ALTO MAYO CONSERVATION INITIATIVE

PROJECT DESCRIPTION

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[1] Further information on the partnership between Disney and CI can be found in the following link: http://www.conservation.org/sites/celb/Documents/2010.03.05_Disney_Factsheet_LR.pdf

[†] R.I.P.

Acronyms

AFOLU	Agriculture, Forestry and Other Land Use
AIDER	Asociación para la Investigación y Desarrollo Integral / Association for Research and Integral Development
AMCI	Alto Mayo Conservation Initiative
AMPF	Alto Mayo Protected Forest
BPAM	Bosque de Protección Alto Mayo / Alto Mayo Protected Forest
CI	Conservation International
CAs	Conservation Agreements
CAM	Comisión Ambiental Municipal / Municipal Environmental Commission
CCBS	Climate, Community and Biodiversity Standards
ECOAN	Asociación Ecosistemas Andinos / Association for Andean Ecosystems
ERs	Emissions Reductions
FBT	Fernando Belaunde Terry (Marginal Highway)
FCPF	Forest Carbon Partnership Facility
GHG	Greenhouse Gas
GIS	Geographic Information System
GORESAM	Gobierno Regional de San Martin / San Martin Regional Government
ICAM	Iniciativa de Conservación Alto Mayo / Alto Mayo Conservation Initiative
LNPA	Law of Natural Protected Areas
MINAM	Ministerio del Ambiente del Peru / Ministry of Environment of Peru
MRV	Measuring, Reporting and Verification
NGO	Non Governmental Organization
NPA	Natural Protected Area
PDD	Project Design Document
PEAM	Proyecto Especial Alto Mayo / Special Project Alto Mayo
REDD	Reducing Emissions from Deforestation and forest Degradation
REDD-plus	Reducing Emissions from Deforestation and forest Degradation, plus Conservation, Sustainable management of forests, and enhancement of forest carbon stocks
R-PP	Readiness Preparation Proposal
SERNANP	Servicio Nacional de Áreas Naturales Protegidas por el Estado / National Service of Natural Protected Areas by the State
SINANPE	Sistema Nacional de Áreas Naturales Protegidas por el Estado / National System of Natural Protected Areas by the State
SPDA	Sociedad Peruana de Derecho Ambiental / Peruvian Society for Environmental Law
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

Table of Contents

List of Tables

List of Figures

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Alto Mayo Protected Forest (AMPF) covers approximately 182,000 hectares of land in the Peruvian Amazon of extremely high value for biodiversity conservation and watershed protection. This area forms part of the Abiseo-Condor-Kutukú Conservation Corridor, one of the most threatened ecosystems in the world which houses an incredible number of endemic plants and animals of global importance. In addition, runoff from the Alto Mayo forests gives rise to several major rivers which provide clean and abundant water supplies and support several economic activities of the local population living in the Alto Mayo basin. For example, the Yuracyacu River provides water for the cities of Yuracyacu and Nueva Cajamarca, while supporting the irrigation of over 9,000 hectares of rice cultivation downstream. Its forests are also recognized for their importance in preventing soil erosion, protecting soils in the lowland areas from torrential flows and floods, and for their scenic beauty. The Alto Mayo forests also store a significant amount of carbon, whose release in the atmosphere through deforestation results in the emission of large quantities of greenhouse gases (GHG) which contribute to climate change. Conserving the Alto Mayo forests is therefore critical for mitigating global climate change, conserving biodiversity, and ensuring the provision of ecosystem services to the local population. For these reasons, the Peruvian government established the Alto Mayo Protected Forest in 1987 as part of the National System of Protected Areas.

Despite the designation of the Alto Mayo forests as a Natural Protected Area (NPA) by the State, insufficient funds for managing the area, the building of a national highway in 1975 that crosses the AMPF, and the high rates of migration from the Andes to the Amazon region have resulted in widespread settlement inside the area, making it one of the NPAs with the highest deforestation rate in Peru. The threats to the area have increased in the last decade with the linking of the highway to other regional mega-development projects such as IIRSA[2] and the rising price of coffee -the main crop grown in this area-, leading to increasing deforestation and the subsequent loss of ecosystem services that this NPA provides. This scenario will continue unless new mechanisms are designed to add value to the standing forest so that it can compete economically with other land uses.

In response, Conservation International and its allies in the region designed the Alto Mayo Conservation Initiative (AMCI), whose main goal is to promote the sustainable management of the AMPF and its ecosystem services for the benefit of the local populations and the global climate. The AMCI recognizes that the key to achieving significant GHG emissions reductions (ERs) and other ecological gains in the AMPF is designing a new mechanism to give the forest an economic value that competes with alternative uses of the land. Currently, conventional coffee production is the primary economic activity among settlers in the AMPF, despite the illegality of this activity under the land use restrictions of the NPA. The conventional coffee production techniques used by the vast majority of coffee producers within the AMPF are highly unsustainable. Most coffee plantations do not utilize organic fertilizers, pest control methods, or effective post-harvest management techniques, causing coffee plantations to quickly lose productivity. When production decreases, most coffee producers convert plantations to pastureland and deforest new areas to establish new coffee plantations. These poor management techniques dominate the coffee production systems in all the sub-basins of the AMPF and encourage the cycle of deforestation.

[2] The Initiative for the Integration of the Regional Infrastructure of South America (IIRSA) is a development plan to link South America's economies through new transportation, energy, and telecommunications projects.

Conservation Agreements (CAs) are being established between local communities and the AMPF Head Office in order to increase the productivity and sustainability of their coffee plantations, thereby increasing individual family incomes and reducing their need to deforest other areas to establish new coffee plantations. Specifically, settlers are being instructed on the production of organic, shade-grown coffee, thereby replacing the current traditional coffee plantations with sustainable, low-impact agro-forestry systems with the goal of restoring degraded areas. In parallel, the AMCI is investing in strengthening the governance and enforcement capabilities of the AMPF Head Office in order to equip them with the necessary skills and resources to successfully manage the complex dynamics between local populations and the Protected Area's conservation goals and to address other drivers such as illegal land trafficking. Additionally, the AMCI is performing extensive outreach and sensitization activities to build awareness among the local population and increase their involvement in conservation activities. With the financial support of carbon financing, these actions are facilitating the conservation of large expanses of forest with associated climate change mitigation benefits, while also creating opportunities for the sustainable development of local communities.

1.2 Sectoral Scope and Project Type

The project falls under scope 14 of the VCS, namely Agriculture, Forestry, and Other Land Use (AFOLU). The AFOLU project category is Reducing Emissions form Deforestation and Forest Degradation (REDD). This is not a grouped project.

1.3 Project Proponent

The project proponent of the Alto Mayo Conservation Initiative is Conservation International Foundation (CI) through its Peru office (CI-Peru). CI-Peru has overall control and responsibility of the AMCI initiative and is in the process of obtaining an administration contract to co-manage the AMPF together with the local Head Office of the National Service of Natural Protected Areas by the State (SERNANP). Pursuant to the administration contract, CI-Peru will obtain the right of use over any GHG emission reductions and/or removals generated during the contract period arising from its performance over the conservation process that generates GHG emission reductions and/or removals in the AMPF. The Right of Use of the Project proponent is more fully discussed in the Right of Use section of the PD (1.12.1).

CI is a global, non-governmental organization (NGO) based in Washington D.C. (USA), with offices in more than 30 countries and more than 1000 partners around the world. CI's mission is to help societies adopt a more sustainable approach to development—one that considers and values nature at every turn. CI has more than two decades of experience in leading successful conservation initiatives around the world and collaborating with local partners in the field. As an organization with a strong foundation on science, CI has a long history of deforestation mapping, Land Use Change modelling, and spatial analyses that has become increasingly relevant to REDD applications. For ten years, even prior to the increasing interest in REDD, CI has made major contributions to the scientific understanding of tropical deforestation patterns and rates. CI has produced wall-to-wall, fine-resolution, multi-temporal deforestation maps for twelve tropical countries and regions[3]. CI has used these products to perform spatial analyses focused on habitat mapping and was one of the first NGOs to adopt habitat mapping using remote sensing as a standard practice. Most recently these deforestation maps have been used to

[3] e.g. Leimgruber et al 2005, Christie, et al 2007, Harper, et al 2007a, 2007b, Killeen et al 2007; see https://learning.conservation.org/spatial_monitoring/Forest/Pages/default.aspx

generate baseline scenarios for REDD initiatives. Some of these maps have also being used by governments in national REDD-readiness efforts, such as in Liberia and Madagascar. CI has also worked extensively with Clark Labs, the developers of the IDRISI software suite, to advance the Land Change Modeller for REDD applications.

In addition to the technical work, CI is building a diverse portfolio of site-level REDD-plus initiatives around the world and working on project design and implementation, with four projects already validated under the Verified carbon Standards (VCS) and/or the Climate, Community and Biodiversity Standards (CCBS) in China, the Philippines and Brazil, and several more ongoing in Fiji, Madagascar and the DRC, among others. CI is also involved in developing feasibility studies for REDD-plus initiatives in a number of countries, and operates a Carbon Fund to channel investments in support of REDD-plus activities. At the national level, CI advises numerous countries on REDD-plus policy and UNFCCC negotiations, as well as on REDD-Readiness and Measuring, Monitoring, Reporting and Verification (MRV) issues and is testing the development of nested approaches to REDD-plus in order to link its ground activities with national REDD-plus frameworks. Finally, CI has conducted extensive capacity building efforts on REDD-plus that have involved more than 1,300 stakeholders, including government officials, representatives from NGOs, indigenous leaders, rural communities, the corporate sector, and academia.

In Peru, CI has been working since 1989, helping to establish the first protected areas in the Amazon. CI-Peru supports conservation efforts at all scales, ranging from the creation of protected areas at the local level to the design of biodiversity conservation corridors on a regional scale. For 20 years, CI and its local partners have worked to create and consolidate the Vilcabamba-Amboro and Condor-Abiseo-Kutuku conservation corridors. CI Peru has initiated a variety of pilot projects related to payment schemes for environmental services, especially those related to REDD-plus, to ensure the long-term provision of these services and the protection of the ecosystems that provide them. CI-Peru works with regional governments, federations of indigenous peoples, the Ministry of the Environment and the National Service of Natural Protected Areas to ensure the success of these initiatives. CI-Peru consists of a multidisciplinary team of 14 Peruvian staff members, who are experts in both social and natural sciences and are supporting the AMCI initiative. In addition, CI-Peru has a technical team of six consultants led by the AMCI Field Coordinator, to provide on-the-ground assistance to the AMPF Head Office. The team's objective is to strengthen the signing of Conservation Agreements in the AMPF by facilitating partnerships between the local population and the AMPF Head Office. Several members of the team have extensive agroforestry experience, specializing in the development of sustainable agroforestry coffee and cacao systems in the Peruvian Amazon and have ample field experience working on conservation projects in NPAs in Peru.

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CONSERVATION INTERNATIONAL

1.4 Other Entities Involved in the Project

Servicio Nacional de Áreas Naturales Protegidas por el Estado (SERNANP)

The National Service for Natural Protected Areas Protected by the State (SERNANP) is the government agency responsible for establishing the technical and administrative criteria for the creation and protection of National Protected Areas in Peru. It manages Peru's National System of Natural Protected Areas (SINANPE, or *Sistema Nacional de Áreas Nacionales Protegidas por el Estado*) of which the AMPF is part of. SERNANP has a diverse array of conservation professionals with a wide range of areas of expertise that together make up the basis from which it manages the vast expanse of protected areas at the national level.

SERNANP participates in the AMCI through the AMPF Head Office (*Jefatura*) which is its decentralized branch in charge of managing and protecting the AMPF in the field in accordance with an approved Master Plan. Although officially designated as a Protected Area in 1987, the AMPF didn't have personnel or an assigned budget until the year 2000, and its Master Plan was not finalized until 2008. Despite these challenges, the local AMPF Head Office has been able to strengthen institutionally and today is made up of several park rangers, who after 10 years in office have gained ample experience in dealing with the challenges and social complexity that characterize this Protected Area. The AMPF Head Office is responsible for signing and monitoring Conservation Agreements with the local population, and is the ultimate authority within the AMPF.

SERNANP also supports the AMCI through its headquarters in Lima. For this project, the headquarters office has been particularly important for establishing the guidelines and legal framework for implementing Conservation Agreements within a Protected Area. It has also signed a Cooperation Agreement with CI-Peru to support the management of NPAs, and is engaged in a process of transferring legal rights to CI to co-manage the area together with the AMPF Head Office through an administration contract. SERNANP is also interested institutionally in the possibility of the AMCI project becoming a model for financing the long-term management of an NPA through the valuation of its environmental services.

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Asociación para la Investigación y Desarrollo Integral (AIDER)

The Association for Research and Integrated Development (AIDER) is a Peruvian institution with over 18 years of experience in managing natural resource conservation projects in the Amazon. Its thirty-two staff members have extensive experience in REDD and other forestry related projects. AIDER has supported the successful validation and registration of the first Clean Development Mechanism reforestation project in Peru[4]. It holds administration contracts for two NPAs in Peru, both of which are REDD projects undergoing VCS and CCB validation[5]. AIDER is a technical advisor to the AMCI project, responsible for conducting the biomass inventory of the AMPF, doing background analysis of the agents and drivers of deforestation, supporting project implementation and contributing to the development of the Project Design Documents (PDD).

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Sociedad Peruana de Derecho Ambiental (SPDA)

The Peruvian Society for Environmental Law (SPDA) is an organization dedicated to integrating environmental conservation into development policies to achieve a sustainable society. SPDA has extensive experience in legislation, environmental management, international treaties, international environmental law, and capacity building regarding legal principles and social responsibility. Specifically, the Forestry Program of SPDA has conducted extensive analyses on the regulatory aspects of REDD-plus in Peru on behalf of the Peruvian Government and other stakeholders. SPDA is a legal advisor to the AMCI project and provides crucial support on issues related to right of use, NPA law, land tenure, administration contracts, Conservation Agreements, and others.

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4 http://cdm.unfccc.int/Projects/DB/TUEV-SUED1245856381.67/view

5 Proyecto Reducción de la deforestación y degradación en la Reserva Nacional Tambopata y en el Parque Nacional Bahuaja Sonene del ámbito de la región Madre de Dios en Perú

Asociación Ecosistemas Andinos (ECOAN)

The Association for Andean Ecosystems (ECOAN) is a Peruvian NGO with more than ten years of experience in implementing conservation projects and conducting research on flora and endangered bird species in Peru. In addition, ECOAN operates ecotourism initiatives and implements community development projects. These projects are located in six regions across Peru, several of which focus on sustainable forestry and forest conservation initiatives. ECOAN manages the Lechucita Bigotona biological station in the buffer zone of the AMPF and has ample experience working with communities living in and around its boundaries. Supported by the AMCI field staff and the AMPF Head Office, it will be responsible for working directly with local settlers to design and implement Conservation Agreements in the field.

