Change (GCC) is a cross-cutting theme that will receive special attention during all phases of the project. The climate change analysis aspect of the assessment will draw upon the REDD+ (Reducing Emissions from Deforestation and Forest Degradation) assessment for Peru completed by USAID/PERU in 2011 and the USAID January 2012 Global Climate Change and Development Strategy in order to ensure that all data collection, analysis and recommendations consider the agency's country and global strategies. Specifically, the evaluation will consider both climate change mitigation and adaptation strategies including analysis of new information and strategies not considered in the 2011 REDD+ report, as relevant to tropical forest and biodiversity conservation.

The following topics will also be considered during discussions with stakeholders, although formal evaluations will be conducted during Phase III.

- Proposed Actions: We will analyze the extent to which USAID actions proposed for the period 2016 – 2020, insofar as they have been defined at the time of the assessment; correspond to the priority requirements for conserving Peru's biodiversity and sustainably managing its tropical forests.

- Constraints: We will examine potential implementation constraints that USAID/Peru may encounter; actions will be identified and recommendations will be made for further actions to consider that are not described or outlined in the Strategic Statement.

- Effects: We will assess the potential effects of USAID/Peru's entire proposed strategy on Peru's

tropical forests and biodiversity (including the Strategic Objectives for Alternative Development, Economic Opportunities, Environment, and Democracy and Governance); these will be assessed and any relevant suggestions will be made for actions to avoid, mitigate or compensate for these effects.

- Opportunities: We will identify alternative opportunities for low-cost and effective cross-sectoral actions that would favor the conservation of Peru's biodiversity, tropical forests and global climate change mitigation and adaptation.

Field Trip: We propose to base the assessment from Lima, to ensure close coordination with the USAID mission and access to key government stakeholders. In addition, we tentatively propose visits to three sites outside of Lima. Possible locations include Iquitos, Tarapoto, and the Madre de Dios region.

These areas have been identified based upon our evaluation teams criteria including, 1) High density of key tropical forest and biodiversity conservation stakeholders; 2) Geographic focus areas for USAID/Peru, particularly related to tropical forest and biodiversity conservation and; 3) Presence of representative, high conservation value areas of tropical forest and biodiversity, particularly areas facing significant potential threats to conservation. The proposed field sites are to be confirmed and modified according to further consultation with key stakeholders in the USAID mission.

Fieldwork Debriefing with USAID:

We will hold an exit briefing with USAID to discuss findings from fieldwork and evaluate them in the context of USAID planning and constraints. We will also hold preliminary discussions of opportunities for USAID planning, and the possible effects of existing plans and newly identified options. This discussion will guide report preparation during phase III.

Phase III

Report Writing and Revision: We proposed the following outline for report preparation.
The proposed report structure and content is based on the report structure proposed in the USAID guidance document Best Practices for Biodiversity and Tropical Forest Assessments. The structure may be adapted as appropriate to best incorporate and analyze assessment findings. The report sections are described in order, below.

The report will include a concise Executive Summary in English.

The report Introduction will include a description of the report purpose, objectives, scope and methodology.

The physical, biological and social Geography of Peru will then presented. This section will present concise baseline information for each of these categories. The description of Peru's biological environment in this chapter will include a description of the location and diversity of ecosystems, species and genetic material. It will identify different vegetation types, including tropical forests.

The Institutional Framework and governance structure for conservation will then be evaluated at the international, national, regional and local levels. This will include an assessment of government, private sector and civil society institutions, particularly those sectors of interest to USAID/Peru.

Key Legislation and Policy will be reviewed as related to conservation, such as land use regulations,

environmental assessment and management. This will include an evaluation of the local, national and international contexts as relevant, e.g. the impact of trade policy on tropical forest and biodiversity conservation.

The Conservation Status, Trends and Drivers of Degradation for each key ecosystem in Peru will be described in an integrated manner, including the primary threats and root causes of degradation. Protected areas and endangered species will receive specific attention as part of this assessment, and climate change will be considered in the evaluation of status, trends and drivers of degradation.

The organization of this section will be based on existing ecological stratifications of the country. This structure, which combines the conditions and trends of each ecosystem on one sub-section, will help the reader visualize and understand the cause and effect linkages that are behind positive and negative environmental trends affecting each ecosystem. This arrangement will also permit USAID/Peru discern actions it could undertake to address the drivers of degradation and promote conservation of biodiversity and tropical forests.

This section will incorporate a summary of the scope and effectiveness of existing conservation efforts in Peru.

The report will end with a Conclusions and Recommendations section. In addition to presenting the conclusions with respect to the status quo of biodiversity and tropical forests in Peru, this section will analyze the USAID/Peru proposed country strategy and suggest ways in which biodiversity and tropical forest concerns could be incorporated. This section will also review the progress to date in bridging the gaps in conservation identified in the 2007 Peru Tropical Forest and Biodiversity Assessment.

Annexes will be included as appropriate.

During this phase, we will continue to work closely with USAID/Peru while formulating recommendations to integrate feasible priority conservation actions into its 2016 to 2020 strategic planning.

Draft Report: We will prepare a draft report for review by USAID prior to submitting the final report. We will also share this report with select Peruvian experts for quality control to ensure all information is accurate. See deliverables section.

Final Report: We will submit the final report after receiving and implementing comments from USAID and Peruvian experts on the draft report. See deliverables section.

Constraints: We believe that the methodology for the preparation of the assessment must reflect the nature of the constraints to overcome in order to produce a high-quality report that responds fully to USAID/Peru needs within the time period available. The principal constraint that will affect the preparation of the report is the short time period available for preparation of the assessment.

We propose to overcome this constraint in two ways. First, we propose to quickly establish the priorities for the conservation of biodiversity and tropical forests in terms of (a) geographic location; (b) categories of activities which USAID/Peru could finance, especially in order to achieve significant results at a reasonable cost and to integrate conservation into its entire 2016 – 2020 planning; and (c) successful prior conservation experiences. We propose that these priorities be established at our initial meeting with USAID technical staff.

IV. DELIVERABLES

There shall be four deliverables:

1. Preliminary Work Plan and Schedule: The contractor shall submit a work plan and schedule for the assessment which will be subject to Mission approval. During the first in-country briefing meeting, USAID/Peru and the contractor will review the work plan and timeline and the contractor will make any necessary adjustments. The work plan shall also contain a list of those individuals and agencies that are to be interviewed, a list of reports, evaluations, etc. to be reviewed, and a proposed series of workshops/focus groups in key regions. The latter should engage the diverse concerned communities to achieve a cross-sectoral perspective on key issues.

2. Debriefing Meetings: The team shall hold at least two debriefing meetings with USAID/Peru, including: a) a kickoff meeting at the USAID/Peru office in Lima to discuss the work plan and schedule; and b) an exit briefing at the conclusion of fieldwork to present preliminary findings and recommendations. The exit briefing shall be accompanied by a two-page written summary of key preliminary findings and recommendations.

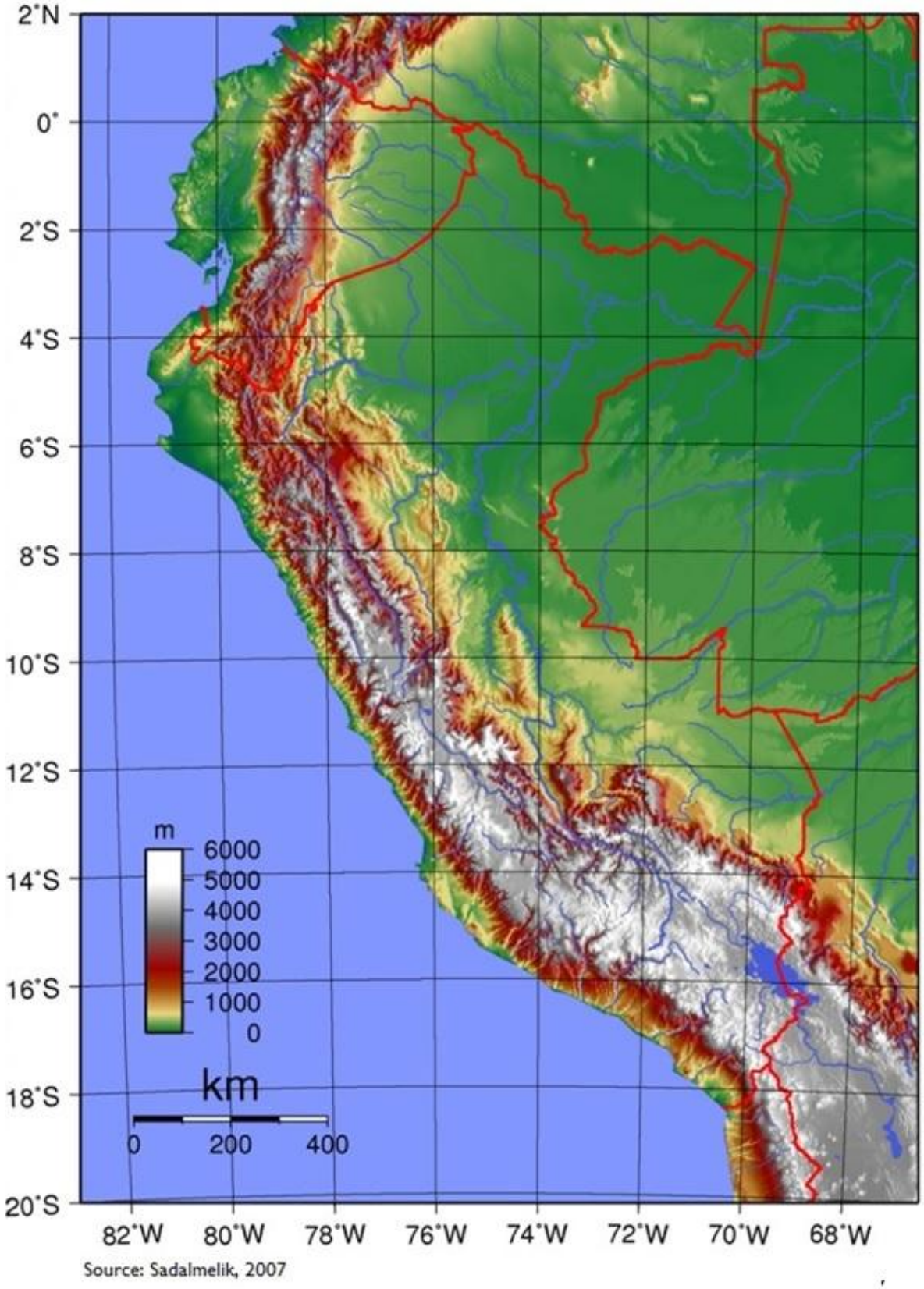
3. Draft Report: The contractor shall submit a draft report to USAID/Peru within four weeks of completing fieldwork (electronic copy in English, with an Executive Summary in Spanish). The recommended outline for the report is provided in Annex D (USAID Country X Biodiversity and Tropical Forests Assessment Outline) of USAID's Best Practices for Biodiversity and Tropical Forest Assessments (http://pdf.usaid.gov/pdf_docs/PNADE673.pdf). Written reports of each workshop findings shall be included as annexes to the final 118-119 assessment report (in English, electronic, plus two hard copies of each). The report shall include a separate section on environmental issues regarding mercury contamination from alluvial gold mining.