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Additional stakeholders

While SERNANP and the AMPF Head Office are key partners in the AMCI initiative and represent the main stakeholders involved in the management and administration of the AMPF, CI recognizes the importance of involving all local stakeholders in the AMCI, ranging from local government officials and private interests to the broader civil society and individual settlers. The Law of Natural Protected Areas (Article 15) requires that all public NPAs in Peru have a Management Committee to provide local stakeholders a voice in the management of NPAs and ensure that they are being managed in accordance with their conservation goals. The AMPF Management Committee, created in 2001, was recognized through Departmental Resolution N° 007-2005-INRENA-IANP in 2005 and provides the main platform for stakeholder dialogue on issues related to the management of the AMPF. As a result of the support received through the AMCI, it currently consists of 59 representatives from local governments and population centres, regional governments, public and private sector institutions, and other organizations with an interest in the management of the Protected Area. This umbrella committee, representing a diverse body of stakeholders has been, and will continue to be, the main mechanism through which the AMCI will involve local interests in the project and maintain an open dialogue. In addition, the AMCI recognizes that the success of the AMPF in conserving its 182,000 hectares of Amazonian forest is inherently linked to the livelihoods of the populations that live in and around its boundaries. Therefore, individual settlers that sign Conservation Agreements with the AMPF Head Office also represent key stakeholders in the AMCI initiative.

As described above, the size and complexity of the project requires collaboration among a broad range of partners and local actors with different roles and responsibilities within the project. Figure 1 illustrates the institutional structure of the AMCI REDD project identifying the Project Proponent, its main partners, and the key stakeholders involved. Note that, as the ultimate authority responsible for the management of NPAs in Peru, SERNANP and the AMPF Park Service are identified as both a Project Participant and a key Project Stakeholder.

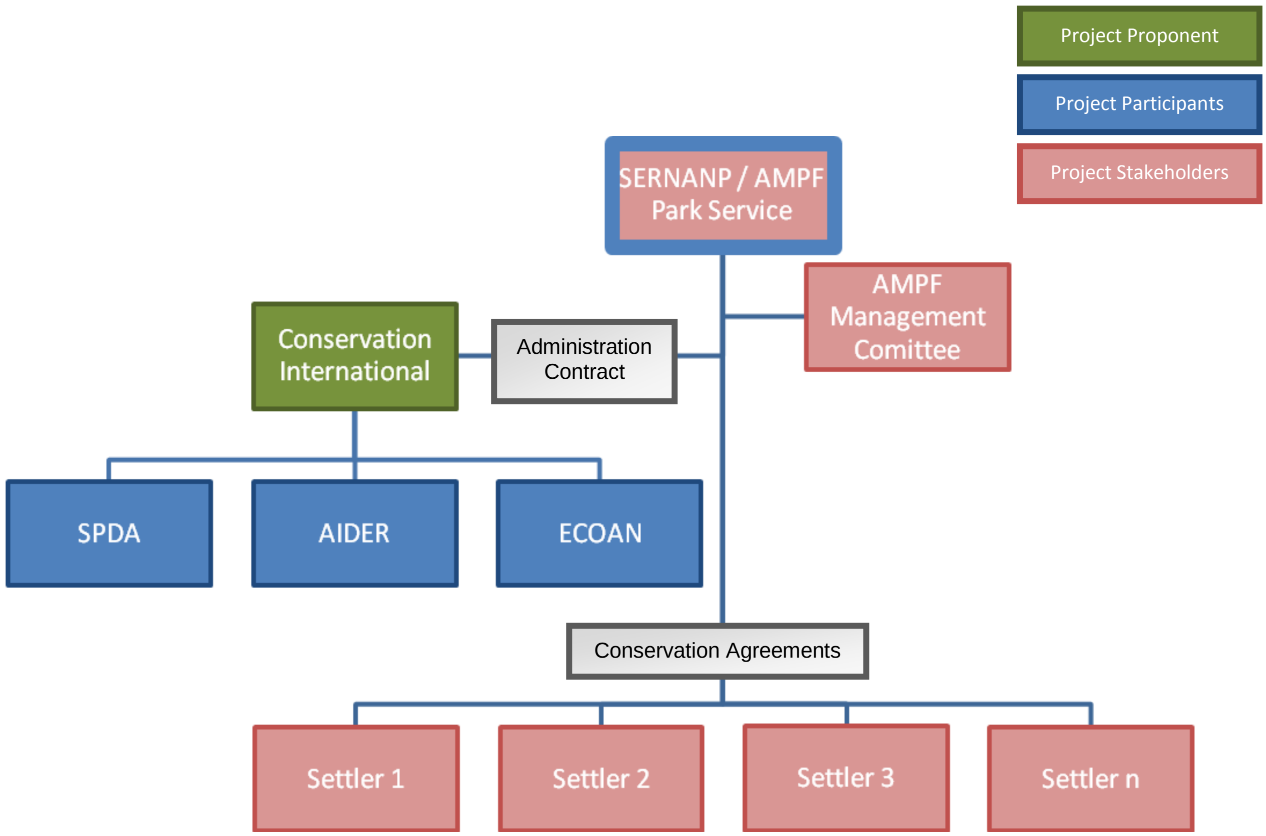

Figure 1. Institutional Structure of the Alto Mayo Conservation Initiative

1.5 Project Start Date

The start date of the project is 15th of June 2008. While several project activities, such as biomass inventories and feasibility studies for the establishment of Conservation Agreements and a REDD+ initiative began as early as 2007 (the project was presented during the 13th COP to the UNFCCC in Bali), this date represents the time when the activities that lead to the generation of GHG emissions reductions started to be implemented, through the development of Conservation Agreements in the field.

1.6 Project Crediting Period

The start and end date of the project crediting period are, respectively: 15th of June 2008 to 14th of June 2028, for a total of 20 years. The project crediting period shall be subject to renewals.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The AMCI is not a mega-project as the estimated average annual GHG emissions reductions generated through the project are less than 1,000,000 tCO_2.

Project	√
Mega-project	

The estimated average annual GHG emissions reductions generated by the AMCI (i.e. after accounting for leakage and prior to buffer withholding) are provided below. Since the first baseline period is only ten years, GHG benefits are shown until 2018.

Years	Estimated GHG emission reductions or removals (tCO_{2e})
Year 2009	474,136
Year 2010	453,796
Year 2011	425,688
Year 2012	468,496
Year 2013	467,040
Year 2014	477,566
Year 2015	502,990
Year 2016	555,762
Year 2017	634,553
Year 2018	691,138
Total estimated ERs	5,151,165
Total number of crediting years	10
Average annual ERs	515,116

1.8 Description of the Project Activity

Since the establishment of the Alto Mayo Protected Forest in 1987, SERNANP and its local Head Office have aimed to conserve its forests in order to protect regional watersheds, wildlife, scenic and scientific research values, and forest vegetation with its associated climate change mitigation potential. This goal of conservation has become increasingly difficult to meet as the number of settlers within the boundaries of the Protected Area has grown, and the AMPF is now one of the NPAs in Peru with the greatest extent of direct human impact. As annual forest loss has continued, Conservation International and local partners have recognized the urgency for action and have designed an integrated strategy to protect forest resources while simultaneously providing local people with viable economic alternatives to deforestation.

The project activities of the Alto Mayo Conservation Initiative are aimed at addressing the drivers of deforestation within the Protected Area. The AMPF is currently being impacted by the significant population of settlers within and around its boundaries that rely heavily on forest conversion of cropland to sustain their income generating activities, despite not having legal claims to the land or natural resources. Coffee production is the primary economic activity in the AMPF, accompanied by subsistence agriculture and cattle grazing on pastures that are established on abandoned coffee plantations. At a smaller scale, illegal logging operations and the collection of firewood for domestic or commercial purposes further degrade forests. Infrastructure is also being built illegally in the AMPF in response to the growing population. Lastly, illegal land grabbing is a threat as population growth drives demand for new lands to be converted to agriculture. As evidenced by the high recent deforestation rate in the AMPF, these threats are challenging the capacity of the AMPF Head Office, which lacks staff, training, infrastructure, equipment, and ultimately financial resources to effectively manage and enforce a conservation strategy throughout the 182,000 hectares of the AMPF (for a detailed description of the drivers and agents of deforestation in the AMPF, please refer to the analysis conducted under Step 3 of the VM0015 Methodology, and reported in Sup.Inf_PD_2.2).

Image 01. Deforestation inside the AMPF

Image 02. Deforestation inside the AMPF

The AMCI recognizes that the key to achieving significant greenhouse gas emission reductions and other ecological gains in the AMPF is a dual strategy that combines improved governance and enforcement in the AMPF with a new incentive structure that makes sustainable agricultural activities economically competitive with other alternative land uses. Based on this approach, the project's activities are structured around five strategic goals, namely: (I) improving the governance and enforcement capabilities of the AMPF local Head Office; (II) promoting sustainable land use practices that will reduce deforestation and forest degradation within and beyond the AMPF's boundaries through the signing of Conservation Agreements with local communities; (III) promoting a change in the perception of the local population towards the importance of the AMPF by increasing its environmental awareness and involvement in the conservation of the Protected Area; (IV) ensuring the long-term sustainability of the AMCI by creating long-term financial mechanisms through carbon financing and other PES schemes; and (V) integrating the AMPF in the broader policy agenda at the local, regional and national level. The activities involved in meeting each of these goals are summarized below, and are elaborated in detail in the *AMCI REDD strategy document* that will be provided to the validator (Sup.Inf_PD_1.1).

I. Improvement of the Governance and Enforcement Capabilities of the AMPF Head Office

A. Governance

In order to successfully reduce deforestation in the AMPF, the AMCI is investing in improving the governance of the Protected Area by supporting the AMPF Head Office strengthen its capacity to respond to a range of diverse and dynamic threats. One aspect of the AMCI strategy to achieve this goal is for CI to co-manage the AMPF in order to support the local Head Office in effectively implementing the PA's Master Plan. Although the AMPF is a Natural Protected Area owned by the Peruvian State, Peruvian law allows SERNANP to grant co-management responsibilities and certain legal rights in a Protected Area through an administration contract. CI is currently in the process of obtaining an administration contract with SERNANP that will allow CI to co-manage the AMPF and execute management and administration operations set forth in the AMPF's Master Plan. This legal responsibility will facilitate the improvement of the Protected Area's facilities, procurement of equipment necessary for enforcement and monitoring, the hiring of park rangers and skilled professionals to join the AMPF Head Office's management team, and the implementation of workshops and training for park staff, among other activities.

Through this administrative reform the AMCI is able to procure the necessary funds for building the capacity of the AMPF Head Office with the staff, skills and equipment it needs to make significant improvements in the governance of the AMPF. Even though SERNANP has an annual budget designated for the management of the AMPF, these annual allocations have been insufficient in the past and have resulted in high deforestation rates that continue to severely threaten the future of this Protected Area. With the funds provided through the AMCI, the necessary supplies and equipment are being procured to meet the operational and administrative needs of the AMPF Head Office. Specifically, a central management office will be opened (including purchasing the land and building the infrastructure) for the AMPF Head Office in the nearby city of Rioja, and provided with the necessary office supplies and technical equipment. The project is also hiring a number of additional personnel to join the Park Service's administrative team, including: a lawyer, a project developer, an environmental specialist, an administrator, an administrative assistant, a communications representative, and a guard. This increase in professional staff will facilitate the AMPF Head Office's more effective and efficient administrative, technical, and legal responses to situations that arise in the Protected Area. Additionally, the AMCI plans to provide training programs for members of the local Head Office to strengthen their understanding and capacity in key legal and technical aspects of the management of Protected Areas.

B. Enforcement

The AMCI also aims to improve the enforcement capabilities of the AMPF Head Office in order to reduce deforestation in the AMPF. Previously, the AMPF Head Office did not have sufficient funds to effectively enforce the land use restrictions of the NPA as set out in its Master Plan. With the implementation of the AMCI, enforcement and surveillance in the AMPF will be essential for encouraging respect and adherence to the conservation commitments of the CAs and the land use regulations of the NPA.

To improve the control and surveillance within the AMPF and its buffer zone, 16 park rangers are being hired, trained, and provided with necessary equipment as part of the AMCI project. The AMCI is also constructing four park ranger stations and three park ranger lodges, as well as renovating the single existing park ranger station and lodge. Vehicles, such as jeeps and motorcycles, are also being purchased through the AMCI to ensure the mobility of the PA's staff and enable rangers to effectively patrol the extensive area of the AMPF. Demarcation and signage will be installed and used to indicate the PA's boundaries and restrictions. In addition, the AMCI is assisting the AMPF Head Office in developing and implementing a plan for the control and surveillance of the Protected Area.

C. Strengthening the Capabilities of the AMPF Management Committee

The AMCI recognizes the importance of involving local civil society in the conservation efforts of the AMPF in order to effectively reduce the rate of deforestation within the Protected Area. The Law of Natural Protected Areas requires that all public NPAs in Peru have a Management Committee to ensure that the NPA is being managed in accordance with its conservation goals. The AMPF Management Committee is the main platform for stakeholder dialogue in the management decisions of the AMPF and its members range from local government officials and private interests to individual settlers. Prior to the AMCI, however, the AMPF Management Committee has been unable to fulfil its responsibility and effectively support the operation of the Management Committee due to both a lack of funding and effective coordination.

The AMCI aims to amplify the representativeness and strengthen the capacities of the AMPF Management Committee and, in so doing, improve the management of the AMPF by building a strong partnership between the AMPF Head Office and local stakeholders. CI coordinated efforts with the Executive Committee of the Management Committee[6] to develop a plan with three central strategies: i) formalize the legal status of the Committee and its regulations, (still pending); ii) improve its operational effectiveness, specifically its capacity to develop annual workplans and to secure funding for all planned activities; iii) strengthen the abilities and understanding of Committee members on a variety of issues essential to the management of the AMPF, including topics such as Conservation Agreements, REDD-plus, patrolling and surveillance, and conflict resolution, among others. The AMCI is also organizing field visits for the members of the Executive Committee to ensure that they have a full understanding of the complex dynamics that threaten the AMPF and ensure their full participation in its management. The full *Plan to Strengthen the Capacities of the AMPF Management Committee* will be provided to the validator for review (Sup.Inf_PD_1.4).