4. Final Report: the final report is due no later than two weeks after USAID/Peru's comments on the first draft report. This report shall clearly meet the legal requirement of FAA Sections 118 and 119 by clearly articulating the actions necessary to conserve tropical forests and biodiversity in Peru and clearly describing the extent to which actions proposed in the CDCS meet the needs identified. In addition to an electronic report, 2 hardcopies of the final report will be submitted in English with an executive summary in Spanish.

Note: Any maps produced as part of this assessment, in addition to their inclusion in the draft and final reports, shall be provided to USAID/Peru separately in previously agreed upon electronic and print formats.

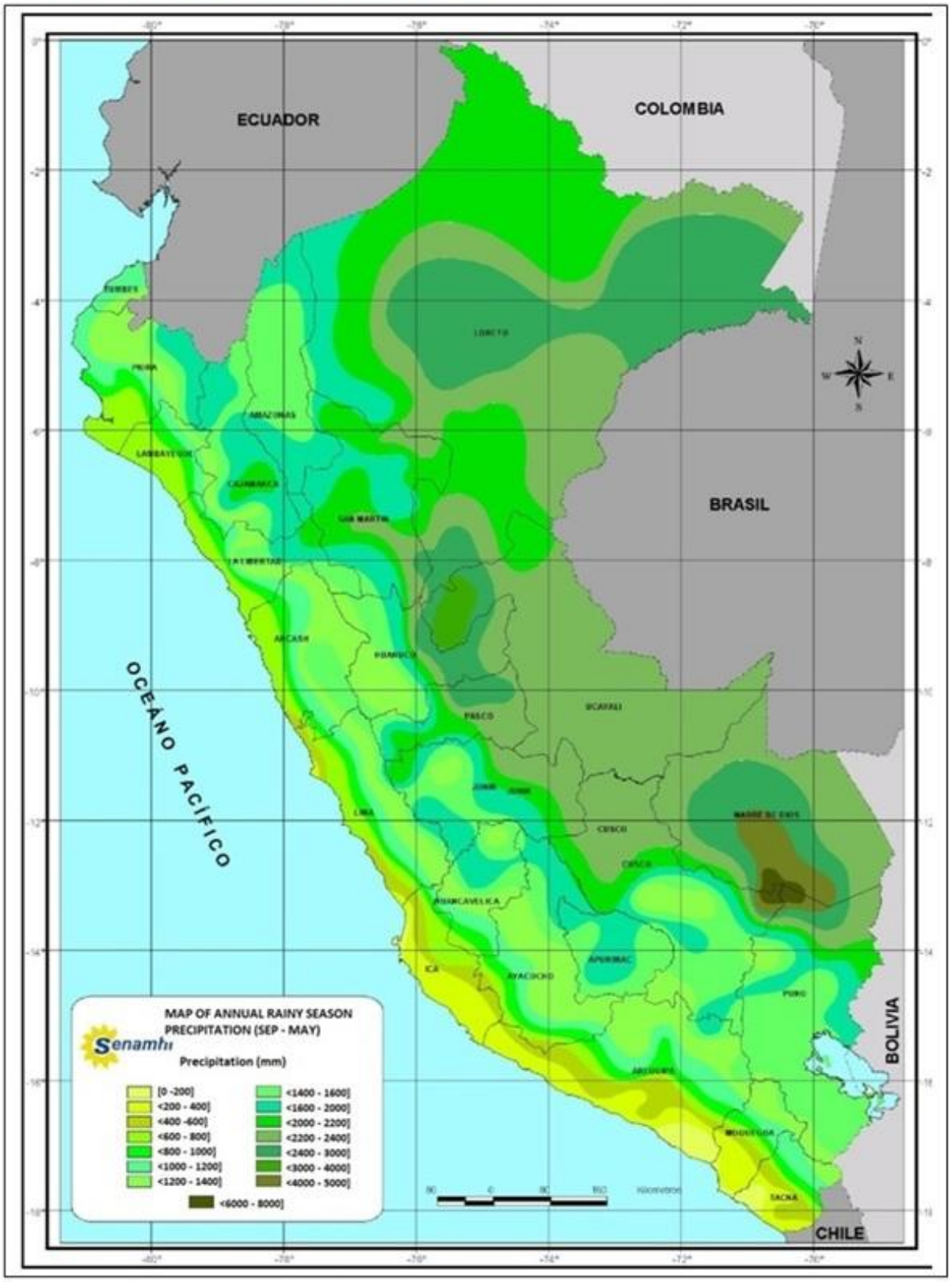
ANNEX D MAPS

MAP 1: TOPOGRAPHY OF PERU



Source: Sadalmelik, 2007

MAP 2: RAINFALL DISTRIBUTION IN PERU

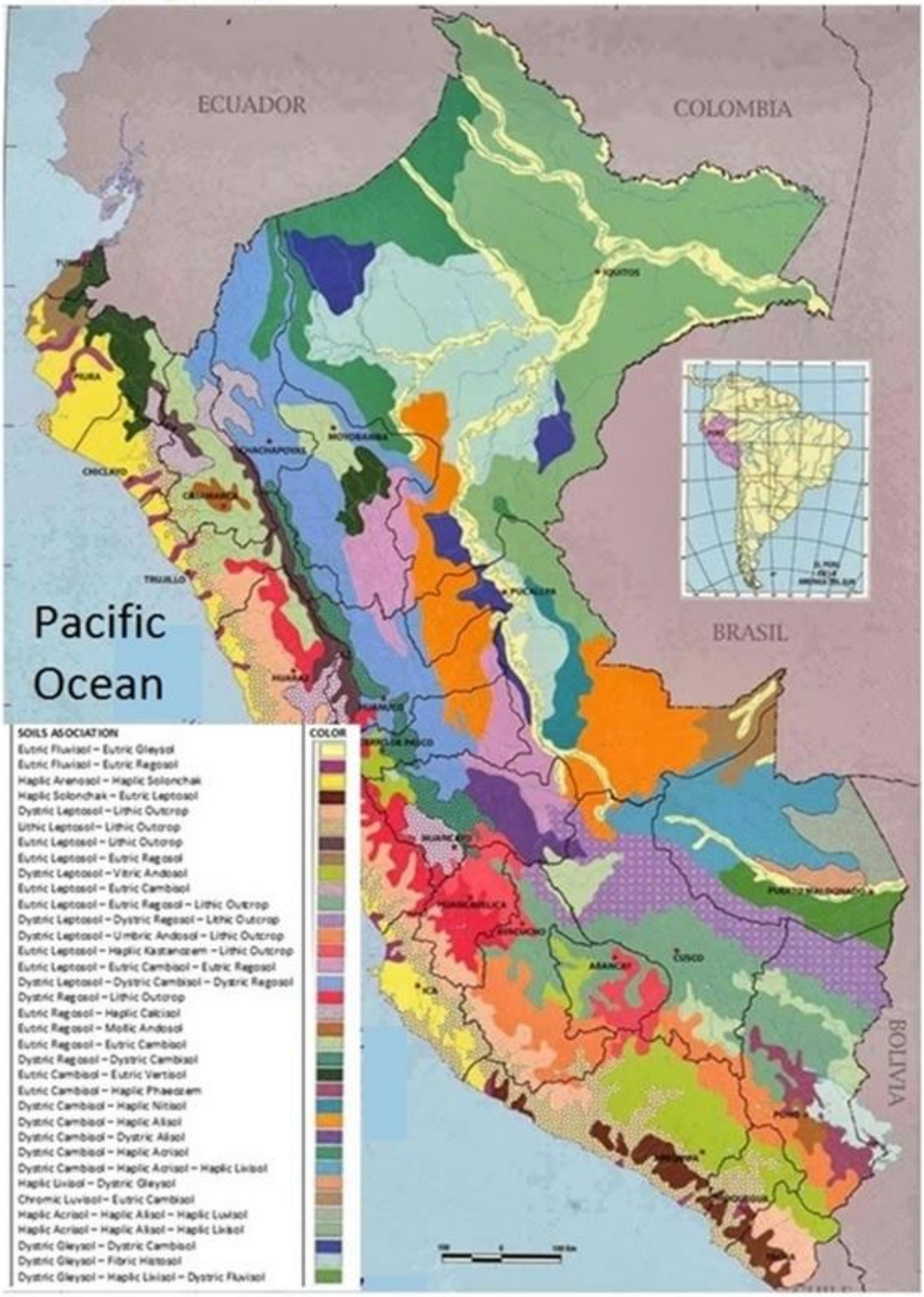


Source: http://www.senamhi.gob.pe/, 2000

MAP 3: HYDROGRAPHIC REGIONS OF PERU

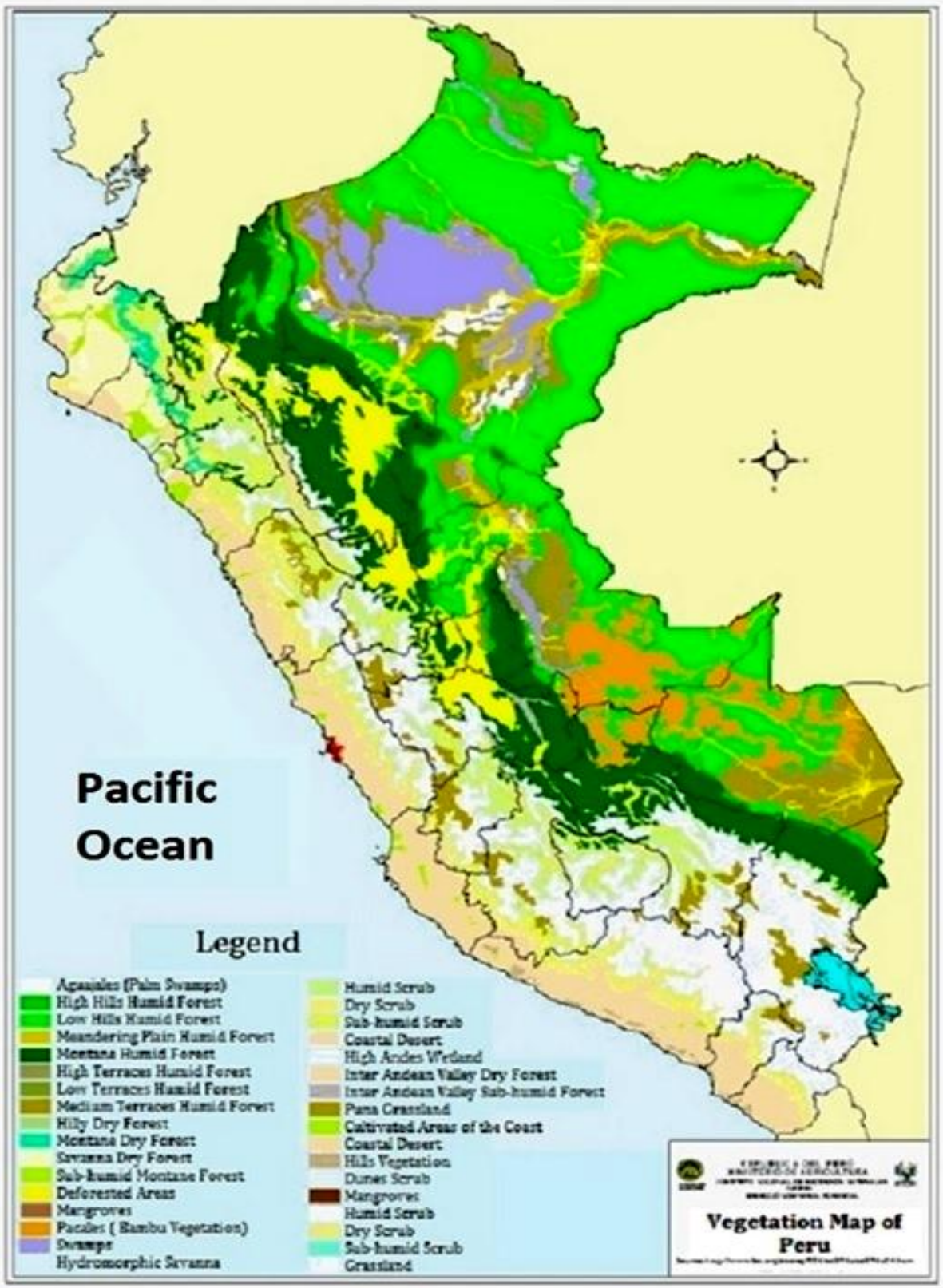
Source: Autoridad Nacional del Agua - ANA; Ministerio del Ambiente de Peru, 2003

MAP 4: SOILS OF PERU



Source: http://kenymaycastillo.blogspot.com/, 2013

MAP 5: VEGETATION OF PERU

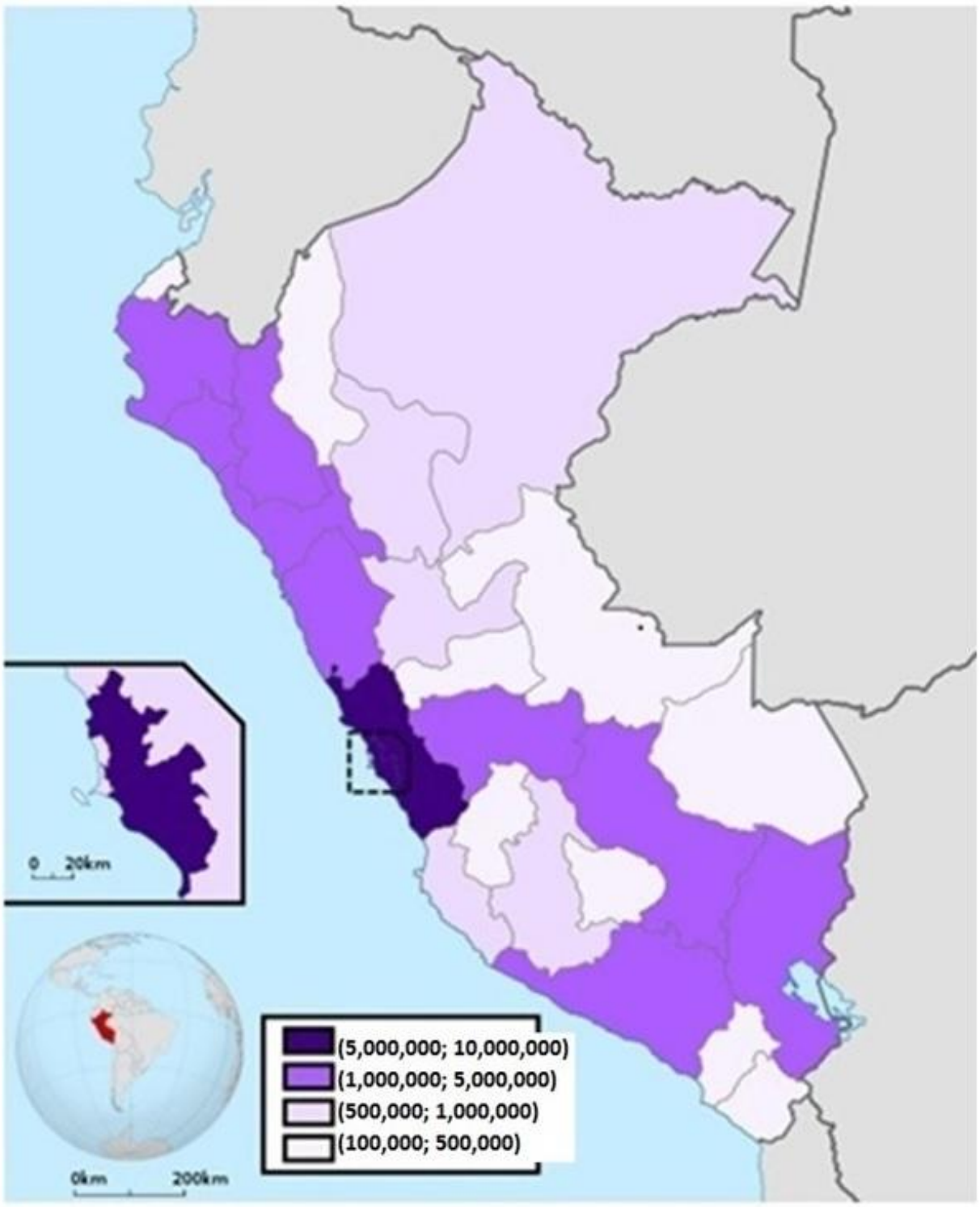


Source: http://www.fao.org/docrep/006/ad396s/ad396s04.htm, 2012

MAP 6: ECOREGIONS OF PERU

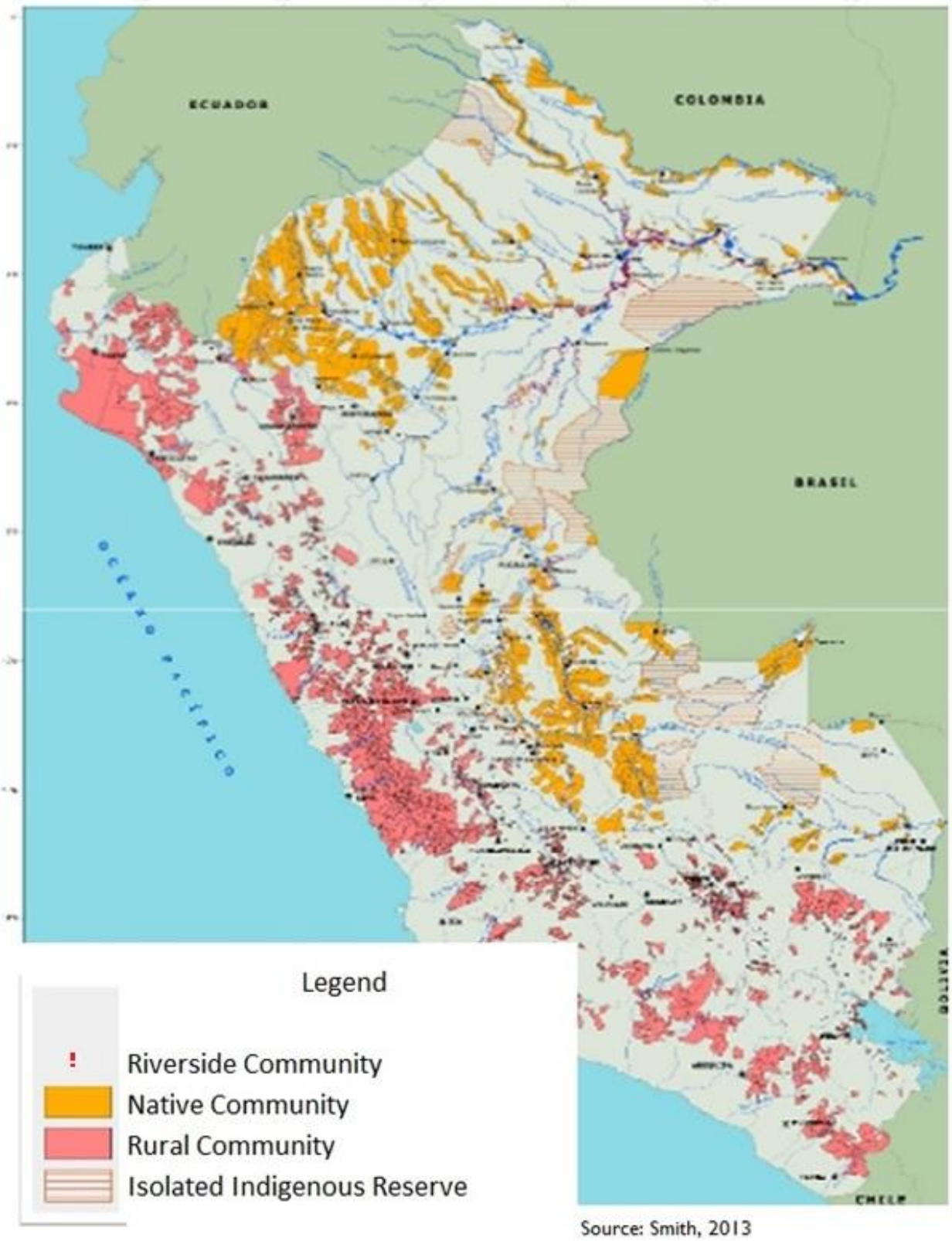
Source: http://antonietacorrrea.blogspot.com/2011/11/ecorregiones-del-peru.html - Correa, 2012

MAP 7: POPULATION DISTRIBUTION IN PERU



Source: Instituto Nacional de Estadística e Informática, *Perfil sociodemográfico del Perú,* 2009