II. Promote sustainable land use practices through Conservation Agreements

The AMCI utilizes Conservation Agreements (CAs) as a tool to reduce the imminent drivers of deforestation inside the AMPF –coffee production- and prevent leakage of these activities outside the Protected Area. Conservation Agreements have been promoted by CI in more than 17 countries to create incentives for local populations to align their economic-generating activities and land use practices with conservation goals. This is done by engaging the local populations in a commitment to achieve measurable forest conservation results while offsetting the forgone benefits that they would have otherwise gained in the short term from unplanned use of the forest. Conservation Agreements are signed between SERNANP, represented by its local AMPF Head Office, and individual coffee producers with the primary objective of conserving and restoring forest cover in the AMPF in order to protect the ecosystem services it provides (specifically, the conservation of carbon, water resources, soils and biodiversity). The AMCI began developing CAs in 2008 and continues to involve more settlers with the

[6] A Management Committee must have an Executive Committee to lead the larger General Assembly of the Management Committee, and the Executive Committee must be reelected every 2 years.

goal of signing agreements in at least eight sub-basins that are the most threatened within the AMPF and its buffer zone.

A series of steps is followed to design, implement and monitor Conservation Agreements in the AMPF. First, a feasibility analysis is conducted by partner NGOs in each sub-basin and the results are presented in a technical report to determine viable strategies for the design and implementation of CAs. Second, the local population is consulted to ensure their understanding of CAs, to give input in the design of the commitments and benefits agreed upon, and to provide their final approval. A standard template for CAs has been approved by SERNANP and provides the general legal framework for all agreements, but the design of the CAs in each sub-basin is flexible and allows for the implementation of different strategies to address the drivers of deforestation and conditions specific to each area. Third, once the CAs have been signed, partner NGOs implement the CAs by distributing the (agreed upon) benefits to the settlers and monitoring the compliance of the commitments taken on-the-ground. These efforts are paired with monitoring led by the AMPF Head Office and CI-Peru to ensure the delivery of benefits and compliance with the CAs. Additionally, independent groups overseen by the AMPF Head Office and CI-Peru, conduct socioeconomic and biological monitoring to measure the impacts of the initiative. The Conservation Agreements model and methodology will be provided in detail to the validator for review (Sup.Inf_PD_1.2).

Each settler who signs a Conservation Agreement in the AMPF agrees to participate in conservation activities, such as training sessions, reforestation campaigns, and surveillance activities, as well as to report to the AMPF Head Office any illegal activities and the establishment of new settlements in the NPA. Additionally, they agree to implement only environmentally sustainable activities that are compatible with the conservation objectives of the AMPF and to limit these activities to the authorized areas of the NPA. In return, each participating settler within the AMPF receives regular technical assistance by qualified professionals in organic coffee production. Additionally, they are provided with high quality organic fertilizers and the necessary materials and tools to prepare specialized compost and apply organic pesticide and herbicide techniques. They are also receiving equipment, training and tools necessary for improving their practices in the different stages of the coffee production cycle, allowing them to improve productivity rates and access to niche markets for organic coffee. Settlers also benefit from paid salaries for patrolling and other conservation activities, as well as access to coffee and native tree seedlings grown in tree nurseries established by the AMCI. For communities in the buffer zone that sign CAs, benefits such as public health campaigns and the provision of school supplies are also included in the agreements. The CA model that has been approved by SERNANP, along with the guidelines that were developed by its legal department, will be provided to the validator for review (Sup.Inf_PD_1.3a-b).

By offering support to establish organic, shade-grown coffee production systems, CAs aim to address the leading driver of deforestation in the AMPF by creating an incentive for settlers to shift their conventional coffee production systems towards more sustainable practices. Such practices are particularly attractive to the local population because of their potential to significantly increase coffee yields, through the use of improved coffee production techniques, up to three or four times greater compared to a conventional coffee plantation, as well as potentially doubling the production life of the crop[7]. This substantial increase in yield and production life has the potential to significantly increase income to the coffee growers. Increased income, combined with the settlers' commitment to conservation (ensured through an agreed

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[7] These estimates are provided by the coffee experts involved in the AMCI project which have ample experience working in the Peruvian Amazon.

monitoring and sanctioning system) reduces their incentive to deforest additional areas of forest to create new plantations. Additionally, this shift in cultivation techniques will lead to the restoration of previously degraded lands which can be returned to sustainable production systems in line with the objectives of the NPA.

To ensure the long-term shift to sustainable coffee production beyond the project's lifetime, the AMCI plans to strengthen the technical and organizational capabilities of local coffee associations and link them with high-value global organic coffee markets. To support this more sustainable production model, the AMCI is coordinating with Verde Ventures, a CI-based loan-making fund that promotes the development of sustainable supply-chains and businesses. Verde Ventures has already invested in several local organic coffee associations in partnership with the AMCI and there are plans in the near future to offer loans or other types of funding to directly assist small-scale farmers in transforming conventional coffee plantations to sustainable coffee production systems.

III. Increased Environmental Awareness and Involvement of Local Populations

Successfully reducing deforestation in the AMPF depends largely on the ability to engage local people in the conservation strategies of the Protected Area. To achieve this goal, the AMCI is investing in the implementation of a comprehensive communication strategy in order to promote a change in the perception of the local community towards the importance of the AMPF and its contribution to human well being. Changing people's perception towards the AMPF and raising awareness about its ecosystem services will be essential to incite the necessary behavioral change that will make the broader local population participant in the conservation activities of the initiative in the long term.

The AMCI communication strategy aims to ensure a broader understanding among local actors of the Conservation Agreements and their link to the conservation goals of the AMPF, as well as the Head Office's authority in the NPA. Specifically, the AMCI is promoting environmental awareness by local people and institutions to enhance their understanding of the importance of conserving the forest and its ecosystem services. The AMCI has made significant advances towards this goal through the wide distribution of communication material such as brochures, factsheets, and posters; by providing information on local bulletin boards; and through the project's website, radio programs and informational spots on local television. All these products are developed in the context of specific sensitization campaigns targeting different issues relevant to the AMPF such as land speculation, deforestation, biodiversity, water quality, etc.

Youth environmental education is also a major goal of the communication strategy to ensure the sustainability of the project in future generations. CI, in collaboration with the AMPF Head Office, has initiated a pilot environmental education program at local schools and has organized activities such as environmental drawing contests and reforestation campaigns. Students from four schools in the districts of Rioja and Nueva Cajamarca also participated in training modules in environmental concepts, journalism, and media production to empower them to become environmental promoters in their communities. Additionally, the communication strategy is collaborating with and training local journalists and media sources as important allies in the dissemination of environmental awareness and information about project activities.

Through these and other sources, the communication strategy aims to disseminate information on the activities and results of the AMCI, as well as the importance of the conservation of the AMPF at the regional and national level. Lastly, to support the implementation of this strategy and in order to strengthen the communication abilities of the AMPF Head Office team, a communications representative has been hired by the AMCI to lead its communication program. The full *AMCI Communication Strategy* will be provided to the validator for review (Sup.Inf_PD_1.5). (See also the Stakeholder Comments section for more details on the AMCI's communication strategy.)

Training programs are also essential for both strengthening the management abilities of the AMPF Head Office and involving local actors in the AMCI. The increase in AMPF staff and the restructuring of the AMPF Management Committee emphasize the need for training workshops on managerial and technical aspects of NPAs. Additionally, the AMCI will engage community patrols, coffee associations, local governments, and other local actors in training sessions to ensure their understanding of their rights and responsibilities related to activities underway in the AMPF and the legal restrictions of the Park. These workshops will also address social conflict resolution strategies, control and surveillance plans, legislation related to NPAs, and information about climate change and forest carbon projects. The *AMCI Capacity Building Plan* is included in the AMCI REDD strategy document that will be provided to the validator for review (Sup.Inf_PD_1.1).

IV. Ensuring the Long-Term Financial Sustainability of the AMPF

The sustainability of the wide scope of project activities that the AMCI proposes depends on having access to secure funding over the long-term. In recognition of this, one of the central goals of the AMCI is to obtain funding from a variety of avenues to ensure a sufficient and stable funding stream to support the implementation of Conservation Agreements, the strengthening of the AMPF Head Office and Management Committee, and the implementation of the AMCI communication and capacity building strategy over the next 30 years or more.

One of the key financing strategies of the AMCI is to obtain funding from carbon credits generated from avoided deforestation in the AMPF through the voluntary carbon market or future compliance markets. In order to market the carbon credits generated from reduced deforestation, the project is seeking registration under the Verified Carbon Standard (VCS) and the Climate, Community and Biodiversity Standard (CCBS). Additionally, the administration contract signed between CI and SERNANP will allow carbon credits to be registered with the VCS under the agreement that funds generated by the project will be invested exclusively in activities aimed at strengthening the management of the AMPF and supporting the implementation of its Master Plan. The project's validation and verification under the VCS and CCB standards thus is an essential part of the AMCI strategy that will allow it to obtain the necessary financing for activities that will facilitate the conservation of large expanses of forest with associated climate change mitigation benefits, while also encouraging the sustainable development of local communities.

In addition, CI is exploring options for the establishment of a trust fund (or other similar options) that would secure the long term funds for the management of the AMPF and for the continuous support to the Park Service and Conservation Agreements well beyond the project's lifetime (see Financial Viability section of the Non-Permanence Risk Analysis for further details).

V. Integration into broader development processes

A. Regional development policies and plans

To be able to counteract the impacts of the expansion of coffee production, currently the main driver of deforestation in the AMPF and its buffer zone, the AMCI will have to significantly increase the scale of its intervention beyond the project's area. The AMCI aims to position the AMPF as an integral part of the San Martin region's vision towards healthy, sustainable economic development. In order to achieve this level of success, the AMCI recognizes the need to create strategic alliances with a variety of actors at the local, regional, and national level. Partnerships between the AMCI and other groups working in agricultural development in the Alto Mayo watershed, particularly those working with local coffee associations, will allow for increased collaboration, provide possible funding opportunities, and permit the AMCI to reach a broader population of smallholders and thus have a larger-scale impact. Integrating critical aspects of Conservation Agreements into the working model of these organizations will be key for expanding the AMCI's activities beyond its current area of influence.

Additionally, the AMCI is coordinating with local authorities and the regional government of San Martin to align the conservation of the AMPF with their regional development plans by incorporating the role of ecosystem services in the development strategies of the local population, and is working with the Environmental Regional Commission (CAR) to develop a Regional Environmental Strategy and Regional Climate Change Strategy that considers the role of Protected Areas in those strategies. In the future, the experience of the AMCI will be presented to the National Strategy of Climate Change.

B. Nested Approach

CI-Peru is collaborating with the national and regional Government to ensure that the AMCI is developed in line with and as a model for the nested approach to REDD-plus. This nested approach is already a key element of the Peruvian government's international negotiations on REDD-plus and CI-Peru is supporting the adoption of this approach by the Peruvian government as a national strategy. At the regional level, CI-Peru is supporting the technical component of the San Martin REDD Roundtable (*Mesa REDD*) that serves as a formal platform for dialogue between the Regional Government of San Martin (GORESAM), the Ministry of Environment, local NGOs, indigenous peoples and other local stakeholders to discuss and coordinate all REDD-plus initiatives taking place throughout the region. This initiative is funded by the Norwegian Agency for Development Cooperation (NORAD) and aims to enhance the capacity of GORESAM in designing and implementing an integrated REDD-plus readiness process that can serve as a national model that safeguards indigenous and local peoples' rights and perspectives in the design of REDD-plus strategies, in line with the REDD Readiness Preparation Proposal (R-PP) as approved by the World Bank Forest Carbon Partnership Facility (FCPF). In addition, CI is also working with the GORESAM to design a regional Monitoring, Reporting and Verification (MRV) System to ensure that the emissions reductions generated by the AMCI project activities and other REDD projects in the region can be reported and accounted for at the regional and national level in the future, and is actively participating in the VCS Jurisdictional and Nested REDD Initiative. By participating in these initiatives, the AMCI is pursuing the dual objective of promoting the Alto Mayo as a REDD-plus model for Protected Areas at the national level, while also incorporating it in a broader institutional and policy framework that will be aligned with the national REDD-plus strategy and accounting framework.

Image 03. AMCI technician showing pruning techniques for coffee

Image 04. Mixing organic fertilizer

Image 05. Coffee plantations inside the AMPF

Image 06. Nursery in San Agustin Sector

1.9 Project Location

The project area corresponds to the Alto Mayo Protected Forest (AMPF), an area of 182,000 hectares in the northern Peruvian Amazon protected by the State, as established by Supreme Resolution No. 0293-87, DGFF-AG, dated July 23, 1987. Administratively, it is situated in the department of San Martin, between coordinates 5° 23' 21" S, and 77° 43' 18" W upper left corner and 6° 10' 56" S and 77° 12' 17" W lower right corner. The above area includes the districts of Yorongos, Rioja, Elías Soplín Vargas, Nuevo Cajamarca and Pardo Miguel in the province of Rioja, and the district of Moyobamba in the province of Moyobamba. Figure 2 illustrates the location of the project. As detailed in the Methodological Annex, while the AMPF comprises 182,000 hectares of land, the VCS project area, defined as the forested area within the AMPF following the VM0015 methodology (i.e. where GHG credits will be generated), is 153,929 hectares. GIS (including KML) files of the physical boundaries that define the land included in the project area will be provided to the validator.