MAP 8: DISTRIBUTION OF NATIVE AND RURAL COMMUNITIES IN PERU



Source: Smith, 2013

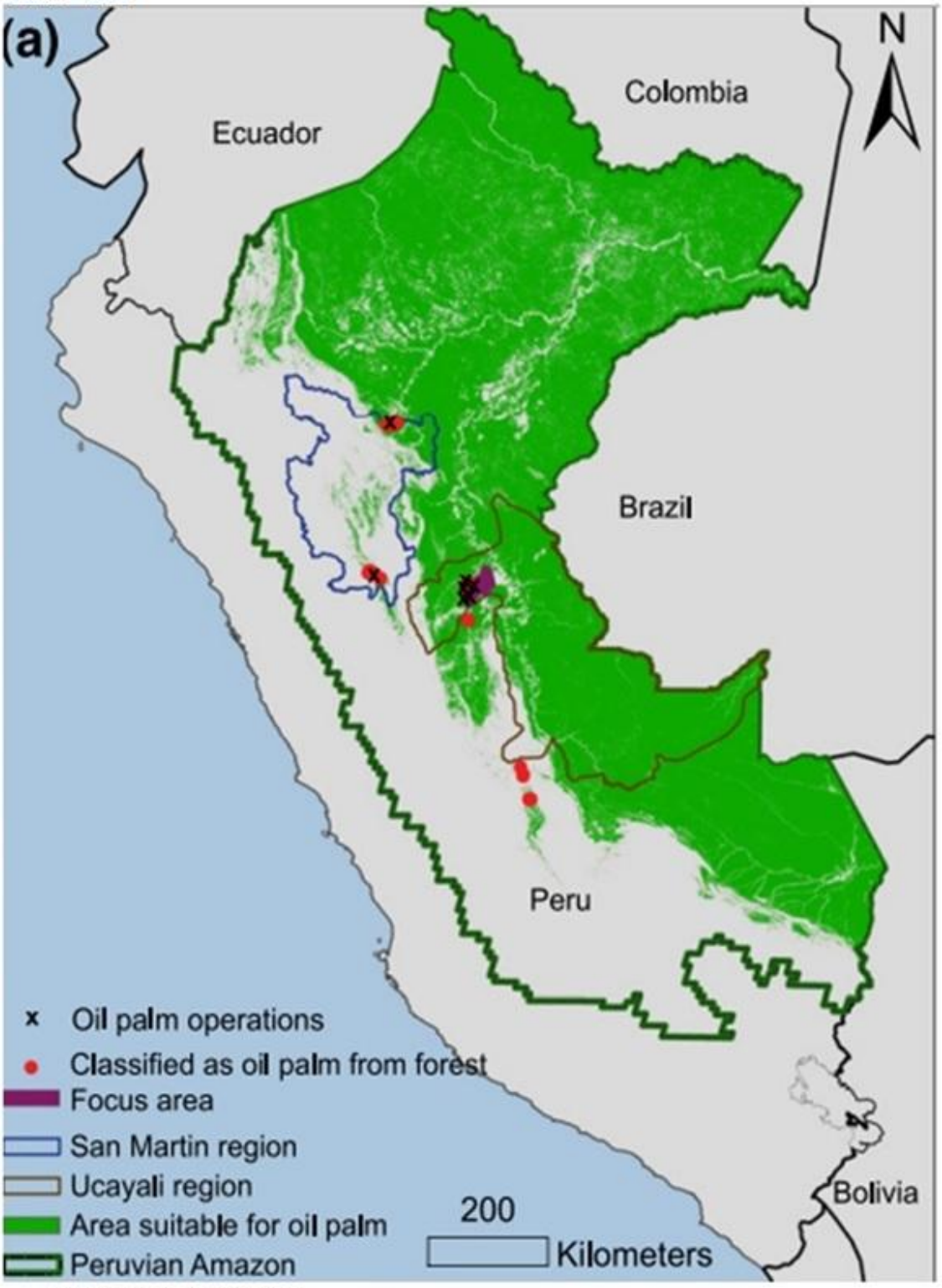
MAP 9: PERUPETRO CONCESSION BLOCK MAP & CONSERVATION AREAS

Source: PeruPetro, 2014

MAP 10: PROTECTED AREAS IN PERU

Source: http://alexanderflorezgonzales.blogspot.com/2013/09/mapa-de-areas-naturales-protegidas-para.html - SERNANP, 2013

MAP 11: AREA SUITABLE FOR OIL PALM PRODUCTION IN THE PERUVIAN AMAZON



Source: Gutierrez-Velez, 2011

ANNEX E TABLE OF ECOREGIONS OF PERU

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
1. Tropical Sea	• Along the northern coast from Piura to the Ecuadorian border • Sea level (0 masl)	• Relatively high water temperatures and weaker temperature inversion than found in the south • Semi-arid but receives more precipitation than the Coastal Pacific Desert	• Rhizophora Mangrove, Yellow Warbler Mangrove (*Dendroica petechia bryanti*), Cuckoo Mangrove (*Coccyzus minor*)	• Loggerhead turtle (*Caretta caretta*), Leatherback turtle (*Dermochelys coriacea*), Magnificent frigatebird (*Fregata magnificens*), Blue-footed booby (*Sula nebouxii*), American crocodile (*Crocodylus acutus*), Tiger shark (*Galeocerdo cuvier*), Yellow snake eel (*Ophichthus zophochir*), and Crab-eating raccoon (*Procyon cancrivorus*)	• Part of the Tumbes-Chocó-Magdalena biodiversity hotspot • Houses Peru's largest extension of mangroves
2. Cold Sea Peruvian (Humboldt) Current	• Along most of the coast from Piura to the Chilean border • Sea level (0 masl)	• Relatively low water temperatures and stronger temperature inversion than found in the north • Average temperatures drop to 13°C in winter and rise to 17°C in summer • Formed by the Humboldt Current	• Mostly weed, lichens and *Tillandsia* species (e.g. *Gigartina chamissoi, Grapeloupia doryphora*), plus sea lettuces (*Ulva fasciata f. costata*), aracanto (*Macrocystis integrifolia*),and wood sorrel (*Oxalis* spp.) • Common woody plants include: species of *Solanum* and chañar (*Geoffroea decorticans*)	• Abundant species acting as base of food chain: Peruvian anchoveta (*Engraulis ringens*), Sardine (*Sardinops sagax*), and Jack mackerel (*Trachurus symmetricus*) • Larger fauna include: Burmeister's porpoise (*Phocoena spinipinnis*), Marine otter (*Lutra felina*), South American sea lion (*Otaria flavescens*), South American fur seal (*Arctocephalus australis*), Elliot's storm petrel (*Oceanites gracilis*), Humboldt penguin (*Spheniscus humboldti*), Guanay cormorant (*Phalacrocorax bouganvilli*), Peruvian tern (*Sterna lorata*), and Inca tern (*Larosterna inca*)	• These waters are called a "plankton soup" by scientists, due to the nutrient-rich conditions that favor animal and plant life
3. Coastal Pacific	• Runs almost the entire coast	• Average daily temperatures drop	• American carob (*Prosopis pallida*), palo verde	• Endemic species: Slender-billed finch (*Xenospingus concolor*),	• This ecoregion hosts - 14,973,264 people

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
Desert	from Tacna to the south of Piura - 7,461,563 ha • Sea level to 500 masl • Consists of flat areas, dunes, and hills • Scoured by approximately 52 rivers, mostly intermittent • Includes the sub-ecoregions of Tumbes-Piura dry forests and Marañón dry forests	to 10°C in winter and rise to 21°C in summer • Features some of the world's driest areas • Annual rainfall is scarce, with most precipitation (~500 mm, from May to October) via condensation (*garúa*)	(*Parkinsonia* sp.) and salty grama grass (*Distichlis spicata*)	Great Inca-finch (*Incaspiza pulchra*), and Raimondi's yellow-finch (*Sicalis raimondi*), and Pied-crested tit-tyrant (*Anairetes reguloides*)	(53.1 percent of the country´s total population)
4. Equatorial Dry Forest	• Located in Departments of Tumbes, Piura and Lambayeque - 5,603,754 ha • Consists of plains and rolling hills that extend inland from coastal to mountainous areas • Principal rivers:	• Minimal annual temperature variations, from24°C to 27°C • Well-defined dry season with limited precipitation (100-500 mm) between January and March	• Species adapted to the extremely arid conditions of the dry season: hualtaco (*Loxopterigium huasango*), guayacán (*Tabebuia billbergii*), palo santo (*Bursera graveolens*), ébano (*Ziziphus thyrsiflora*), charán (*Caesalpinea corymbosa*), sapote (*Capparis angulata*), pasallo (*Bombax discolor*), angolo (*Pitthecellobium multiflorum*), almendro (*Geoffroya striata*), the endemic ceiba (*Ceiba*	• Mammal species include: White-tailed deer (*Odocoileus virginianus*), Sechuran fox (*Lycalopex sechurae*), and Southern tamandua (*Tamandua tetradactyla*) • Bird species include: White-winged Guan (*Penelope albipennis*),the Pacific parrotlet (*Forpus coelestis*), the endemic Watkins's antpitta (*Grallaria watkinsi*), and the endemic Velvet-fronted Euphonia (*Euphonia concinna*)	• Part of the Tumbes-Chocó-Magdalena biodiversity hotspot • Contains approximately 40 endemic bird species • Many plant species have nitrogen-fixing capabilities, contributing to the survival of a large number of species of flora and fauna • WWF Conservation

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
	Zarumilla, Tumbes, Piura and Chira • Sub-ecoregions are Tumbes-Piura dry forests and Marañón dry forests		*trichistandra*), papelillo (*Bouganvillea* sp.), yellow geiger (*Cordia lutea*), and species of mesquite (*Prosopis* spp.)		Status - Critical/Endangered, due to habitat degradation/ unsustainable timber extraction
5. Pacific Tropical Forest	• Small enclave located in the Tumbes department of northern Peru - 49,182 ha • Sub-ecoregion is Southwest Amazon moist forests	• Minimal annual temperature variations (24-26°C), with more pronounced daily fluctuations (10-15°C) • Average precipitation range of 300 to 1500 mm per year, 90 percent of which is concentrated between December and May	• Common species: ceiba (*Ceiba trichistandra),* mesquite (*Prosopis juliflora*), yellow geiger (*Cordia lutea*), pasallo (*Eriotheca ruizii*), Dyer's mulberry (*Maclura tinctoria),* blackbead (*Pithecellobium excelsum*), palo santo (*Bursera graveolens*), *Pradosia montana,* croton (*Croton riviniaefolius*), agua palm (*Phytelephas aequatorialis*) and barbasco (*Jacquinia sprucei*) • Endangered species: golden trumpet (*Tabebuia chrysantha*), laurel (*Cordia allidora*), cedar (*Cedrela* sp), ebony (*Ziziphus thyrsiflora*), guayacán (*Tabebuia billbergii*) and colorado (*Simira ecuadorensis*)	• Some of the most important faunal species include: Jaguar (*Panthera onca*), Emperor tamarins (*Sanguinus imperator*), White-lipped peccaries (*Tayasu pecari*), Ecuadorian cacique (*Cacicus sclateri*), Linnaeus's false vampire bat (*Vampyrum spectrum*), and the Emerald tree boa (*Corallus caninus*)	• WWF Conservation Status - Critical/Endangered, due to unsustainable timber extraction, slash-and-burn, and hillside cultivation
6. Highland	• On the western	• Distinguished by	• Desert plants; particularly	• Endemic avian species include:	• WWF Conservation