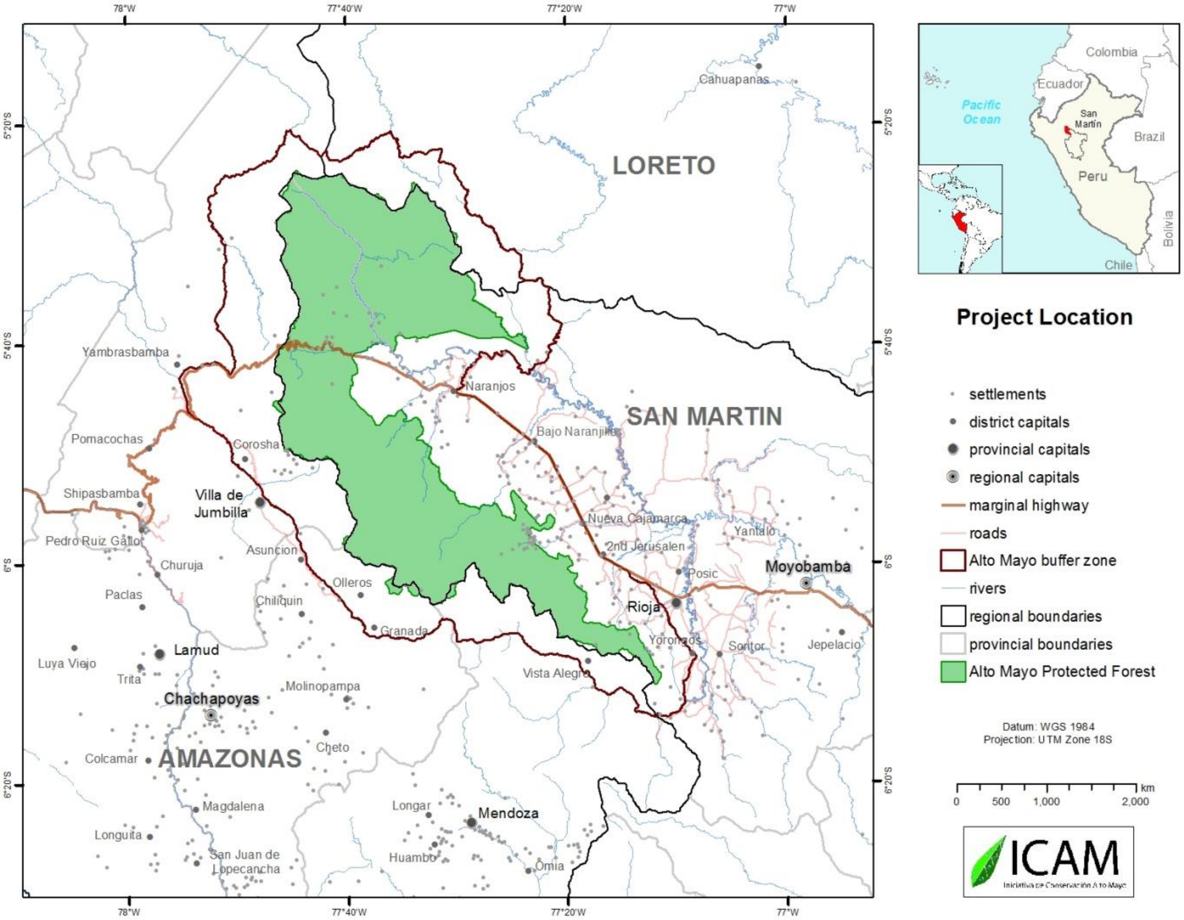

Figure 2. Location of the Alto Mayo Protected Forest

1.10 Conditions Prior to Project Initiation

Historical occupation of the Alto Mayo basin

In October of 1963, Supreme Resolution No. 442 created the Alto Mayo National Forest which covered an area of 52,000 ha encompassing lands in the provinces of Rioja and Moyobamba in the Department of San Martin. At that time, National Forests were areas declared suitable for the permanent production of timber and other forest products, including wildlife, that could be utilized by the government or private entities. The Alto Mayo National Forest laid the foundation for the later creation of the present Alto Mayo Protected Forest (AMPF).

For decades, the Alto Mayo basin has been a destination for immigrants. The majority of the population that settled in the region came from the departments of Cajamarca, Amazonas, Piura, La Libertad and Lambayeque. Colonization of the Peruvian Amazon is a result of several factors. The difficult socio-economic conditions in the Andes region of Peru encourage individuals, many of which are farmers, to leave in search of better economic opportunities in the Amazon. The historical "booms" or peaks in migration to the Alto Mayo have been, and continue to be, directly related to improved accessibility to the region with the development of new infrastructure and increasing demands for agricultural products.

The construction of the Marginal Highway in the Amazon (*Carretera Marginal de la Selva*, also known as Fernando Belaunde Terry highway) was an enormous endeavour that began in 1975 and marked the beginning of a surge in colonization of the Alto Mayo Basin. When the highway was constructed through the Ingenio - Aguas Verdes - Rioja area, the first farmers began to settle in the Alto Mayo National Forest, mostly coming from Cajamarca and Amazonas. The construction of the Marginal Highway in the Alto Mayo region substantially changed the spatial distribution of the population. Before the construction of the road, towns were established along rivers and streams. After its construction, the rivers were used less for transportation and accessibility to the highway became the most important criteria when establishing new settlements (Arrese, 1995; and Gierhake, 2002; as cited in PEAM and IIAP, 2007). As a result of the access to the region provided by the highway, the population growth rates between 1972 and 1981 were as high as 9.4% (Gierhake and Gottsmann, 2001, as cited in Heckmann, 2006). Following the construction of the highway, agricultural production also shifted from subsistence to market-oriented production (Gierhake 2002, as cited in PEAM and IIAP, 2007). This population growth and related shifts in agricultural practices led to the beginning of the extensive deforestation of the Alto Mayo watershed. Deforestation in the region has continued since, as demonstrated by the annual deforestation rate of about 4.2% between 1999 and 2002 (Zimmermann and Horna 2003, as cited in Heckmann, 2006). Primary forests were seen then and are still seen now as areas available for agricultural development, as well as a source of marketable timber (INRENA, 2008).

Booms in the colonization of the Alto Mayo basin were also spurred by the unrestrained extraction of natural resources in response to demands outside the region (Maskrey, Rojas and Pinedo, 1991, as cited in PEAM and IIAP, 2007). Historical peaks were caused by the rise in economic value of “Panama" hats, followed by rubber, then by wild yam and later, and on a smaller scale, coffee and cotton. Coffee was introduced to the region in the 1940s and was transported by river to Yurimaguas and Iquitos (PEAM and IIAP, 2007). In the 1970s and 1980s, the production of corn motivated migration to the Amazon, and most of these farmers settled in the Alto Mayo basin. People left the mountains and the northern edge of the Peruvian jungle to move to the Amazon region, having originated largely from Celendin, Cutervo, Chota, Jaén (Cajamarca), Bagua (Amazonas) and Huancabamba (Piura), as well as some coastal areas, like Lambayeque (INRENA, 2008).

In 1981, the Peruvian government established the Alto Mayo Special Project (PEAM) with the goals of controlling the colonization of the Alto Mayo basin and providing assistance to poor farmers to give them more economic opportunities and options other than deforestation (Heckmann, 2006). This government initiative failed, however, to stop the unplanned colonization of forest land unsuitable for agricultural production. Instead, the government’s initial support for the production of rice and corn encouraged, unintentionally, further uncontrolled colonization due to agricultural expansion.

Rice and corn suffered a dramatic downturn in the market beginning in 1984 and ending in 1989 that coincided with the rising price of coca in the international market (PEAM and IIAP, 2007). Throughout the 1980s and 1990s, the rise of coca attracted migrants from Huanuco and La Libertad, many of whom settled in the southern region of San Martín (INRENA, 2008). The Alto Mayo basin was, subsequently, heavily influenced by drug trafficking and terrorism, with some of these groups finding refugee inside the AMPF. In 1985, the illegal production of coca occupied 88% of arable land (Gierhake and Gottsmann 2001, as cited in Heckmann, 2006). Along with extensive destruction of protected forest lands and a massive shift in regional labor to cultivate, process and sell coca, there was a significant decline in the production of food crops and, as a result, a distortion in the economy. This shift can be seen in the comparison of the production of crops in 1961 to crop production in 1985. In 1961, the Gross Value percentage for three agricultural products in the department of San Martín was: 76% for coffee, 18% for rice, and 6% for coca. In 1985, 88% of cultivated lands were used for coca, 11% for rice, and 1% for coffee (Maskrey et al., 1991, as cited in PEAM y IIAP, 2007). Due to changes in the anti-narcotics policies that occurred in 1992-1993, the production of coca and cocaine nearly disappeared in the Alto Mayo region. The economic crisis in the Alto Mayo from 1992 to 1995 reflects this change (PEAM and IIAP, 2007).

On July 23 of 1987, Supreme Resolution No. 0293-87-DGFF-AG established the Alto Mayo Protected Forest (AMPF), encompassing an area of 182,000 ha (449,732 acres) and forming part of Peru’s National System of Natural Protected Areas (SINANPE). This legislation created the AMPF with the objective of protecting its watersheds, forest vegetation, wildlife, scenic or landscape values, and scientific research values.

In 1996, the regional economy was revitalized by the boom in coffee production, driven by the rising price of coffee in the international market (CEBEM 2000, as cited in PEAM and IIAP, 2007), causing a new migratory wave to the region. This economic situation was exploited by land grabbers who took advantage of the influx of people from other regions in search of agricultural lands to plant coffee. As more settlers arrived in the Alto Mayo basin, they found that most lands were already occupied, especially those areas that were relatively flat and most ideal for cultivation. As a result, newcomers settled and established plantations along hillsides, along riparian corridors and in drained marsh land, causing severe pressure on the relatively unfertile soils of the area (INRENA, 2008).

Image 07. Sol de Oro Sector

The continued growth of the population can be observed in the establishment of new settlements and the expansion of existing settlements in the AMPF and its buffer zone. Aguas Verdes is one of the largest settlements established during this recent colonization wave and is located on the banks of the Mayo River near the Fernando Belaunde Terry (FBT) highway. The size of the Aguas Verdes settlement is expanding and populated areas are drawing closer to the AMPF, as seen by new “satellite” settlements that have been established, namely Perla del Mayo, El Triunfo, and Jorge Chavez. The opposite side of the Mayo River has also become populated by settlements, such as Alto Valle and El Paraiso del Alto Mayo. Settlements are also being formed in the AMPF buffer zone around Naranjos, the capital of the Pardo Miguel district, namely the settlements of San Agustín and Sánchez Carrión. Other towns that have formed in the buffer zone as a result of the pressure of a growing population are San Pablo, San Carlos, and Santa Cruz, all expanding from the more densely populated area of Naranjillo. Settlers also leave the more populated center of Nueva Cajamarca to populate the settlements of La Florida and La Primavera, then expanding towards the area where the Yuracyacu River begins (INRENA, 2008). The settlement along the Negro River, located between the AMPF and its buffer zone, was established by populations from Cutervo, San Miguel and San Ignacio in the Cajamarca region. Many of them had settled previously in Nueva Cajamarca and Segunda Jerusalem. They continued to penetrate the AMPF, forming the Vista Alegre settlement on the border with the Amazonas region. By 2008, there were 14 settlements and nine rural sectors[8] found within the AMPF and an additional 55 settlements in the AMPF buffer zone (INRENA, 2008).


Image 08. Deforestation inside the AMPF

The main economic activity in the Alto Mayo basin has traditionally been agriculture. Farmers that settled in the area have focused on producing food crops to supply the national market. Before the arrival of the FBT highway, raising livestock was the predominant practice, but gradually, rice cultivation gained ground after the highway was constructed (PEAM and IIAP, 2007). Farmers also grow commercial crops such as coffee, cocoa, oil palm, cotton, tobacco, and peach-palm (INRENA, 2008) for both export and domestic consumption,). Coffee was introduced to the region more recently and has been growing rapidly in economic importance and occupying larger land areas on slopes. Besides these crops, other crops of local importance are pineapple and a large number of native plants (Heckmann, 2006). The crops of least importance are subsistence crops, such as corn, yucca and bananas which are now cultivated less, with only a portion of them entering the local market (INRENA, 2008). There is also evidence of small-scale coca plantations in certain sectors of the AMPF, which have large negative impacts on soils (INRENA, 2008). The most profitable crops are coffee (mainly *Coffea arabica*) and dry or wet rice (*Oryza sativa*). Land use is directly related to the location of families in the sub-watersheds. Families living in the areas of intermediate to high altitudes in the sub-basins, mainly inside the AMPF, largely produce coffee. Families in the lower altitude areas generally produce rice (GTZ, 2005). Currently, the most important crop in the AMPF is coffee.

The above description provides a historical record of the process of colonization of the Alto Mayo basin encroaching on the AMPF, and the history of land use practices that has resulted. Often settlers begun to populate lowland fertile areas and then, gradually, continued to expand upon established settlements as population numbers grew to reach the higher altitude areas that act as the head waters of the Alto Mayo watershed (INRENA, 2008). As a result of this historical process, the AMPF is currently suffering significantly from the large population of settlers within and around its boundaries that depends heavily on forest conversion to sustain their income generating activities, dominated by coffee production. If nothing is done to revert this trend, this human-caused pressure will only become more severe. The AMCI aims to reduce GHG emissions from deforestation that occur due to the historical and social factors described above, and are independent from the project. It is obvious thus that the AMCI has only played a role in reducing emissions in the region and is not being implemented to generate GHG emissions for the purpose of their subsequent reduction.

[8] Rural "sectors" are distinct from “settlements” in that the term “settlements” refers to a group of relatively nearby houses, whereas “sectors” are areas that have no social structure other than a loose grouping of very distant houses. The basic social structure in these sectors lies at the family level. Because these groupings of houses are loosely defined, the delimitation of sectors is not very accurate. A sector in the Yuracyacu sub-basin, for example, may have up to 40 homes spread across a large area (Gallois, 2010).

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Ministry of Environment of Peru states that, in a broad sense, environmental legislation encompasses all the existing regulations at the different levels of law (international treaties, the Constitution, national laws, decrees and resolutions, etc.) that directly or indirectly relate to maintaining an environment suitable for the development of life[9]. The AMCI project is in compliance with all international and national legal requirements, and furthers the goals of many of these legislative actions in protecting and valuing the ecosystem services of the AMPF. A compendium of the national legislation related to Natural Protected Areas in Peru will be provided to the validator (Sup.Inf_PD_1.6).

With respect to treaties and international agreements, Peru signed the *United Nations Framework Convention on Climate Change*[10], which aims to stabilize atmospheric concentrations of greenhouse gases at a level that prevents dangerous anthropogenic interference with the climate system. Peru also signed the *Convention on Biological Diversity*[11] that aims to conserve biodiversity, promote the sustainable use of biological resources, and ensure a fair and equitable sharing of the benefits that might arise from utilizing genetic resources. Peru also ratified the *Convention 169 on Indigenous and Tribal Peoples in Independent Countries of the International Labor Organization*[12]. This is the principal treaty on human rights of indigenous peoples and serves as an instrument to promote dialogue between indigenous peoples, governments, civil society and development institutions on issues that may affect the lifestyle of indigenous peoples.

Within the domestic arena, the *Political Constitution of Peru, 1993* is the principal ruling order of the Peruvian legal system. The Constitution recognizes the fundamental right of all people to enjoy a balanced environment suitable for the development of human life (Art. 22.2). It establishes that natural resources are a patrimony of the Nation, belonging to all Peruvians and that the State is the sovereign body that sets forth the conditions for their use through Organic Law (Art. 66 and 67). Consequently, the *Organic Law for the Sustainable Use of Natural Resources (Law 26821)* promotes and regulates the sustainable use of all natural resources, establishing a framework for investment that balances economic growth with the conservation of the environment and human development.

The General Environmental Law (Law 28611) establishes the regulatory framework for environmental management in Peru. Article 92 of this law establishes the State's obligation to formulate forestry policy that promotes the sustainable use of the nation's forests. This law defines environmental services as the protection of water resources, the protection of biodiversity, the mitigation of greenhouse gas emissions, and the preservation of scenic beauty, among others. Further, it recognizes that these services generate non-monetary benefits and that the State will establish mechanisms to assign values to these services (Art. 94). It also specifies that the Ministry of Environment, as the national environmental authority, is responsible for the inventory of natural resources and environmental services, as well as promoting financial mechanisms for payment of environmental services (Art. 85). The AMCI project aligns with this

[9] Ministry of Environment. Peruvian Environmental Legislation, Lima. p.3.

[10] Legislative Resolution 26185 on May 13, 1993.

[11] Legislative Resolution 26181 on Mayo 12, 1993.

[12] Legislative Resolution 26253 on December 5, 1993 and becomes active in Peru on February 2, 1995.

national goal by developing a sustainable financial mechanism to protect the ecosystem services provided by the AMPF.

Legislative Decree 1013 created the Ministry of Environment of Peru with the general duty to design, develop, implement and monitor national and sectoral environmental policy, assuming stewardship over it. In compliance with the provisions of Legislative Decree 1013 and Article 67 of the Constitution, which states that it is the duty of the State to establish the National Environmental Policy, Supreme Decree 012-2009-MINAM was approved. This is one of the main management tools for achieving sustainable development in the country as it establishes a set of guidelines, objectives, strategies and instruments of a public nature which are intended to define and guide the actions of national, regional and local government agencies, the private sector and civil society in environmental matters.

The Law of Natural Protected Areas (Law 26834) and its Regulation (approved by Supreme Decree 038-2001-AG) have particular relevance to the REDD project underway in the AMPF. This law establishes NPAs as inland and/or marine territories designated for the preservation of biodiversity, cultural values, scenic and scientific values, as well as their contributions to the sustainable development of the country. In addition, Article 2 of its Regulation establishes that one of the objectives of NPAs is to ensure the continuity of the environmental services they provide[13]. The law states that NPAs are to be maintained in perpetuity according to their respective land use restrictions (Art. 1). The law outlines the different classifications of NPAs regarding the permitted use of their natural resources. The NPAs designated as "areas of direct use" allow natural resources within the NPA to be utilized by local populations according to the restrictions outlined in the NPA's management plan (also referred to as Master Plan). The Master Plan specifies which resources can be accessed and in which zones of the NPA these activities are permitted. Any use that is not authorized or does not comply with the restrictions outlined in the Master Plan is not permitted in the NPA. The AMPF is categorized as a "Protected Forest," pursuant to Supreme Resolution N 0293-87-AG-DGFF (Sup.Inf_PD_1.7) and falls under the category of NPAs designated for direct use. This Law and its Regulations also include the provisions for the granting of administration contracts which authorize SERNANP to grant rights to a non-profit organization to co-manage a Protected Area in collaboration with the local Head Office. Pursuant to these laws, and as discussed above, CI has entered into the process of pursuing an administration contract that grants CI the right and responsibility to co-manage the AMPF in accordance with its Master Plan. A copy of the official letter from SERNANP commencing the Direct Grant Process will be provided to the validator as documentary evidence that SERNANP is in the process of granting the administration contract to CI (Sup.Inf_PD_1.8).

The Master Plan of the AMPF was approved in 2008 for the 2008-2013 period through Departmental Resolution N° 001-2008-INRENA (Sup.Inf_PD_1.9). This document explains the history and basic characteristics of the AMPF, as well as outlines the AMPF's conservation goals, a framework of cooperation with local populations, the main threats to AMPF, its organizational and management plans, and zoning strategies for managing the area. The Master Plan proposes a financing strategy that involves compensation for ecosystem services and the signing of Conservation Agreements with local populations to achieve the sustainable restoration of forest cover in the AMPF. The AMCI project is the result of these goals outlined in the AMPF Master Plan and is in compliance with all land use restrictions and zoning

[13] Such as climate regulation, watershed protection, water harvesting, biomass production, biological control, provision of habitat for fauna and flora species, food sources, genetic and medicinal resources, raw materials for clothing, construction, and manufacturing, among others.

regulations. A copy of the AMPF Master Plan will be provided to the validator for review (Sup.Inf_PD_1.10).

The *Directing Plan of Natural Protected Areas* (approved by Supreme Decree N° 016-2009-MINAM), complements the NPA Law to include, among others, additional goals related to Protected Forests, namely: to emphasize the conservation of environmental services in Protected Forests at the national level, and to promote at the regional level economic activities linked to the conservation of environmental services, such as the valuation of environmental services. In addition, Article 3(k) of the *Regulations for the Organization and Functions of the SERNANP* (Supreme Decree Nº 006-2008-MINAM) establishes that SERNANP has the ability to promote, grant, and regulate rights for environmental services and other similar mechanisms generated by the NPAs under SERNANP's administration. The AMCI project is, therefore, fulfilling these goals outlined in national legislation by aiming to acquire funding in exchange for reducing emissions from deforestation and forest degradation.

Several laws exist to ensure the protection of NPAs. The *Regulation of the Sanctioning Administrative Procedures for damaging Natural Protected Areas administered by the State* (Supreme Decree N° 019-2010-MINAM) establishes the administrative proceedings for sanctioning noncompliance with the NPA legislation. In addition, *Legislative Decree No. 1079* (approved by Supreme Decree N. 008-2008-MINAM) states that the Ministry of Environment, acting through SERNANP, is the authority responsible for the management of the forests, flora, fauna, and environmental services of NPAs. Its corresponding *Regulation* outlines the mechanisms that SERNANP can utilize against illegal acts in NPAs. Furthermore, *Law 29263* amended Title XIII of the Penal Code of Peru to establish more rigorous penalties for those who commit environmental crimes. Article 310 defines an environmental crime as an act performed without permission, license, authorization or concession granted by the competent authority that destroys, burns, damages or logs, in whole or in part, forests or forest fragments. The AMCI project will not destroy forest cover and, on the contrary, will conserve and restore forest areas only by means of authorized methods in compliance with the zoning restrictions of the AMPF Master Plan.

The AMCI project also complies with national legislation relating to forests. The *Law of Forestry and Wildlife (Law 27308)* and its associated *Regulation* (approved by Supreme Decree 014-2001-AG) regulates and promotes the sustainable management of forest resources and wildlife. It also establishes a framework for ecosystem services provided by forests. Multiple articles of this law were amended by the new *Law of Forestry and Wildlife (Law 29763)*, which establishes the legal framework for the regulation, promotion, and monitoring of forestry and wildlife activities in the country. This law also created the National System of Forestry and Wildlife Management (SINAFOR) and the National Forestry and Wildlife Service (SERFOR).

Finally, it is important to note that Peru still lacks specific legislation regulating the use of ecosystem services. However, the Commission of Andean, Amazonian, and Afro Peruvian People, Environment and Ecology of the Peruvian Congress has been elaborating the design of an Environmental Services Law which recognizes the importance of environmental services and thus the need to establish regulations regarding their improvement and conservation. Its purpose is to regulate the use of environmental services in order to contribute to the conservation, restoration, improvement, assessment and sustainable use of the ecosystems, biodiversity and natural resources of the country. It also proposes to clarify issues such as the legal nature of ecosystem services, its implications for the current legal framework, the definition of the different stakeholders involved, their rights and obligations, the different types of compensation schemes that might arise, the role of the State, among others[14].

1.12 Ownership and Other Programs

1.12.1 Right of use

Natural Protected Areas (NPAs) in Peru, such as the AMPF, are considered national patrimony, but the Peruvian government may grant certain rights within these areas. The project proponent commissioned a background legal analysis by partner SPDA to identify the best options for interpreting VCS requirements with regards to Right of use under Peruvian legislation. The report concluded that, in return for CI's co-management of the AMPF pursuant to an administration contract, the Peruvian Government will be able to vest CI with the right of use over any greenhouse gas emission reductions or removals within the AMPF generated through the AMCI, in order to support the effective implementation of the PA's Master Plan (Sup.Inf_PD_1.11).

Natural Protected Areas in Peru are established by Supreme Decree[15] and constitute patrimony of the nation. Their natural condition must be maintained in perpetuity, allowing for the regulated use of the Area and its resources, restricting their direct use[16].

The Alto Mayo Protected Forest was established as a 182,000 hectare Protected Area in 1987 by Supreme Decree No. 0293-87-AG/DGFF, dated July 23, 1987 (see Sup.Inf_PD_1.7), forming part of Peru's National System of Natural Protected Areas (SINANPE) . As such, the Peruvian government has national patrimony over all of the land in the AMPF. In addition, Conservational International and its partner SPDA conducted an extensive land tenure analysis as part of the AMCI which showed that there are no known registered legal landowners within the AMPF other than the Peruvian State (see the Land Ownership and Access/Use Rights section of the Non-Permanence Risk Report).

Pursuant to Peru's Law of Natural Protected Areas (LNPA), Nº 26834 (July 4, 1997) and its Regulations, the management and protection of NPAs in Peru is the responsibility of the Peruvian Government through a designated agency, namely the *Servicio Nacional de Areas Naturales Protegidas por el Estado* (SERNANP). In accordance with Article 2 of Legislative Decree 1079 and Article 115 of the Regulations of the LNPA, SERNANP is responsible for the administration of the forest and wildlife patrimony of NPAs as well as their environmental services. Likewise, Article 3(k) of the Regulations for the Organization and Functions of the SERNANP, Supreme Decree Nº 006-2008-MINAM (Sept. 17, 2008), provides that SERNANP has the ability to "promote, grant, and regulate rights for environmental services (*servicios ambientales)* and other similar mechanisms generated by the Natural Protected Areas under SERNANP's

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[14] Congreso de la República del Perú. Comisión de Pueblos Andinos, Amazónicos y Afroperuanos, Ambiente y Ecología. Dictamen recaído en los Proyectos de Ley N° 2386/2007-CR, que propone una Ley de Promoción y Compensación de los Servicios Ambientales, y N° 3213/2008-PE, que propone una Ley de Servicios Ambientales. Periodo anual de sesiones 2008 – 2009. Lima. 2009.

[15] A Supreme Decree is the highest ranking regulation that can issue the executive branch as part of their general constitutional powers. Usually they are used to regulate laws and in order to enter in force they need the signature of the President of the Republic and at least one Minister of the State. In the case of Presidential Decrees establishing Natural Protected Areas, these are driven by the Ministry of Environment, the institution responsible for handling the technical procedures used to justifying their creation.

[16] See Constitución Política del Estado Peruano, Articulo 66; Ley de Áreas Naturales Protegidas, Ley Nº 26834, Articulo 1 (July 4, 1997).

administration". SERNANP manages NPAs in accordance with a Master Plan, a management and zoning plan designed to regulate the forest's designated uses and meet the NPA's objectives. The Master Plan is implemented by the local Head Office (*Jefatura*), which is a decentralized division of SERNANP.

At the same time, Peruvian legislation also promotes the participation of private entities in the management of Natural Protected Areas through distinct modalities (see Article 17 of the LNPA and articles 97 and 98 of the Regulations of the LNPA). In order to achieve the objectives of the AMCI, the project aims to secure the most comprehensive level of support for the management of the AMPF provided by the NPA regulatory framework, namely, a full administration contract. Through such contracts, the SERNANP has the ability to grant legal rights to non-profit organizations for the execution of the management and administration operations contained in an NPA's Master Plan, Annual Operational Plans, and other management tools of the SINANPE (Article 117 of the Regulations of the LNPA)[17]. In addition, among the responsibilities of the executor of the administration contract is also the establishment of financial sustainability mechanisms for the implementation of the Master Plan[18].These contractual rights are granted for a maximum period of 20 years and are subject to renewal for additional twenty year periods. By obtaining an administration contract the project proponent will obtain a right that will enable it to have a direct effect on the management and conservation process that will generate emissions reductions within the AMPF.

Conservation International is currently in the process of obtaining an administration contract with SERNANP in order to co-manage the entire AMPF (*i.e.*, the Project Area) with the Head Office (*Jefatura*) in accordance with its Master Plan. The administration contract will thus serve as a contractual right in the conservation or management process within the AMPF that generates GHG emission reductions and/or removals, establishing CI's unconditional, undisputed and unencumbered ability to claim such reductions or removals arising from CI's control of the project area. A copy of the official letter from SERNANP commencing the Direct Grant Process (*Proceso de Otorgamiento Directo*) will be provided to the validator as documentary evidence that SERNANP is in the process of granting the administration contract to CI (Sup.Inf_PD_1.8). A copy of SERNANP's draft form of administration contract (which remains subject to further comment and negotiation by CI) shall also be presented to the validator (Sup.Inf_PD_1.12). Upon execution, the administration contract will evidence the project proponent's right of use with respect to the emissions reductions generated by the project. SERNANP has recognized the support provided by the AMCI in financing the conservation of the AMPF and ensuring its financial sustainability, as well as the intention to retire carbon credits towards this goal in the near future (Sup.Inf_PD_1.13). CI anticipates the

[17] Pursuant to The Law of Natural Protected Areas Nº 26834, at Articulo 17 (July 4, 1997) and Supreme Resolution (Reglamento de la Ley de Areas Naturales Protegidas) Nº 038-2001-AG, at c.1 (June 26, 2001), the Instituto Nacional de Recursos Naturales (INRENA) was given the authority to grant administration contracts to a non-profit organization to execute management and administration operations set forth in a protected area's Master Plan. In May 2008, the Peruvian government created the Ministry of the Environment (Ministerio del Ambiente – MINAM), incorporating INRENA's responsibilities under its authority pursuant to Legislative Decree 1013 (May 14, 2008). Legislative Decree 1013 also established SERNANP as the governing body of the National System of Natural Protected Areas of the State (Sistema Nacional de Áreas Naturales Protegidas por el Estado – SINANPE) with the authority to grant administration contracts. Supreme Resolution Nº 007-2011-MINAM (May 5, 2011) likewise states that SERNANP is the competent authority to grant and supervise, as representative of the State, administration contracts in Natural Protected Areas. Presidential Resolution Nº 097-2011-SERNANP (May 31, 2011) further elaborates on the roles of SERNANP and the non-profit Executor in the context of administration contracts.