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
Steppes	slopes of the Andes, spanning from La Libertad to Chilean border • Altitude ranges from 1,000 to 3,800 masl	two different types of climates: ○ 1,000 – 3,000 masl:sub-humid with high average annual temperatures up to 20°C and low rainfall ○ 3,000 – 3,800 masl: average temperature of 12˚C with rainy summers and dry winters	ferns, cone-bearing plants, cacti, and flowering plants that survive by absorbing moisture from fog and dew • Recently discovered plants: *Copiapoa* genus, yelmo (*Griselinia carlomunozii*), and air plant (*Tillandsia tragophoba*)	Slender-billed finch (*Xenospingus concolor*), Great Inca finch (*Incaspiza pulchra*), Raimondi's yellow finch (*Sicalis raimondi*), and Pied-crested tit-tyrant (*Anairetes reguloides*)	Status – Vulnerable, due to urbanization, mining, pollution, road construction, livestock grazing, fuel wood collection, commercial plant collection, and erosion
7. Puna Grassland	• Situated on high altitudes of the Andean Cordillera - 26,609,140 ha • Altitude ranges from 3,800 to 5,200 masl	• Dry and cold climate with average annual temperatures from <0 to 15°C; daily variations extreme, often more than 20°C • Precipitation ranges from 250 to 500 mm per year • Dry season for most of this ecoregion occurs during June and July	• Grasses, primarily of the genera *Calamagrostis, Agrostis* and *Festuca* • Wet formations such as *bofedales*, peat bogs and reed beds • Species: Central Andean puna (*Parasthrephia lepidophylla*), canglla (*Margyricarpus* sp.), yareta (*Azorella yarita*), queñoa (*Polylepis* spp.), olle (*Buddleia* sp.), and hachacomo (*Escallonia* sp.)	• Puna endemics include: Aceramarca Gracile mouse opossum (*Gracilinanus aceramarcae*), Andean hairy armadillo (*Chaetophractus nationi*), and Chozchoz (*Octodontomys gliroides*), the single species of an endemic genus. • Mammal species include: South American fox (*Pseudalopex culpaeus*), Guanaco (*Lama guanicoe*), and Taruca (*Hippocamelus antisensis*)	• Many of Peru's glaciers are situated in the upper reaches of this ecoregion • WWF Conservation Status – Vulnerable, due to mining as a source of deforestation, contamination of water and soil, and faunal declines due to reductions in habitat
8. Moorland (i.e. Paramo)	• Situated in the northern extreme of the Andes, in the departments of Piura and	• Low nightly temperatures, generally below 0°C; in valleys, more temperate climate.	• Grasses of the genera *Calamagrostis*, *Agrostis*, and *Hypericum* • Tree genera such as *Polylepis* and *Escalonia*	• Isolation has caused high endemism • Mammal species include: Mountain tapir (*Tapirus pinchaque*), Little red brocket	• This ecoregion serves as the origin for numerous watershed basins, playing a critical role in regional hydrological cycles

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
	Cajamarca - 159,595 ha • Consists of plateau formations and steep gradients on high peaks, with flat and undulating portions on the tablelands, scoured by deep valleys • Altitude ranges from 3,000 to 4,100 masl	• Cold and wet with high precipitation; very cloudy		(*Mazama rufina*), Spectacled bear (*Tremarctus ornatus*), Northern pudú (*Pudu mephistophiles*), and American short-tailed shrew (*Cryptotis* sp.) • Moorland species with tightly restricted distributions, include: lizards (*Stenocercus huancabambae*), frogs (*Astrotheca galeata , Gastrothecalateonata, Phrynopus parkeri, Eleutherodactylus* spp.), butterflies (*Dysmorphia* spp., *Pagyris* spp., *Veladyris* spp.), and endangered birds like the Bearded Guan (*Penelope barbata*) and Red-faced Parrot (*Hapalopsittaca pyrrhops*)	• WWF Conservation Status – Relatively Stable/Intact, with primary threats of fragmentation due to human settlements and roads, as well as expansion of agriculture and mining
9. High Jungle - Yungas	• Located on the eastern slopes of the Andes - 20,807,844 ha • Altitude ranges from 600 to 3500 masl • Consists of mountainous surface with many steep cliffs, ridges, hillsides and valleys	• Altitudes > 2,500 masl average temperatures vary from 6-12°C (northern section) and 8-22°C (southern section); lower altitudes have an average temperature of 25°C • Moderately temperate to tropical climate with high rainfall that can exceed 6,000 mm per year. Lower precipitation, between May and	• Cloud Forest (2,700-3,500 masl): bamboo (*Chusquea spp.*) and arboreal ferns (*Cyathea* spp.) • Below 2,700 masl: cedro (*Cedrela odorata*), cetico (*Cecropia* spp.) and relatives of papaya (*Carica* spp)	• Endangered and threatened species include: Peruvian yellow-tailed woolly monkey (*Lagothryx flavicauda*), Jaguar (*Panthera onca*), Ocelot (*Leopardus pardallis*), Spectacled bear (*Tremarctos ornatus*), Neotropical otter (*Lutra longicaudis*), Pampas cat (*Oncifelis colocolo*), and Andean cock-of-the-rock (*Rupicola peruviana*) • Endemic butterfly genera include: *Dismopha, Callithea, Paridos,* and *Morpho* • Mammal species include: Marsupial mouse (*Lestos inca*), Kalinowski's agouti (*Dasyprocta kalinowski*), Northern pudú (*Pudu mephistopheles*), and Hairy	• WWF Conservation Status - Critical/Endangered, based on migratory agriculture, coca, deforestation, selective cutting and gradual urban development

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
		August		long-nosed armadillo (*Dasypus pilosus*)	
10. Amazon Rainforest	• Located in low areas east of the Andes - 58,712,974 ha 45.7 percent of the country's surface • Consists of the following land formations: a) upland terra firme (non-flooded) mostly on nutrient-poor lateritic soils, b) ancient alluvial plains (mostly non-flooded) on nutrient-rich soils, and c) present alluvial plains (*várzea*, seasonally flooded) of super-rich sediments renewed with each annual flood. Alluvial plains contain permanent swamp forests. • Altitude ranges	• Minimal annual temperature variations from 22°C to 27°C • Northern & southern regions experience different climate regimes: ○ North (*i.e.* Iquitos & Pucallpa): wetter (3,000 mm) and less seasonal forests that flood twice a year (March & December) ○ South (*i.e.* Puerto Maldonado): less rainfall (1,500-2,100 mm) and floods once per year (December-January)	• Tree species diversity of up to 300 species per ha • Common species (vernacular names vary): *Calycophyllum acreanum, Terminalia amazonica, Combretum laxum, Mezilaurus itauba, Didymopanax morototoni, Jacaranda copaia, Aspidosperma megalocarpon, Vochisia vismiaefolia, Hirtella lightioides*, *Hura crepitans, Oenocarpus mapora, Chelyocarpus chuco, Phytelephas macrocarpa, Euterpe precatoria,* and *Jessenia bataua* • Commercial species: rubber (*Hevea brasiliensis*), mahogany (*Swietenia macrophylla*), balsam wood (*Myroxylon balsamum*), timber and essential oil (*Amburana acreana*), tagua nut (*Phytelephas microcarpa*), and strychnine (*Strychnos asperula*)	• Important mammal species include: South American tapir (*Tapirus terrestris*), Jaguar (*Panthera onca*), Capybara (*Hydrochoeris hydrochaeris*), Kinkajou (*Potos flavus*), White-lipped peccary (*Tayassu pecari*), Pygmy marmosets (*Cebuella pygmaea*), Goeldi's marmoset (*Callimico goeldii*), Pacarana (*Dinomys branickii*), and Bushy-tailed Olingo (*Bassaricyon gabbii*) • Globally-endangered species include: Black caiman (*Melanosuchus niger*), Spectacled caiman (*Caiman crocodilus crocodilus*), Woolly monkeys (*Lagothrix lagotricha*), Giant otter (*Pteronura brasiliensis*), Giant anteaters (*Myrmecophaga tridactyla*), and Ocelot (*Leopardus pardalis*)	• WWF Conservation Status – Relatively Stable/Intact • Highest number of mammal species (257 with 11 endemics) and bird species (782 with - 17 endemics)recorded for the Amazonian biogeographic realm

Ecoregions	Location/ Topography	Climate	Vegetation	Fauna	Additional Comments
	from 100 masl in the east to 300 masl in the west				
11. Palm Savanna	• Contained within limited range of Madre de Dios Department - 262,198 ha • Altitude ranges from 130 to 235 masl • Consists of forest islands, savannas, and wetlands amongst many rivers, lakes, permanent swamps, and marshes	• Temperatures drop to 25°C in winter and rise to 37°C in summer • Annual precipitation of about 2,000 mm • Flooding occurs each year from December to May with high rainfall and snowmelt in the Andes, covering 50-60 percent of the land for 4–10 months	• Vegetation types vary due to flooding, soil type, elevation and fire regimes • Sedges and grasses such as piripiri (*Cyperus giganteus*), spikesedge (*Eleocharis geniculata*), beaksedge (*Rhynchospora trispicata*), marsh grass (*Hymenachne* spp.), cutgrass (*Leersia hexandra*), Peruvian watergrass (*Luziola peruviana*), Brook crowngrass (*Paspalum acuminatum*), and foxtail (*Setaria* spp.) • Palms and trees such as: urucuri palm (*Attalea phalerata*), ceiba (*Ceiba* spp.), *Coccoloba* spp., Ficus (*Ficus* spp.), cedro (*Cedrela* sp.), huito (*Genipa americana*), cramantee (*Guarea* spp.), mangosteen (*Rheedia* spp.), *Salacia* spp., *Trichilia* spp., Brazilian ucuba (*Myristica sebifera*), el panamá (*Sterculia apetala*), and pechiche (*Vitex cymosa*)	• Important primate species include: Black howler monkey (*Alouatta caraya*), Azara's night monkey (*Aotus azarai*), White-eared titi monkey (*Callicebus donacophilus*), Rio Beni titi monkey (*C. modestus*), Ollala Brothers' titi monkey (*C. olallae*), and Black-tailed marmoset (*Callithrix melanura*) • Other important mammals include: Day's grass mouse (*Akodon dayi*), Marsh deer (*Blastocerus dichotomus*), Maned wolf (*Chrysocyon brachyurus*),Puma (*Puma concolor*), Jaguar (*Panthera onca*), and Jaguarundi (*Herpailurus yagouaroundi*) • Important reptiles include: Yacare caiman (*Caiman yacare*), Anaconda (*Eunectes murinus*), and False water cobra (*Hydrodynastes gigas*) • Important amphibians include: Rococo toads (*Bufo paracnemis*), Spot-legged poison frogs (*Epipedobates pictus*), and Marsh frog (*Lysapsus limellus*)	• WWF Conservation Status - Critical/Endangered, based on extensive grazing and intense seasonal burning for maintenance of cattle forage

Annex E: Ecoregions of Peru

ANNEX F TABLE OF NATIONAL AND INTERNATIONAL PARTICIPATORY ORGANIZATIONS

Organizations	Objectives/Areas of Intervention	Observations
Bilateral		
German Society for International Cooperation (GIZ)	• Projects related to Climate Change Adaptation and Renewable Energy • Focuses specifically on environmental policy, natural resource and urban development. Key areas include: – Biodiversity – Sustainable forest management – Climate change and coastal ecosystems – Wastewater management – Renewable Energies.	• Supports the Peruvian Ministry of Environment in the compliance to national environmental regulations, and national environmental certification • Supports the forest conservation program and mitigation of climate change • Finances environmental and climate change projects in Peru.
Belgian Development Cooperation (BTC)	• After consultation with its Peruvian partners, Belgium identified two priority areas for action in its cooperation program for 2010-2013, namely healthcare (health insurance) and sustainable economic development with sound management of natural resources.	• The 2010-2013 BTC program for Peru has a budget of $55 million USD, part of which is set aside for projects and part of which takes the form of sector budgetary support – $27 million USD has been allocated to the healthcare sector (health insurance), while $17.8 million USD has been earmarked for activities related to a sustainable economy.
Swiss Agency for Development Cooperation (COSUDE)	• Works for more than 45 years in Peru • Foster economic self-reliance and state autonomy • Contributes to the improvement of production conditions • Helps in finding solutions to environmental problems, and to provide better access to education and basic healthcare services.	• Leads the Climate Change Adaptation Program (PAAC) in Peru – The specific objective of PACC is to promote the implementation of climate change adaptation strategies and measures by the local population and public and private institutions, as well as to capitalize on knowledge and allow dialogues on public policies at different levels. • Funds programs in Peru such as the "Regional Program for social management in Andean forest ecosystems, which is currently occurring in Bolivia, Ecuador and Peru (ECOBONA). This program aims at conserving biodiversity and improving the quality of life of people through the