[18] Presidential Resolution N 097-2011-SERNANP (May 31, 2011), Articles 30(b) and (e), provide that the responsibility of the Executor includes (1) handling "receivables on behalf of the State, when so empowered by the Administration Contract, those revenues generated by the management of the ANP under the Administration Contract" and (2) "seeking sources of funding to support the management of the ANP according to the Master Plan and Administration Contract, and designing programs to ensure the financial sustainability of the ANP."

administration contract will be signed in early 2012, and in any case before any verification event takes place.

1.12.2 Emissions Trading Programs and Other Binding Limits

In Poznan during the 14th COP to the UNFCCC, the Ministry of Environment of Peru stated its intention to reduce net deforestation to zero in the country by 2020 on a voluntary basis, through the implementation of a range of strategies. However, the Peruvian Government does not currently have any binding commitments and/or obligations to reduce GHG emissions from the Land Use, Land Use Change and Forestry (LULUCF) sector. In fact, both in meetings of the UNFCCC as well under the framework of the FCPF Readiness process, the Government of Peru has clearly established that it will not assume any binding commitments to reduce emissions from deforestation and forest degradation for the time being. Rather, it will opt for the nested approach (*enfoque por niveles*) which will allow for the implementation of subnational activities such as the AMCI to strengthen in-country capacities in order to achieve more ambitious reduction goals at the national level. The project proponent is working closely with the national and regional governments to support the establishment of a region-wide system that will allow for emissions reductions generated by the project to be reported and accounted for under regional and national MRV frameworks in the future, and is actively participating in the VCS Jurisdictional and Nested REDD Initiative.

1.12.3 Participation under Other GHG Programs

The project has not been registered and is not seeking registration under any other GHG program.

1.12.4 Other Forms of Environmental Credit

The project has not and does not intend to generate any other form of GHG-related environmental credit for GHG emissions reductions or removals claimed under the VCS Program. The only GHG-related environmental credit generated by the project will be under the VCS.

1.12.5 Projects Rejected by Other GHG Programs

The project has not been rejected under any other GHG program.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project.

Leakage Management

Currently, conventional coffee production is the primary economic activity among settlers in the AMPF, despite the illegality of this activity under the land use restrictions of the NPA. The conventional coffee production techniques used by the vast majority of coffee producers within the AMPF are highly unsustainable. Most coffee plantations do not utilize organic fertilizers, pest control methods, or effective post-harvest management techniques, causing coffee plantations to quickly lose productivity. When production decreases, most coffee producers convert plantations to pastureland and deforest new areas to establish new coffee plantations. The conversion of new forest areas to coffee instead of intensifying existing production systems follows an economic rationale system in a context where illegal markets make land available at a lower rate than the capital needed to intensify production. These poor management techniques, coupled with land speculation, dominate the coffee production systems in all the sub-basins of the AMPF and encourage the cycle of deforestation (for further details see the analysis of Drivers, agents and underlying causes of deforestation provided in Sup.Inf_PD_2.2).

The AMCI will utilize Conservation Agreements as a tool to reduce the imminent drivers of deforestation in the AMPF –coffee production- and prevent leakage of these activities to areas outside of the Protected Area. The REDD project will provide each individual coffee producer who signs a Conservation Agreement with a technological package that will allow them to produce sustainably grown coffee, including high quality organic fertilizers, tools and materials to produce specialized compost and apply organic pest control techniques. The project will also provide regular, extensive technical assistance and training to each coffee producer. Access to tree nurseries will also be provided to encourage the planting of native tree species alongside coffee plants. These sustainable coffee production systems will eliminate the need to deforest to establish new plantations, thus reducing the risk of leakage, while also managing existing coffee plantations with low-impact techniques. In order to ensure the effectiveness and fairness of the Conservation Agreements and prevent leakage of deforestation outside of the project area, the opportunity cost approach is an essential element taken into consideration in the design of the benefit package delivered to participating communities in the AMPF through the AMCI, ensuring that the activities promoted through the project result in increased and stable income opportunities for the participating farmers (see also the Opportunity Cost analysis conducted under the Non-Permanence Risk Analysis). These incentives, paired with enhanced monitoring and enforcement by the AMPF Head Office, will reduce the demand for low-cost land available in the past therefore also reducing land speculation.

Such activities to reduce deforestation and prevent leakage will take place in the Restoration and Special Use Zones of the AMPF, in line with the land use restrictions established by the AMPF Master Plan and its respective zoning regulations (see page 163 of the Master Plan). As part of the AMCI, CI and the AMPF Head Office together with its Management Committee have started a process of re-zoning the areas of highest deforestation in the AMPF in order to allow project activities to be conducted in these areas in accordance with the PA's Master Plan. For further technical details on the AMCI Leakage Management Areas, please refer to the Methodological Annex.

Commercially Sensitive Information

All information collected or generated by the AMCI, except proprietary information and that which is considered confidential information as per contractual obligations, will be made available upon request. Please contact the person(s) listed in the contact information section in this PD for any such requests.

Further Information

Hydrology

The Alto Mayo basin extends over 794,000 hectares. The upper parts of the basin in the far west, where the Mayo River is formed, make up the Alto Mayo Protected Forest. The Mayo River is the principal river in the region and forms the central axis of the basin. It flows from northwest to southwest and has a length of 300 km, 200 km of which fall within the AMPF forming several sub-basins, as shown in Table 1.

Table 1. Major sub-basins of the Alto Mayo Protected Forest

AMPF Sub-basins	Surface (ha)
Delta	16,509.35
Serranoyacu	9,452.49
Naranjos	30,357.13
Rio Huasta	21,968.01
Yuracayacu	13,615.82
Rio Negro	7,901.47
Amangay - Mirador	6,292.72
Yanayacu	23,189.36
Huasta (Qda.)	6,143.22
Naranjillo	17,868.06
Soritor	1,160.20
Uquihua (Qda.)	1,642.65
Aguas Verdes	19,586.13
No name	2,063.22
Total	177,749.84[19]

Geology, physiography and soils

The AMPF borders the Alto Mayo geological depression, a tectonic syncline located between the Sub-Andean belt to the northeast that has a large number of faults (such as the Cahuapanas Mountains), and an isolated branch that extends to the northwest of the Oriental Mountains (*Cordillera Oriental*) called the *Ventilla* Mountains or *Piscohuañuna* Mountains towards the southwest (De la Cruz et al., as cited in INRENA, 2008). The nuclei of the two ridge Mountains are anticlines, following an orientation from the SE to the NW. The bottom of the flat basin is the result of a long and continuous history of river and lake sedimentation since the Mesozoic era, which is likely the result of an ongoing tectonic sinking of the depression that parallels the Mayo River (INRENA, 2008).

The AMPF (the middle and southwest portion of the *Cordillera Oriental*) is formed by a sequence of pure marine gray limestone from the Triassic and Jurassic periods (250 to 145 million years BC) with extensive structural deformation and deeply dissected and integrated with sedimentary materials of sandstone quartz, gray clay sedimentary rock (shale), clay containing calcium and dark gray limestone, among others (ONERN, as cited in INRENA, 2008).

[19] Figure represents an estimate generated through a GIS. Source of data: INRENA, 2008.

The landscape is mountainous, as is the eastern part of the *Cordillera Oriental* that covers approximately 61% of the total area of the Alto Mayo basin. There are two predominant sub-landscapes that are directly related to the slope of the land, namely piedmont, which is characterized by slopes ranging from 20 to 30%, and mountains, which are characterized by slopes greater than 70%. The slope determines the extent to which the area is susceptible to erosion (INRENA, 2008).

Much of the area is distinguished by residual soils that are the most predominant soil type in large hills and mountainous terrain with slopes exceeding 50%. The soil quality is related to the physiography of the area. Generally, soils are moderately deep to shallow, have low fertility and are at risk of erosion by rains. Given the mountainous conditions and the nature of the rocks and structural flaws in the area, there are diverse rock outcrops and natural landslides in addition to landslides caused by agricultural activities (INRENA, 2008).

Climate

The altitudinal gradient of the AMPF provides for a variety of climates that are characterized by fluctuations in average temperature, varying between 12°C and 25°C depending on the altitude. Annual rainfall ranges from 1,200 mm in the lower areas to more than 3,000 mm at altitudes of 1,200 meters above sea level. Rainfall is likely to exceed these levels at altitudes around 2,000 meters above sea level. There are two rainy seasons per year, the first being between September and December and the second occurring between February and April. In areas with permanent cloud cover, there is a unique microclimate with high saturation of humidity. Increased precipitation can be observed from Moyobamba to the headwaters of the Alto Mayo watershed on the Serranoyacu River. Peak rainfall is observed in March and October (INRENA, 2008).

Ecology

The Forestry Map of Peru classifies the Alto Mayo Basin as cloud forest, with a small area of natural grasslands in the southern part of the AMPF (INRENA, 1995). Premontane and dwarf forests are also part of the landscape mix (Heckmann, 2006). The main habitat types present in the project area are described below:

Cloud forests: These forests grow at altitudes between 1,000 to 2,500 meters above sea level (masl) and comprise the great majority of the AMPF. They are of high importance for their hydrological functions, as they capture and condense the water from cloud moisture, infiltrating it into the soil which then moves to increase rivers flows downstream. They are characterized by a high diversity of epiphytes, including orchids, bromeliads and ferns, while also serve as the habitat for endangered species like the spectacled bear (*Tremarctos ornatus*) and the yellow-tailed woolly monkey (*Oreonax flavicauda*).

Pre-montane forests: these forests grow at lower altitudes (between 500 and 1,000 masl and have a fairly sharp relief (up to 100% slope). They shelter timber species such as Cedar (*Cedrela fissilis*), Moenas (*Aniba sp.*), Tornillo (*Cedrelinga catenaeformis*), among others.

Dwarf forests: these forests grow in the upper ranges of the AMPF (2,500 to 3,300 masl) and develop a rough vegetation, also known as stunted forests, where shrubs can reach an average height of 10 meters. These areas are characterized by an abundance in mosses and smears of terrestrial bromeliads.

Pajonal: these areas are a type of natural grassland typical of the Peruvian Andes and located 4,000 mabsl. Due to the extreme temperatures they comprise small herbaceous vegetation which, due to its hydromorphic constitution is able to retain large volumes of water in the soil.

Other vegetation types that are a result of human intervention include fallows (*purmas*), agricultural lands (mainly coffee), and pastures.

The life zones found in the Alto Mayo Protected Forest and its buffer zone are: Pre-montane tropical rainforest; Pre-montane tropical high humidity forest; Low tropical cloud forest; Low tropical rainforest; Low tropical high humidity cloud forest; Montane tropical rainforest; Tropical high humidity cloud forest. The characteristics of these life zones suggest a gradient from less to more complexity: from erodible soils in the low areas to very saturated soils as altitude increases; from zones that experience dry seasons to the last life zone where rainfall is constant; and from lesser to greater slopes. With these considerations, it is expected that the greater diversity of habitats is found in the higher life zones (Veliz Rosas, 2003).

Image 09. Alto Mayo Protected Forest

Image 10. River in the AMPF

Biodiversity

The Alto Mayo Protected Forest (AMPF) forms an important part of the Peruvian Amazon forests, composed of terrestrial and aquatic ecosystems that host hundreds of unique (endemic) species of flora and fauna. It also forms the habitat for many rare and endangered species, currently threatened by the continuous human pressures that exacerbate their potential for local extinction.

The project area is located in the centre of the Conservation Corridor Abiseo-Condor-Kutukú (CCACK), a regional proposal for promoting the conservation and sustainable use of several important ecosystems in two priority areas for global conservation: the Tropical Andes hotspot along the eastern foothills and the Great Amazon Wilderness Area in the lowland ando-amazonian areas. The CCACK extends from the Sangay National Park in Ecuador until the Cordillera Azul National Park in Peru, covering an area of approximately 13 million hectares (Fundación Natura and Conservation International, 2009).

For Conservation International, a conservation corridor comprises a system of natural areas with very high biodiversity values, managed with appropriate planning tools in order to integrate them into the socio-economic, political and cultural environment that surrounds them, with the goal of ensuring the conservation of nationally and globally important species, their ecosystems and the ecological processes that they generate (Fundación Natura and Conservation International, 2009). The AMPF forms a central part in this comprehensive and strategic ecological conservation system.

Furthermore, the AMPF is one of the most important centres of endemism in Peru, mainly due to its proximity to the Huancabamba depression[20] as well as to its altitudinal gradient. The heterogeneity of environmental conditions present in the area create appropriate conditions for the existence of a great variety of species and ecosystems, with the occurrence of species occupying very small areas (endemic) or segregated in different altitudinal belts with very peculiar habitat.

Of the 39 species of primates that are reported for Peru (Pacheco et al. 2009, Cornejo et al. 2010), 03 of them are endemic, with all of them living precisely in the eastern montane and premontane forests of Peru where the project is located: the "Yellow-tailed wooly monkey" (*Oreonax flavicauda*), the "Andean titi monkey" (*Callicebus oenanthe*), and the "Andean night monkey" (*Aotus miconax*).

The yellow-tailed woolly monkey (*Oreonax flavicauda*) in particular, is considered the largest animal endemic to Peru, its range worldwide being restricted to the montane forests of the Amazonas and San Martin regions. It was rediscovered in 1974 and is considered to be critically endangered (CR) by the IUCN[21], mainly due to the destruction of its habitat and the hunting of its offspring which are sold as pets in the local markets (ECOAN-CI, s.f.). According to Cornejo et al., (2010), it is included in the list of the "25 most endangered primates in the world".

Image 11. Yellow-tailed wooly monkey (*Oreonax flavicauda*)

[20] The Huancabamba depression is considered to be the lowest altitude zone of the Andes Mountain Range between its southern parts of Chile and Colombia, which has allowed for the transfer of Amazonian species to the Pacific coast; likewise, it is considered the limits for the distribution of Andean-Patagonian species.