Organizations	Objectives/Areas of Intervention	Observations
		social management of Andean forest ecosystems.
Spanish International Cooperation Agency for Development (AECID)	• Focuses on poverty reduction and sustainable human development and relations with partner countries.	• Contributes to the eradication of poverty in Peru through the provision of human resources and materials • Funds key projects and programs in Peru such as the Capacity Building Program for the Decentralization Process.
Norwegian Agency for Development Cooperation (NORAD)	• Operating under the Norwegian Office of Foreign Affairs, NORAD assures efficient foreign assistance, guaranteeing quality and good evaluations.	• Works with REDD and REDD+ mechanisms, which propose that developing countries reduce the effect of greenhouse effects by reducing deforestation, conserving forests, increasing reforestation and promoting the management and sustainable use of forests.
Finnish Department for International Development Cooperation (FINNIDA)	• FINNIDA operates under the Finnish Ministry of Foreign Affairs. This Department provides Finnish citizens with a platform to actively co-operate with southern hemisphere organizations and develop people-to-people networks. • The Finnish government has worked in cooperation projects in Peru since 1964.	• Since 1998, Peru and Finland have implemented the Peruvian Amazon Biodiversity Project called BIODAMAZ, which aims at strengthening the national capacities in research, administration and sustainable use of the biodiversity resources at the Departments of Madre de Dios, Ucayali, Loreto, San Martín and Amazonas, covering more than 600,000 km^2 of the most diverse terrestrial ecosystems on Earth. • The BIOMADAZ work is done through the implementation of three components: 1. Component 1: Strengthening of regional environmental management and administration; 2. Component 2: Strengthening of scientific knowledge on Peruvian Amazonia; 3. Component 3: Support to the National Reserve Allpahuayo-Mishana (Reserva Nacional Allpahuayo-Mishana, RNAM) and the Botanical Garden-Arboretum El Huayo (Jardín Botánico y Arboretum El Huayo, JBAH).
Multilateral		
World Bank (WB)	• Works in Peru since 1952 • Supports various development projects	• Finances and grants loans to Peru for various projects, such as

Organizations	Objectives/Areas of Intervention	Observations
	in all areas • Supports numerous projects in biodiversity conservation, sustainable forest and coastal natural resource management.	– National Agriculture Innovation – Strengthening Sustainable Management of the Guano Islands, Isles and Capes National Reserve System Project – Strengthening Biodiversity Conservation through the National Protected Areas – Second Programmatic Environmental Development Policy Loan – Water Resources Management Modernization.
United Nations Development Program (UNDP)	• Works in countries like Peru since 1965 • Focuses on democratic governance and participation; inclusive and equitable growth; sustainable development; climate change and disaster risk reduction • Supports in the following areas: – Poverty reduction – Energy and Environment.	• Leads a Program on Reducing Emissions from Deforestation and Forest Degradation (REDD+) in Developing Countries, which includes Peru.
Inter-American Development Bank (IDB)	• Established in 1959, is the leading source of development financing for Latin America and the Caribbean • Evolves reform agenda that seeks to increase its development impact in the region • Provides loans, grants, technical assistance and does research. IDB shareholders are 48 member countries, including 26 Latin American and Caribbean borrowing members, who have a majority ownership of the IDB • Partners with Peru to determine how the country's priorities coincide with the Bank's development strategies for the region. The product of that process is the IDB country strategy with Peru, containing the Bank's expected program for Peru for 2012-2016.	• Accounts for about 28 percent of the country's external public debt and 41.5 percent of its multilateral debt. • Between 2012 and 2016, approves loans totaling $2.4 billion USD, with a cumulative debt balance of $3.9 billion USD. • Currently, leads and finances the Biodiversity and Ecosystem Services Program in Peru and other Latin American and Caribbean countries to help the region protect and use this natural capital to generate social and economic development, the Biodiversity and Ecosystems Services (BES) Program supports countries by: – Integrating the value of biodiversity and ecosystem services into key economic sectors – Protecting priority regional ecosystems – Supporting effective environmental governance and policy – Creating new sustainable development business opportunities.
Development Bank of Latin America (CAF)	• Established in 1968, CAF is a multi-purpose bank and an agency for	• CAF finances and grants loans to Peru for various projects:

Organizations	Objectives/Areas of Intervention	Observations
	promoting Andean development and integration • Incorporates Peru as well as all other countries in the Andean Region.	– CAF has signed an agreement with Peru's SERNANP to support a gastronomic proposal for exploiting natural resources in protected natural areas, emphasizing consolidating benefits in the local productive population and making them sustainable – CAF recently approved a $304million USD loan for Peru to finance the third phase of the $715 million USD Chavimochic multipurpose irrigation project – Conduit Capital and CAF have invested in a 40 Megawatt Peruvian Solar Project.
European Union (EU)	• Develops and Cooperates – EuropeAid is a new Directorate–General (DG) responsible for designing EU development policies and delivering aid through programs and projects across the world and providing a single contact point for stakeholders inside and outside the EU. • Works closely on climate change issues, including loans and technical assistance for climate change mitigation • Gives assistance for food security and resilience building (including risk management, early warning systems etc)	• Cooperates with Peru in developing long standing relationships. • The EU has established a new structure/organization of thematic programs to improve cooperation with Peru by facilitating access to aid and increasing and improving results. To achieve this, five new Thematic Programs have been introduced: investment in citizenry; environment and sustainable management of natural resources (energy, among others); non-state agents and local authorities in development; food security; and migration and asylum.
International NGOs and Foundations		
World Wildlife Fund (WWF)	• Concerns organization with biodiversity conservation and environmental protection • Initiatives include: – Species protection – Forests and wetland restoration – Responsible forest management – Supporting local livelihoods – Sustainable aquaculture and fisheries – Ecosystem-based climate change adaptation • In 1994 established the first project office in Peru and in 1998 founded the Program Office of WWF Peru.	• The main WWF Peru projects are : – REDD Project Implementation in the Peruvian Andean Amazon: This project aims to contribute to the effective conservation of biodiverse forest lands in the Peruvian Andean Amazon – Natural Resource Use in Indigenous Lands in Peru: This project aims to help indigenous people in rural areas of the Peruvian Amazon defend their rights to the sustainable use of natural resources in their territories.
The Nature	• Works in Peru as well as other	• Partners with Grupo GEA and the *Fondo*

Organizations	Objectives/Areas of Intervention	Observations
Conservancy (TNC)	countries of Latin America to protect a myriad of habitats to preserve the diversity of life on Earth.	*de las Américas* (FONDAM) to create the Lima Water Fund in Peru • On December 30, 2009, the Peruvian Government created the Guano Islands and Capes National Reserve, encompassing 22 islands and 11 capes and spanning 348,000 acres along the coast of Peru. TNC has actively promoted the creation of this marine reserve since 2001 and spent the past two years directly providing technical and institutional support to Peru's national protected area authorities.
Wildlife Conservation Society (WCS)	• Strives to save wildlife and wild places across the globe. • Operates country programs throughout four continents—Africa, Asia, Latin America, and North America • Based on 20 years of experience in Peru, helps to promote community-based conservation and improve the livelihoods of local inhabitants through sustainable management of wildlife, fisheries, and forest products.	• Conducted 20 years of research on peccary ecology and provided recommendations to permit a certified and limited commercial harvest of peccary pelts in the region. This will provide local communities with the means and incentives to better manage wildlife populations • Studies the impacts of subsistence hunting and human-wildlife conflicts on Peruvian wildlife. WCS assesses the main threats to the Tambopata watershed—home to endangered jaguars, Andean bears, harpy eagles, and macaws—and other protected areas to inform planning • Helps to raise public support for conservation work in Peru through educational outreach programs.
Moore Foundation	• Integrated land use planning and governance in the Andean Amazon, particularly in Peru, Ecuador, and Colombia • Began supporting biodiversity and forest conservation in the Amazon basin in 2001, and launched the Andes-Amazon Initiative in 2003. Funding for the Andes-Amazon Initiative is currently authorized through 2016. • Improves monitoring for adaptive management and establish sustainable finance structures for protected area systems in Brazil, Peru and Colombia.	• Works in strategies to reduce or mitigate the impact of infrastructure development in the Andean Amazon. • Works in the advancement of REDD frameworks to increase the value of standing forest.
Blue Moon Fund	• Blue Moon Fund supports three broad efforts in the Tropical Americas, including Peru. In the eastern Andes-	• Blue Moon supports work that empowers local inhabitants of the Andes Amazon countries, including the region's

Organizations	Objectives/Areas of Intervention	Observations
	western Amazon Blue Moon works to protect remaining intact lowland and montane forests that will serve as critical refuge for plants and animals under predicted climate change scenarios. • In the eastern Amazon, Blue Moon works to reverse trends towards large-scale ranching and agriculture that are destroying one of the globe's greatest carbon sinks – the Amazon rainforest.	many indigenous groups to retain territorial control and fend off large-scale infrastructure development including highway construction, oil, gas and mineral extraction, and hydropower projects.
National NGOs and Foundations		
Association for Research and Integral Development (AIDER)	• AIDER is a Peruvian NGO founded in October 1986. It works on sustainable development and environmental conservation through the design and implementation of projects to develop business management capabilities and forest and environmental governance in indigenous and rural communities to carry out: – Forest Management – Management of protected natural areas – Biological, forestry and socio-environmental diagnoses – Recovery of degraded areas – Forestation and reforestation – Carbon sequestration and REDD – Voluntary forest certification – Organizational strengthening – Agro-forestry – Planning, monitoring and evaluation of projects.	• Has experience in REDD mechanisms and has signed contracts with private companies • Works in forest certification mechanisms with native communities.
Peruvian Association for the Conservation of Nature (APECO)	• APECO is a civil non-profit association, which since its founding in 1982 promotes awareness of issues such as biodiversity conservation and sustainable development in Peru • Promotes the development of local and regional capacities to strengthen the governance of national and regional protected areas and co-management of communal reserves, as well as community management of private conservation areas • It promotes and develops: environmental education, outreach and	• APECO has a multidisciplinary approach. Some of the programs in which APECO is involved are: • Montane Forests and Cloud Forest Program in Northern Peru • Forest and Indigenous Peoples Program • Biodiversity and Climate Change Program • Coastal and Marine Program • Environmental Policy Program.