[21] http://www.iucnredlist.org/apps/redlist/details/39924/0

Likewise, the Andean titi monkey (*Callicebus oenanthe*) is considered rare and endemic to the Alto Mayo, critically endangered[22], even more so than the other endemic primates such as the yellow tail and the Andean night monkey, due to its restricted distribution to the premontane forests of the Alto Mayo valley (500-1000 masl). Other species of endemic mammals present in the Alto Mayo are the “Hairy long-nosed armadillo” (*Dasypus pilosus*) and “Strong-tailed Oldfield Mouse” (*Thomasomys ischyrus*).

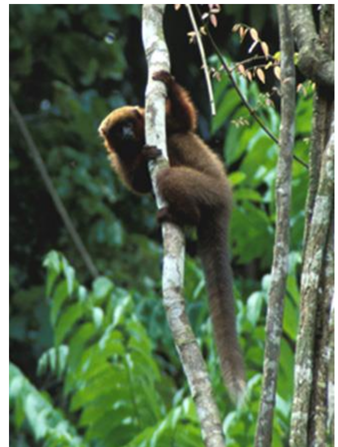

Image 12. Andean titi monkey (*Callicebus oenanthe*)

In addition to their high endemism, the forests of the Alto Mayo are also extremely biodiversity rich as they host a large number of flora and fauna species. According to various studies conducted in the AMPF, there have been reported a total of 37 species of mammals, 420 species of birds, 9 species of amphibians and reptiles, 8 species of Morpho, 588 species of plants (25 endemic, 159 timber species, 177 native of Peru), 59 species of orchids and other epiphytes and shrubs (INRENA 2008).

Moreover, the AMPF contains parts of two EBAs (Endemic Bird Areas): the Northeastern Peruvian Cordilleras, and the Andean Ridge Forests[23], and is regarded as one of the 129 Important Bird Areas (IBAs) of Peru (IBA 55), reporting a total of 23 threatened species of birds and 17 endemic species with restricted distribution, of which 05 are considered to be in danger of extinction (EN): *Heliangelus regalis* (Royal Sunangel), *Herpsilochmus parkeri* (Ash-throated Antwren), *Xenoglaux loweryi (*Long-whiskered Owlet), *Loddigesia mirabilis (*Marvellous Spatuletail), *Grallaricula ochraceifrons* (Ochre-fronted Antpitta), and 4 vulnerable species (VU): *Ara militaris (*Military Macaw), *Poecilotriccus luluae (*Lulu's Tody-flycatcher), *Picumnus steindachneri (*Speckle-chested Piculet), *Thripophaga berlepschi (*Russet-mantled Softtail) according to the IUCN.

The AMPF also contains an extremely high diversity of rare and endangered plant species, such as *Cedrela fisilis; Larnax nieva; Prumnopitys harmsiana; Podocarpus oleifolius; Zamia hymenophyllidia; Virola surinamensis; Luteolejeunea herzogii;* and others, among which is worth highlighting the unique Orchid species *Phragmipedium peruvianum* (known as kovachii), discovered in 2002 and endemic to the Alto Mayo valley, currently under high pressure from illegal trafficking due to its extraordinary beauty and rarity (INRENA, 2008).

Image 13. Kovachi Orchid (*Phragmipedium peruvianum)*

[22] http://www.iucnredlist.org/apps/redlist/details/3553/0
[23] http://www.birdlife.org/datazone/ebasearchresults.php?reg=11&cty=166&sn=&fc=&cri=#

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The project applies the "Methodology for Avoided Unplanned Deforestation" (VM0015, Version 1) approved by the VCS on July 12, 2011. The methodology requires referring to each of the steps and sub-steps using the same titles and numbers of the methodology so that its application can be transparently validated. Therefore, the Project Proponent has documented the application of the methodology to the AMCI project in a separate Methodological Annex, which represents the main Annex to the VCS PD.

2.2 Applicability of Methodology

Please refer to the Methodological Annex.

2.3 Project Boundary

Please refer to the AMCI Methodological Annex.

2.4 Baseline Scenario

The baseline scenario is continued illegal deforestation and conversion of forest to other land uses, mainly coffee plantations and subsequently pastures. It has been identified through extensive stakeholder consultation and following the steps of the approved VCS methodology VM0015 (see AMCI Methodological Annex). Its justification is provided in the Additionality section.

2.5 Additionality

As required by the methodology, the project uses the most recent version (1.0) of the VCS Tool VT0001 "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities" in order to demonstrate the additionality of the Alto Mayo Conservation Initiative. The project meets the applicability conditions of this tool since:

a) The AFOLU project activities do not lead to the violation of any applicable law (see PD section 1.10);

b) The baseline methodology used for this project (VM0015) provides for a stepwise approach justifying the determination of the most plausible baseline scenario.

The steps of the tool have been applied as follows:

Step 1: Identification of alternative land use scenarios to the proposed REDD project activity

This step serves to identify alternative land use scenarios to the proposed REDD project activity that could be the baseline scenario, through the following sub-steps:

Sub-step 1a. Identify credible alternative land use scenarios to the proposed REDD project activity

Based on the historic trends regarding land use and land occupation in the region where the AMCI project is located (see also section 1.9 Prior Conditions), three realistic and credible alternative land use scenarios have been identified that could have occurred on the land within the project boundary in the absence of the REDD project activity:

1) Continued illegal deforestation and conversion of forest to other land uses, mainly coffee plantations and subsequently pastures. This activity has been carried out extensively in the past in the reference region and in the project area despite it being designated a Natural Protected Area by the State since 1987.

2) Conservation as a result of improvements in the governance and enforcement capabilities of the AMPF Head Office. Since the AMPF is part of the SINANPE, SERNANP (independently or with the help from other NGOs and donors) could increase the annual budget allocated to this NPA in order to decrease the rate of deforestation that continues to affect this Protected Area.

3) Conservation as a result of a shift in the current land use practices of the population of settlers living in the AMPF towards sustainable, organic coffee production. Some associations of small-scale coffee producers and government initiatives (e.g. PEAM) exist in the region that promote organic coffee production; these initiatives could scale up their activities to engage the large number of settlers that conduct unsustainable productive activities inside the AMPF, thereby reducing the rate of deforestation.

The first scenario represents the continuation of the pre-project land use, while the following two represent the project activities taking place on the land within the project boundary without being registered as a VCS AFOLU project, i.e. in the absence of carbon financing from REDD. As the project area is a Natural Protected Area protected by the Peruvian State under Law No.26834, no other land use (such as forest or mining concessions) is considered credible as it hasn't been observed in the period beginning ten years prior to the project start date. Scenario 2 would require significantly increased financial resources being made available to SERNANP. Given the budgetary history there is no reason to believe that without the project, any such significant increase in financial resources would be available through SERNANP. Scenario 3 requires a significant shift in coffee cultivation practices without providing growers with technical know-how or other inputs such as organic fertilizer. In these circumstances it is likely that the current practice of shifting cultivation and forest conversion would continue (see further details in sub-section on 1-c selection of baseline scenario).

Sub-step 1b. Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

In Peru, Natural Protected Areas such as the AMPF have an explicit legal restriction to maintain their natural condition in perpetuity (see Article 1 of the Law on NPAs[24]). Scenario 1 therefore does not comply with the mandatory applicable laws and regulations (see also section 1.10 for other relevant legislation). However, the Peruvian government lacks the resources to effectively maintain or enforce this legal mandate, and non-compliance with these requirements is widespread at the national level and in the project region. As noted in recent reports of the SINANPE, deforestation and degradation within NPAs

[24] Article 1 of Law No. 26834 on NPAs: (...) Natural Protected Areas constitute patrimony of the State. Their natural condition must be maintained in perpetuity, allowing for the regulated use of the Area and its resources, or for the restriction of direct uses.

have advanced in recent years despite significant efforts by the State to improve the management of these areas and address the major drivers that undermine their protection (INRENA, 2007). Management reports of the SINANPE identify as one of the main challenges faced by Protected Areas the "uncontrolled migration and colonization which causes the intense conversion of natural ecosystems to agricultural or other systems." As SERNANP has pointed out in a recent report named "Experiences with Payment for Environmental Services mechanisms in Natural Protected Areas", although under a pure *de jure* interpretation NPAs should not be under threat, the *de facto* situation justifies the existence of projects seeking to fund activities to avoid deforestation and degradation (SERNANP, 2010).

In fact, illegal deforestation is a major threat to many NPAs in Peru. Official data from the PROCLIM Program[25] released in 2005 indicate that of all the NPAs in Peru, the Alto Mayo Protected Forest ranked as having the second largest area of deforested land within its boundaries as of the year 2000 (MINAM, 2009 - see Table 2). In addition, the region of San Martin -where the project is located- resulted in having the highest accumulated deforestation among all the regions of Peru (MINAM, 2009). As can be seen in the Table, other NPAs located in San Martin also have high rates of deforestation, such as Cordillera Azul and Rio Abiseo, which ranked 6th and 12th respectively. There is, therefore, widespread non-compliance with the land use restrictions imposed by the AMPF's designation as a NPA, justifying scenario 1 as a viable alternative land use scenario. To further demonstrate that non-compliance with the NPA law is widespread within the AMPF, i.e., prevalent on at least 30% of the area of the smallest administrative unit that encompasses the project area (in this case, the Protected Area is this unit since it falls under the administrative jurisdiction of the SERNANP), we defined a grid of regular cells of 500 meters covering the project area, and for each cell we estimated the deforestation by applying the Tabulate Area tool from the Spatial Analysis extension of ArcGIS 10. The cells that did not have any deforestation were excluded from the total counting. The results counted 1316 cells out of 2032 having presented deforestation, representing 35% the project area (see Sup.Inf_PD_2.1).

Table 2. Ranking of NPAs in Peru according to deforestation observed through the year 2000.

Ranking of NPA according to extent of deforestation	Name of NPA	Cumulative Area deforested by the year 2000 (hectares)
1	Pacaya Samiria	14588.38
2	Alto Mayo	3900.47
3	Sierra del Divisor	3780.11
4	Gueppi	3608.79
5	El Sira	2224.57
6	Cordillera Azul	1673.74
7	San Matias San Carlos	1548.29
8	Allpahuayo Mishana	1443.57
9	Tabaconas Namballe	1252.95
10	Santiago Comaina	944.03
11	Bahuaja Sonene	859.36
12	Rio Abiseo	844.26

25 Programa de Fortalecimiento de Capacidades Nacionales para Manejar el Impacto del Cambio Climático y la Contaminación del Aire (PROCLIM).

13	Tambopata	581.2
14	Tingo Maria	506.12
15	Ashaninka	393.4
16	Chayu Nain	363.75
17	Yanesha	333.07
18	Yanachaga-Chemillen	306.41
19	Alto Purus	274.79
20	Cordillera de Colan	259.2
21	Machupicchu	170.99
22	Manu	126.09
23	Pucacuro	102.6
24	Machiguenga	60.62
25	Megantoni	55.05
26	Pampa Hermosa	52.89
27	Otishi	48.01
28	Ichigkat Muja - Cordillera del Condor	24.26
29	Tuntanain	11.26
30	Amarakaeri	5.88

Scenario 2 is consistent with all enforced mandatory laws and regulations. The project area is registered as a Protected Forest and is governed by the national Law of Natural Protected Areas (Law No.26834) and other relevant legislation. This law establishes that the only land uses permitted within a Protected Area are those that do not threaten the vegetative cover of the area as established by its Master Plan and respective zoning classifications. SERNANP, independently or with the support of other donors, could increase the annual budget allocated to the AMPF in order to increase the ability of the local Head Office to enforce this legal mandate.

In scenario 3, settlers in the AMPF could potentially reduce their impact on the forest resources of the AMPF by, independently or with external support, transitioning from conventional to sustainable coffee production. The AMPF is a “Direct Use” NPA in which according to Article 21 of the Law on NPAs the use or extraction of natural resources is permitted, primarily by local populations, in those areas and for those resources as defined by the Master Plan of the Area. In addition, according to Article 27 of the same law, the use of natural resources in a NPA should not put in jeopardy the objectives for which it has been created, and can only be authorized if it results compatible with its assigned category, zoning, and Master Plan. As such, sustainable coffee production activities inside the AMPF can only be carried out within those areas where the AMPF zoning regulations permit such activities as defined by its Master Plan, namely, Special Use Zones, Recuperation Zones, and Recreational Zones (see chapter 8 of the AMPF Master Plan. INRENA, 2008, provided as Sup.Inf_PD_1.10).

Therefore, scenario 3 would only partially be consistent with mandatory laws and regulations since a large portion of the areas that have been deforested within the AMPF and where many settlements are located fall outside of the abovementioned zones and into Strict Protection, Wilderness, and Direct Use zones, where even uses such as agroforestry systems are not permitted. Even in the special cases where such uses are permitted in certain areas, such as Recuperation and Special Use zones, they are allowed only through previous communication with the competent authority, i.e. SERNANP (See Article 104 of the

LNPA Regulations). Systematic enforcement of the zoning regulations of the NPA is therefore not widespread within the AMPF. According to a diagnostic conducted in 2004, the area occupied by the largest 14 settlements located inside the AMPF that were assessed represented 15% of the total area of the AMPF (Silva, 2004, as cited in INRENA, 2008). More recent estimates indicate that the AMPF currently has an estimated population of 3 to 4 thousand families within its boundaries clustered around a total of approximately 35 settlements (AIDER, 2010). Therefore, any potential change in the land use practices of this population must be considered as a plausible land use scenario due to the extent that the natural resources in the NPA are affected by the decisions of local populations.

Sub-step 1c. Selection of the baseline scenario

Scenario 1, or continued illegal deforestation and conversion of forest to other land uses, mainly coffee, is evidently the most plausible alternative land use scenario in the absence of the REDD project as it is the most widespread land use throughout the reference region and project area, despite being in violation of the NPA Legislation. The baseline scenario was determined by following the steps outlined in the VCS REDD methodology for Avoided Unplanned Deforestation VM0015, including an involved consultation process with local stakeholders and a review of existing socio-economic studies to assess deforestation trends in the project region (Sup.Inf_PD_2.2). The Barriers Analysis in Step 3 of the Additionality Tool provides further detail on the combination of factors that make the other two alternative land use scenarios unlikely to occur. A brief discussion of the likelihood of each land use scenario is presented here to justify the selection of the baseline scenario.

Scenario 1: Continued illegal deforestation and conversion of forest to other land uses, mainly coffee plantations and subsequently pastures.

The AMPF is one of the Natural Protected Areas in Peru with the highest level of human impact (see Table 2) and the population of settlers within its limits continues to grow. In 2010, the estimated population in the AMPF was 3 to 4 thousand families (AIDER, 2010). Despite these settlers not having legal claims to the land, they base their livelihoods on a variety of activities that are unsustainable, such as conventional coffee production, the establishment of pastures and food crops, illegal logging and firewood collection, and land trafficking. As the size of local populations increase, this human-caused pressure will only become more severe.