Organizations	Objectives/Areas of Intervention	Observations
	research for the conservation of biodiversity, monitoring of biodiversity and associated social monitoring, sustainable use of natural resources, technical training, and management of protected areas and their areas of influence • Actively involved in environmental and social policy of Peru, contributing to its development in terms of biodiversity and in the processes of decentralization and public involvement.	
Center for Conservation, Research and Management of Natural Areas (CIMA-Coordillera Azul)	• The Center for Conservation, Research and Management of Natural Areas (CIMA) was founded in 2002 • Undertakes and promotes research, and communication of knowledge as well as design and validation of models for managing conservation of nature, considering its rich and pioneering experience in managing the Cordillera Azul National Park.	• Is recognized for: – Development and promotion of research, inventory and monitoring of high biodiversity areas in Peru, as well as socioeconomic and anthropological studies necessary for the conservation of these areas – Planning and application of successful models for the management and conservation of biodiversity – Reporting acts or omissions that constitute a threat to conservation of biological diversity – Promoting partnerships and strategies at local, national and international levels, for the development and implementation of biodiversity policies compatible with conservation – Ensuring long-term financing of managed areas – Promoting and implementing sustainable economic alternatives compatible with conservation of the environment together with the creation of necessary skills in social groups involved with areas of high biodiversity, including local populations.
Peruvian Society for Environmental Law (SPDA)	• SPDA is a civil non-profit organization founded in 1986. Its scope of work relates to environmental policy and legislation in Peru • Promotes and facilitates effective implementation of environmental policies and standards, actively participating in technical and political dialogues and being involved in defense of public interests in individual cases.	• Proposes the use of specific planning and management tools and to support public and private management of environmental issues • Invests in education and training programs, promoting environmental and social responsibility of business and other stakeholders, including fronts linked to the three dimensions of sustainable development: environmental,

Organizations	Objectives/Areas of Intervention	Observations
		economic and social.
Peruvian Society for Ecodevelopment (SPDE)	• SPDE is an NGO development agency that has worked more than 10 years in Peru. • Specialized in conservation of natural protected areas, Amazon forest ecosystems and humid coastal ecosystems.	• Advocacy and analysis of processes of issuing title to land for planting oil palm. • Work and advocacy on mono-cropping. • Regulatory policies related to forestry and the forest sector.
Association for the Conservation of the Amazon Basin (ACA)	• Non-profit organization that works to conserve biodiversity in the Andean-Amazon area of southern Peru, since 1999.	• Works in areas of source waters for the Madre de Dios River, from the cloud forests to the lower Amazon basin and the high plateaus of Heath on the Bolivian border. Within this extensive area, works with local communities and public and private sectors to conserve biodiversity and improve the quality of life of the population • Carries out conservation efforts in these forests based on solid knowledge of their diversity, ecology and threats. The area where they work includes a dramatic ecologic gradient that extends from Andean mountains more than 6,000 meters above sea level, passing through punas and cloud forests to the tropical jungle.
Peruvian Foundation for Conservation and Nature (PRONATURA LEZA)	• PRONATURALEZA is a private non-profit foundation founded in 1984 that implements projects financed by international cooperation and national sources. • Makes strategic alliances with businesses for development projects.	• Assist in the management of protected natural areas. • Promote sustainable initiatives that contribute to improving the quality of life of inhabitants living inside and outside PNAs, through the conservation of biological diversity and appropriate management of those areas. • Works in strengthening, identifying and categorizing protected natural areas and priority sites for conservation by using tools such as master plans, plans for financial sustainability, plans for use and others needed for sustainable and efficient management. • Also work in strengthening the capacity for sustainable use of natural resources.
Peruvian Trust Fund for National Parks and Protected Areas (PROFONANPE)	• PROFONANPE was established on December 29, 1992 to support the conservation and management of Peru's Protected Areas.	• PROFONANPE supports the development of innovations when managing protected natural areas in Peru, acting as a regular source of

Organizations	Objectives/Areas of Intervention	Observations
	• The main objectives of PROFONANPE are: contributing to the conservation of biodiversity through the involvement of civil society in the management of Protected Natural Areas, and contributing to the financial sustainability of the National System of Protected Natural Areas (SINANPE).	resources for the design and implementation of pilot mechanisms, and becoming part of the regular activities of the national environmental authorities.
Mountain Institute (IM)	• The Mountain Institute's (IM), South America Program was established in Peru in 1996 during a time of rapid social change in the mountain communities of the northern Andes. • The expansion of large-scale mining and hydroelectric projects and a sharp increase in tourism coincided with a rapid decline in traditional means of livelihood within local communities. The resulting conflict between development and traditional cultures not only exacerbated the economic challenges faced by local populations, it also accelerated deterioration of local mountain ecosystems.	• IM developed comprehensive community-based projects to demonstrate the potential for diversifying local methods of subsistence through community-based tourism and protection of biodiversity hotspots. • It is important to mention that IM Andes staff coordinated a groundbreaking and productive international climate change workshop in July 2009.

ANNEX G ALLUVIAL MINING

According to the U.S. Geological Survey, in 2012 Peru was the world's third largest producer of copper, silver, zinc and tin, in addition to the fourth largest producer of molybdenum, the fifth largest producer of lead, and the sixth largest producer of gold. Peru is also known for other minerals, including phosphates, tungsten, and increasingly iron and uranium (GBR, 2013). An estimated $53 billion USD is expected to flow into the country over the course of the next decade for mining projects, with $19.5 billion USD of these investments to be realized in 2013 and 2014.

While the legacy of environmental impacts caused by large-scale mining continues to be a concern, new regulations and improved corporate behavior have helped mitigate the impact of formal mining operations on the environment. On the other hand, illegal mining, particularly illegal alluvial gold mining in the Amazon region, continues to pose a major threat to the environment, public health, and economic activities such as inland fisheries.

Alluvial gold mining is the process of extracting gold particles from creeks, rivers and streams. The worldwide surge in gold prices – a 360 percent price increase in the last decade following the financial crisis - has coincided with a drastic increase in illegal gold mining throughout Peru that is largely, but not exclusively, concentrated in the Madre de Dios Region. Other important centers of alluvial mining include Puno, Cusco, Arequipa and Ayacucho. Currently, between 50,000 and 70,000 miners are estimated to be operating without legal permits in the Madre de Dios region alone, thanks in part to the recent completion of the Interoceanic Highway, which has facilitated increased access to the area.

Alluvial mining activity, the majority of which is illegal, is known to be financed by wealthy investors who provide the resources to purchase mining equipment (boats, pumps, backhoes, etc.). The actual miners who work the equipment are frequently salaried workers, attracted by wages estimated around 90 to 120 soles per day in Madre de Dios, more than 20 times higher than profits earned by many in the agriculture sector. Many miners are migrants, most likely attracted by high salaries, many of whom migrate from the Andes highlands to mining areas.

MERCURY IN ALLUVIAL MINING

Although alluvial mining typically does not displace large amount earth, it does commonly lead to the destruction of sensitive riparian (backhoes) and riverbed habitats (dredges) along lengthy stretches of river, while contributing to river sedimentation. Furthermore, alluvial mining in Peru most commonly uses mercury to extract gold from excavated soil and dredged sediment. The use of mercury contaminates waterways used by human populations and fauna alike, endangering public health and ecosystem equilibrium.

Mercury has been used for decades in the small-scale alluvial gold mining process to separate gold from ore by forming an amalgam, which is a mixture of mercury and gold. The mixture is then heated, evaporating the mercury and leaving just the gold. This method is cheaper than most alternatives and can be performed quickly and easily by a single individual. This process turns the mercury into a vapor called methyl mercury, a neurotoxin that is both extremely dangerous to humans and easily absorbed into the food chain. Elemental mercury and methyl mercury produce a host of physical and mental health problems, including death.

The adverse environmental impacts of mercury contamination can be more severe than impacts caused by most other drivers of environmental degradation. For example, mercury contamination can cause soil to become barren and unproductive for up to 200 years in some cases, whereas fertility loss caused by mono-cropping or deforestation can be remediated far more quickly – approximately 20 years. Due to this extreme and long-term damage, alluvial mining (that utilizes mercury) is arguably one of the most dangerous threats to the local biodiversity and human population. In Madre de Dios between 30-40 tons of mercury is estimated to be released into the environment every year. It has been reported that 60 percent of the fish species sold in Puerto Maldonado, downstream of Madre de Dios, had mercury levels that exceed the international limits. Seventy-eight percent of the adults in Puerto Maldonado had hair mercury concentrations above international mercury limits, a clear indication that mercury contamination is contributing to an ongoing public health crisis.

The Law of the Environment No. 28611 establishes the rights and principles for the state's environmental policy. Holders of mining titles are obligated to work within the constraints of mining safety and hygiene and environmental sanitation requirements. Currently, the commercialization of mercury in Peru is regulated under Legislative Decree N 1103, which establishes controls for the distribution, transportation, and commercialization of chemical inputs that are used in illegal mining (Ipenza, 2013). Currently, this decree does not contain any regulation that specifically addresses the control of the importation of mercury.

The Convention of Minamata is a UN initiative that aims to eliminate or considerably reduced the use of mercury in alluvial mining by suspending ore amalgamation by heating the amalgam without a system that traps mercury vapor and employing alternatives methods that use gravity casting and direct chemical filtration, along with others. This was the first international agreement to reduce the use and trade of mercury to prevent damage to health and the environment. This initiative was ratified by MINAM in October 2013, and can potentially contribute to reducing the use of mercury in alluvial mining, but it is too early to identify any results (Ipenza, 2014).

Cost-efficient, mercury-free alternative technologies do exist, but adoption rates are low. This is likely related to a combination of factors including a lack of awareness and expertise among miners, as well as the comparatively inexpensive and abundant supply of mercury. Some mercury-free mining methods that have seen success in other countries are sluice, shaking tables, direct smelting, along with others. However, without site-specific research, it is impossible to identify which mining technologies would be implementable within the differing mining regions of Peru (a method that works well in Ghana won't necessarily be successful in Peru). Furthermore, even if a certain alternative technology were found to be feasible given site-specific mining conditions, there is no guarantee that miners would have adopted it.

CONTROL AND ENFORCEMENT

In 2012, illegal mining was officially addressed and classified to be a crime. However, based on stakeholder input and direct observation by the assessment team, the enforcement of this law in Madre de Dios has not been rigorous enough to act as a significant deterrent against illegal mining. Police officers are rotated in and out of regions like Madre de Dios every six months, but they still remain vulnerable to pressure and influence exerted from wealthy mining interests. Control and enforcement are also lacking on the national level. There are mining sites within 30 minutes of Lima that are operating illegally, which indicates that accessibility is not the key issue.

FORMALIZATION

The government of Peru is currently implementing a process to formalize all mining activity in accordance with applicable legislation. Formalization is necessary for the government to be able to oversee mining activities, for purposes ranging from control and oversight to tax collection to review and approval of environmental management plans.

The vast majority of alluvial miners in Peru are small-scale and artisanal miners ranging from a single individual to associations. The government legally defines and recognizes these two categories of miners and they are subject to formalization requirements despite the fact that many alluvial miners operate on a very small scale and with limited resources.

One stakeholder estimated that this process has helped prevent the degradation of a much wider area in places such as Madre de Dios. However, this same stakeholder recognizes that the formalization and control process has been incomplete. Some stakeholders suggest that many alluvial miners would like to formally register their activity, but that the process is too complicated and/or too expensive. Others, however, suggest that many miners intentionally do not formalize their status because they do not want to be subject to government oversight and the costly requirements such oversight entails, such as taxes and environmental management plans.

REMEDIATION MEASURES

While there have been mitigation efforts for mercury, such as capture technologies (retortas), there is an outstanding gap with respect to remediation of mercury contamination. For all intents and purposes there are no mercury remediation measures currently being widely used in Peru. There are empirical technologies such as filter remediation, which was partially investigated by University of San Marcos. A filter remediation that uses certain plants to capture the mercury in an aquatic ecosystem, shows great potential, but, unfortunately, not much follow up has been done by responsible government sectors in Peru.

RECOMMENDATIONS FOR ALLUVIAL AND ILLEGAL MINING

Promote increased government oversight and control of alluvial and other forms of illegal mining. This can be accomplished through three lines of action: 1) support the ongoing formalization process; 2) strengthen administrative control and law enforcement agencies; and, 3) conduct in situ research on improved technologies and approaches.

These three actions must be interrelated and linked in order to be effective. For example, there was a consensus among stakeholders that without the proper law enforcement, the mechanism of formalizing/registering miners would be futile, because the potential fines and sanctions would be less than the expenses associated with formalizing/registering.

1) FORMALIZATION

In spite of ongoing government initiatives to create and implement a formalization process, stakeholders in government and representatives of mining associations both reported that the majority of small-scale and artisanal miners are not officially formalized.

The assessment team has identified the following actions to advance the effectiveness of the mining formalization process:

- Implement more severe penalties for non-formalized miners, accompanied by stricter law enforcement. This will require legislative reforms to increase penalties.

- Promote formalization through economic incentive programs for miners currently operating illegally (e.g. subsidization of formalization process costs).

- Minimize administrative hurdles and costs, and increase technical assistance to make the formalization process more accessible and manageable for miners who currently operate illegally.

2) LAW ENFORCEMENT

With the creation of specialized national and regional environmental prosecutor's (procuraduría) offices in 2009, and the legal codification of illegal mining in 2012, there has been some progress in increasing law enforcement to combat illegal mining. However, illegal alluvial and other illegal forms of mining continue to be widespread. This is due to a lack of regional capacity and resources, and can be exacerbated by the pervasiveness of mining interests and their influence within the local and regional governance structure.

To mitigate these law enforcement issues, the assessment team recommends the following actions:

- Increase emphasis on enforcement and control of investors who finance illegal mining activity to complement in situ enforcement of mining operations, similar to the approach used to combat narcotics trafficking. It may be helpful to create a specialized police force to investigate and control the investors who promote illegal mining in an attempt to cut the flow of financing.

- Increase the severity of penalties for illegal mining through legislative reform and apply those penalties.

- Increase federal support to local and regional authorities through massive, unannounced control operations that target regional, not individual sites.

3) IN SITU RESEARCH

To date, there has only been one study on the negative effects of alluvial mining done by the Peruvian government (Ministry of Environment) - MINERÍA AURÍFERA EN MADRE DE DIOS Y CONTAMINACIÓN CON MERCURIO. Studies conducted by US universities such as Duke and Carnegie-Mellon have brought to light important information on the negative effects of mercury contamination to the environment and public health.

However, localized impacts have not yet been researched in detail in most locations making it difficult to evaluate which approaches and/or technologies could best reduce the impacts of alluvial and other forms of artisanal and illegal mining, or promote alternative livelihoods in the different regions with alluvial mining.

The assessment team has identified the following key research areas:

- In situ and downstream research of the economic and public health impacts of ecosystem contamination and degradation by alluvial mining could help generate increased awareness and support for environmental control among government functionaries and civil society.

- In situ research and pilot projects on the effectiveness and feasibility of technologies that prevent or mitigate to acceptable levels the negative environmental and public health impacts caused by contamination from alluvial mining. This could be done by partnering with reputable mining companies.

- In situ and downstream research and pilot projects to identify potentially effective remediation technologies to address mercury contamination in soil and water. In situ research to identify social, economic, technical and any other barriers to the adoption of technologies that could prevent, mitigate, and/or remediate environmental and public health impacts caused by alluvial mining.

ANNEX H TABLE OF MAIN CLIMATE CHANGE ADAPTATION PROGRAMS IN PERU SINCE 2012

The following table presents a summary of six main climate change adaptation programs that have been implemented in Peru since 2012. It is important to note that, with the time and resources allotted, the assessment team was not able to conduct an exhaustive review of climate change adaptation projects in Peru. This table is based on information from interviews, and information that could be identified through a literature review.

Organization	Climate Change Adaptation Program/ Duration	Observations
United States Agency for International Development (USAID)	USAID-Climate Change Adaptation Program (GPAP) in Peru/ June 2013–June 2014.	• This program includes targeted support to address the following problem: *"One important effect of global climate change is the reduction in naturally stored water resources which, for Peru, means melting glaciers and a decrease in the size of highland wetlands (paramos). The loss of these areas decreases water availability for upland and lowland communities and increases the potential for Glacial Lake Outburst Floods (GLOFs)."* • This Annual Program Statement (APS) supports adaptation projects that assist indigenous mountain communities, rural and urban areas, and local and regional governments potentially affected by GLOFs or changes in water availability. • General project outcomes will be long-term, sustainable approaches that help reduce the impact of climate change on glaciated and highland wetland ecosystems and on those that depend on these ecosystems' services (US Agency for International Development, 2014).
International Development Research Centre (IDRC)	Climate Change and the Health of Indigenous Communities/ March 2011 to March 2016.	• The five year IRIACC research program, has a $2.5 million USD project studying remote regions in Canada, the Peruvian Amazon, and Uganda. In Peru, the project works in the Ucayali region with the Shipibo indigenous people and in the Loreto region with the Shawi indigenous people. The focus of this research is indigenous health adaptation to climate change. (Indigenous Health adaptation to Climate Change, 2014). • IDRC "researchers aim to apply scientific and indigenous ancestral knowledge to empower remote indigenous populations to adapt to the health effects of climate change. Research objectives are to: – "Characterize and compare the vulnerability of remote indigenous health systems and the ways climate affects food and water insecurity and vector-borne diseases; – "Estimate future vulnerability by analyzing how climate change might alter identified health risks and the adaptive capacity of health systems;

Organization	Climate Change Adaptation Program/ Duration	Observations
		– "Implement and monitor interventions using indigenous and scientific knowledge on health vulnerability and adaptation, working closely with communities, stakeholders, and policymakers; – "Develop adaptation plans based on vulnerability assessment, experience from interventions, and comparative analysis that will identify actions to reduce vulnerability and increase adaptability. Adaptation plans will be developed for local to national levels, and will involve collaboration with relevant community and policy stakeholders; – "Identify, train, and equip adaptation leaders in the scientific community, partner organizations, and participating communities; and – "Develop an indigenous knowledge bank on health, and the implications for adapting health systems." – The project is expected to have important outcomes applicable at the community, national, regional, international and scientific levels "(International Development Research Centre, 2014).
German Society for International Cooperation (GIZ)	Programme of Adaptation to Climate Change in the Andean Region (ACC Programme) /2012-2013.	• The program supports adaptation, particularly with regard to agriculture, through the support for the following: o Planning and management instruments o Knowledge transfer o Capacity development • The area of focus of these three components, respectively, are: o 1) Develop and apply methods and planning instruments for mainstreaming climate change adaptation in agriculture. o 2) Promote regional exchanges of experience in the fields of climate data management and adaptation. o 3) Advisory services, education and training, and local grants for pilot measures in selected areas. • The regional, inter-governmental organization *Comunidad Andina* (CAN) is the program's lead implementing agency. The agricultural and environment ministries of the four member states, Bolivia, Colombia, Ecuador and Peru, are the national partners • Since Peru is highly vulnerable to the effects of climate change, the extent of the potential economic damage by 2025 is estimated by the Peruvian Ministry of Economy and Finance at around $10 billion USD. If criteria for adapting to climate change and for disaster risk management are incorporated into the formulation and approval processes for public investments, the damage from climate change could be reduced or prevented. • At the national level and in the two project regions of Cusco and Piura, the relevant actors understand the possible environmental, social and economic costs of climate change for specific sectors. They consider climate-relevant criteria when formulating and approving public investments • This project supports the local partners in drawing up sets of

Organization	Climate Change Adaptation Program/ Duration	Observations
		criteria to facilitate climate-change adaptation in two specific sectors. These criteria will be incorporated in the national approval procedure for public investments (SNIP). It also provides advice to the Ministry of Economy and Finance, which carries overall responsibility, as well as the Peruvian Ministry of Environment and selected regional governments, on applying the criteria. • The adaptation measures promoted in accordance with the criteria are playing a significant part in reducing climate change-related economic damage. At the same time, the activities are promoting biodiversity conservation and securing incomes for the long term in those regions and sectors that are particularly badly affected by climate change in Peru. Widespread implementation is possible, thanks to the cooperation with several ministries; awareness is also increasing among actors in the private sector (German Society for International Cooperation, 2012).
Ministry of Environment of Peru (MINAM)/ Swiss Agency for Development Cooperation (COSUDE)	Climate Change Adaptation Programme -PACC Peru/ 2010-2012.	• The specific objective of PACC is to promote the implementation of climate change adaptation strategies and measures by the local population and public and private institutions, as well as to capitalize on knowledge and allow dialogues on public policies at different levels. • PACC works at both the local and national level. • At local and regional level PACC is: – Developing scientific knowledge while revaluing traditional – knowledge, – Promoting local pilot projects on climate change adaptation, – Promoting the formulation of adaptation strategies and their mainstreaming, as well as instruments for development planning and public investment. • At national and global level PACC is: – Using and applying information on global climate scenarios, – Supporting the country's efforts in international climate change negotiations, – Supporting the development of a national framework for the implementation of a National Plan of adaptation to Climate Change. The implementation of this dual dynamic will be fostered through coherence and linkages between local and regional policies and processes, promoted in accordance with the established national policy framework on climate change adaptation. In turn, this policy is expected to incorporate knowledge from local and regional experiences in adapting to climate variability and to climate change. • The research in PACC takes place at two levels: regional (in Apurimac and Cusco) and local (through prioritized watersheds within these regions). Research is carried out by Peruvian regional (sub-national) and national technical-scientific institutions, which receive support from Swiss scientific entities. The studies cover a wide range of themes linked to the problem

Organization	Climate Change Adaptation Program/ Duration	Observations
		of climate change, and will contribute to a better understanding of its impacts on the rural populations of Cusco and Apurimac and their livelihoods (Swiss Agency for Development Cooperation, 2010).
General Directorate of Agricultural Environmental Affairs/Directorate for Evaluation of Natural Resources/ SENAMHI/ FAO	Risk Management and Climate Change Adaptation Plan for the Agricultural Sector, 2012-2021 (PLANGRACC-A).	• The objective of PLANGRACC-A is to provide strategies, guidelines, policies, proposals and actions agreed with the regional governments of Peru to reduce risk, vulnerabilities and mitigate the effects of climate change in the Agricultural Sector. • The PLANGRACC-A, is the instrument of Peruvian public policy on risk management and adaptation to climate change for the Agricultural Sector in the entire country. • The Ministry of Agriculture, as a governing entity in the Agricultural Sector, incorporated risk management and adaptation to climate change into the 2012–2016 Multi-Sector Strategic Plan of the Ministry of Agriculture (PESEM), as a management instrument that articulates strategies, guidelines, policies, proposals and agreed actions on risk management and adaptation to climate change (Ministry of Agriculture of Peru, 2012).