Although various NGOs and the Peruvian government have funded activities to promote the conservation of the AMPF, their efforts have not been sufficient in confronting these rising levels of threats to the AMPF. These prior efforts were not able to provide the amount of funding, scope of activities, or timeframe necessary to reduce deforestation and sustain this reduction in the long-term. The influence of organic coffee associations on coffee producers in the AMPF, even with the support of governmental initiatives, is also limited due to financial, technical, and legal barriers prohibiting coffee producers in the AMPF from transitioning to organic coffee production. Thus, in spite of efforts made prior to the AMCI initiative, deforestation in the AMPF continues at a high rate. Carbon financing through the REDD project is the only currently identifiable mechanism that could ensure that sufficient funds will be provided over a long timeframe to implement an integrated strategy to reduce deforestation in the AMPF. The strategy proposed by the AMCI will combine improved governance and enforcement in the AMPF with assisting local populations in transitioning to sustainable land use practices.

Scenario 2: Conservation as a result of improvements in the governance and enforcement capabilities of the AMPF Head Office.

The AMPF currently receives modest funds from the State and has received limited funding from NGOs in the past. It is possible that the government, NGOs or other donors would individually or collectively provide the AMPF with enough funds in the future and sustain these funds over the long-term in order to effectively reduce the rate of deforestation within the AMPF in the absence of carbon financing. While plausible, the history of the AMPF suggests that this scenario is unlikely.

Throughout the history of the AMPF, the amount of government-allocated funding has been unable to prevent illegal deforestation within the NPA. Although the AMPF was created in 1987, its local Head Office unit wasn't established until the year 2000. During this period, the AMPF received negligible public funding, while from 2000 to 2008, the year its Master Plan was approved, it received only enough funds to cover basic administrative costs and operate with minimal functionality (INRENA, 2008). Clearly, the costs required to achieve and sustain significant reductions in the deforestation rate within the AMPF are beyond the financial limitations of SERNANP. The AMPF Master Plan for 2008-2013 estimates that the ideal annual budget to effectively improve the governance and enforcement capabilities of the AMPF would amount to approximately S./1,515,710 (approximately $551,167 USD), not including significant additional costs to promote sustainable land use practices among settlers of the AMPF[26]. Still, the AMPF's budget for 2011[27], the year representing the peak in government-allocated funding in its history, is only 27% of this desired amount, indicating the lack of funds available to make significant advancements in combating deforestation in the AMPF.

The AMPF has also received some funding from a number of NGOs in the past to strengthen its governance capabilities. While the funding provided to the AMPF by these NGOs has in some years exceeded the NPA's budget provided by the State, these funds financed only a limited number of specific activities such as the development of the Master Plan and the purchase of equipment over a limited number years. This funding has not been sufficient to facilitate technical or financial long-term sustainability in the AMPF. These limitations, paired with the financial constraints of the government, have prevented the efforts of these entities from controlling illegal deforestation in the AMPF, as evidenced by the existing high rates of deforestation. Recent initiatives by the Government of Peru such as the National Forest Conservation Program for Climate Change Mitigation (*Programa Nacional de Conservación de Bosques para la Mitigación del Cambio Climático*) have been focused on indigenous titled lands, and have not managed to secure enough funds to effectively protect NPAs. In addition, this Program seeks to raise private funds to complement the public investment made and therefore is perfectly aligned with the efforts promoted by the AMCI.

In the absence of REDD funding, it is unlikely that the government or third-party donors will be able to secure sufficient funding to strengthen the AMPF's Head Office and promote sustainable coffee production at the level needed to significantly reduce the deforestation rate in the AMPF. Carbon finance presents the only realistic opportunity to obtaining additional financial resources to fund and sustain these activities in the long term.

[26] See Annex 10 of the AMPF Master Plan. INRENA, 2008.

[27] Source: "Plan Operativo Institucional del Servicio Nacional de Áreas Naturales Protegidas por el Estado". Portal de Transparencia de SERNANP. Accessible at: http://www.sernanp.gob.pe/sernanp/transparencia_pep.jsp?ID=1

Scenario 3: Conservation as a result of a shift in the current land use practices of the population of settlers living in the AMPF towards sustainable, organic coffee production.

Currently, conventional coffee production is the primary economic activity among settlers in the AMPF, despite the illegality of this activity under the land use restrictions of the NPA. The conventional coffee production techniques used by the vast majority of coffee producers within the AMPF are highly unsustainable. Most coffee plantations do not utilize organic fertilizers, pest control methods, or effective post-harvest management techniques, causing coffee plantations to quickly lose productivity and be converted to pastures. Coffee producers then cut primary forest to establish new plantations, furthering the cycle of deforestation. These practices are considered less labour intensive and less costly than organic, sustainable coffee production. A shift from conventional to sustainable coffee production would require significant start-up costs in order to purchase the necessary materials and equipment, as well as pay for technical assistance and training. Few coffee producers will invest significant energy and financial resources to make this shift to organic coffee production independently.

A small number of small coffee producer associations exist in the project region that are seeking certification as organic coffee vendors and are promoting organic coffee production among their members. Up until now, only a minority of settlers in the AMPF have associated with these groups due to several barriers that limit settlers' eligibility and motivation to join. Local coffee associations are unable to provide coffee producers within the AMPF sufficient support or incentives in order for coffee producers to overcome the legal, financial and technical barriers related with transitioning from conventional to sustainable coffee production (see the Barriers analysis in Step 3 for more details). The majority of coffee producers in the AMPF cannot overcome the high start-up costs and reach the required technical assistance for establishing organic coffee production systems independently.

Because of these limitations, a significant transition from conventional to sustainable coffee production has not occurred in the AMPF so far and is unlikely to occur in a business-as-usual scenario. The scale of funding available through the REDD project, in combination with the signing of Conservation Agreements and the technological package provided by the AMCI remains the only realistic pathway to generate this shift for the majority of coffee producers in the AMPF and eliminate the main driver of deforestation within the NPA.

Step 2: Investment analysis

The AMCI initiative is not set up as an economic investment activity. In the absence of carbon finance from the sale of GHG credits, the Project Proponent would not be able to financially support the scope of activities required to reduce deforestation in the AMPF. All the REDD revenues generated by the project thus will be reinvested through the AMCI initiative for the long-term sustainability of the AMPF.

Sub-step 2a. Determine appropriate analysis method

The activities proposed by the REDD project do not generate any revenue for the Project Proponent other than VCS related income. Therefore, a simple cost analysis is performed.

Sub-step 2b. – Option I. Apply simple cost analysis

The costs associated with the AMCI project have been documented as part of a simple cost analysis which will be provided to the validator for review (see Financial Viability analysis in the Non-Permanence

Risk Assessment). In addition to this, a detailed Barriers analysis is performed as an extension to the Investment analysis to further illustrate the additionality of the project.

Step 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of the type of proposed project activity

a) Investment barriers:

One of the main goals of the REDD project is to improve the governance and enforcement capabilities of the AMPF. In the absence of carbon financing, the only potential for these activities to be implemented would be through funds from the Peruvian government or NGOs. While these entities have invested and continue to invest in the AMPF, the levels of funding required over a relatively long time period are not likely to be available from these sources and would prohibit the required activities from reaching the scale necessary to ensure a long-term, substantial reduction in the deforestation rate in the AMPF.

The AMPF, designated as a NPA by the Peruvian State, receives the majority of its funds from the National Service of Natural Protected Areas. SERNANP must distribute a limited annual budget among the 73 NPAs that compose the SINANPE, of which the AMPF received nearly 1.6% and 1.5% in 2010 and 2011 respectively.[28] Because social and development programs are often a political priority, the funds allocated from the national budget to NPAs can be extremely variable year-to-year. Importantly, while the NPA was created in 1987, the AMPF Head Office was not established until the year 2000 with the support of NGOs (INRENA, 2008). From 2000 to 2005 the AMPF received only enough funding to pay for basic administrative activities; while only in 2006, with the support of different NGOs, did the AMPF Head Office have enough funds to hire additional staff members to begin control and surveillance activities (INRENA, 2008). Overall, the AMPF's annual budget has varied dramatically over the past decade, with State funds dipping as low as $10,182 USD in 2008 and peaking as high as $149,348 USD in 2011[29] (Table 3).

A small number of NGOs have made important contributions to the annual budget of the AMPF throughout the past decade, and these funds exceeded those provided by the State in several of these years. These investments resulted in concrete improvements in the governance of the AMPF by financing specific project activities, such as the development of the first version of the AMPF's Master Plan and the purchase of equipment,[30] as well as paying the salaries of two park rangers and the construction of a station within the AMPF. Financial limitations of these NGOs did not, however, allow further investments to be made to meet other needs of the AMPF over a timeframe exceeding several years that would allow for a reduction in the rate of deforestation inside the NPA (Table 3). In order to achieve technical or financial sustainability in the AMPF, sufficient funds need to be invested over the long-term. For instance, since these purchases, the motorcycles have been stolen or burned in protests of the AMPF's resistance to the construction of a road within the AMPF, and the ranger station is in disrepair. This deterioration of

[28] Data accessible through SERNANP's website: http://www.sernanp.gob.pe/sernanp/transparencia_pep.jsp?ID=1

[29] 2008 budget data provided as anecdotal evidence from some of the oldest AMPF park staff interviewed. 2011 budget data is publicly accessible information from the SERNANP website: http://www.sernanp.gob.pe/sernanp/transparencia_pep.jsp?ID=1

[30] one truck, two motorcycles, and furniture (personal comments from AMPF staff).

infrastructure and equipment indicates that the AMPF does not have sufficient funding to effectively maintain or protect the PA's assets.

Even the combined funds received from the State and these NGOs have not been sufficient to ensure significant and sustained improvements in the management of the AMPF to reduce the deforestation rate in the NPA. A generous budget is necessary in order to develop and execute an effective plan for control and monitoring across the 182,000 hectares of the AMPF. The Master Plan for 2008 to 2013 estimates that the ideal annual budget to cover administrative costs and enforcement activities should be approximately S./1,515,710 (or $551,167 USD), not including additional funding that would be needed to promote sustainable agricultural activities among local settlers like the ones promoted by the AMCI through the Conservation Agreements. The budget allocated by SERNANP to the AMPF for 2011, while being the highest in its history, still only reaches 27% of this goal. The ability of the AMPF Head Office to achieve and maintain significant reductions in the rate of illegal deforestation is handicapped by unstable State funding. Because of these financial barriers, carbon financing is crucial for providing the necessary amount of funding and stability to the NPA's budget over the long-term to achieve real reductions in the deforestation rate in the AMPF.

Table 3. Annual AMPF Budget 2000-2011 (USD)*

Year	Assigned Budget (Government)	Assigned Budget (NGO)	Budget (Government + NGO)	% increase	% of ideal situation (USD551,167)
1987-2000	n/a	n/a	n/a	**-**	**-**
2000	5,473	18,942	24,415	-	-
2001	49,636	-	49,636	103%	9%
2004	17,455	-	17,455	-65%	3%
2005	33,818	-	33,818	94%	6%
2006	32,798	50,136	82,934	145%	15%
2007	34,182	39,353	73,535	-11%	13%
2008	10,182	11,004	21,186	-71%	4%
2009	52,509	-	52,509	148%	10%
2010	147,698	-	147,698	181%	27%
2011	149,348	-	149,348	1%	27%

*There are no data for the years 1987-2000, 2002 and 2003
**Data for the years 2000-2008 were collected through interviews with the AMPF Head Office staff
***Data for the years 2009-2011 are from SERNANP's transparency website
****The budget figures refer to planned budget, as opposed to executed budget

b) Institutional barriers:

Peruvian legislation on Natural Protected Areas (Law No. 26834) requires that NPAs be maintained in their natural state in perpetuity according to the land use restrictions pertaining to each area. In the past and present political climate, some local politicians have and continue to advocate development priorities in the region that conflict with the conservation priorities of the AMPF. Local political candidates often campaign for office with the promise of constructing new infrastructure for communities within or surrounding the AMPF, activities that degrade forested areas and encourage more settlement within the AMPF. Conflicts have occasionally arisen between the AMPF Head Office and local politicians over the construction of roads, bridges, schools, and health centres within the limits of the AMPF or in its buffer zone. Without appropriate public awareness and educational outreach campaigns it is likely that local politicians will be tempted to promote projects that are detrimental to the future sustainability of the AMPF.

The AMCI, in collaboration with the AMPF Head Office is currently working with various government agencies, such as the Regional Government of San Martin and local Municipalities, the Environmental Prosecutor's Office, National Police of Peru, and the Ministry of Energy and Mines, to collaborate in protecting the AMPF and ensure that its conservation objectives are considered in the political decisions of these institutions (see PD section 6 for more information on the work with local stakeholders). These efforts had not been undertaken prior to the AMCI and would only be likely to be funded through the REDD project.

c) Technological barriers:

As a result of a lack of sufficient financial resources, the AMPF does not currently have the operational capabilities, technology and equipment necessary to effectively manage the 182,000 hectares of the Protected Area. Prior to the AMCI, the AMPF only had one truck, one park ranger station and a lodge in disrepair, and limited administrative facilities and equipment to perform the basic administration requirements of the NPA. The Head Office had two old GPS units, but there were no staff trained for using them. Recognizing this need, the AMCI is utilizing carbon financing to provide the necessary equipment, infrastructure, and training to strengthen the technological capabilities of the AMPF Head Office and ensure the sustainability of its management, surveillance, and monitoring activities. The AMCI will make improvements ranging from providing modern computers and new vehicles to teams in the field, to building checkpoints and improving the facilities of the administrative office. The delivery of these services will be accompanied by a rigorous training plan and a plan for monitoring and enforcement in the AMPF. The AMCI's goals will be met by jointly addressing the technological needs of the AMPF while also building the skills of the staff to effectively utilize this equipment and facilities.

Technological barriers also exist with regards to the main land use practices currently applied by the population living in and around the AMPF. The predominant agricultural activity in the AMPF, conventional coffee production, is highly unsustainable. Assessments performed by the AMCI indicate that on average, the maximum production time of a plantation is 15 years, producing no more than 45 quintals annually per hectare during a three year time period, after which the annual production quickly decreases to 6-8 quintals per hectare. When production decreases, most coffee producers convert plantations to pastureland and deforest new areas to establish new coffee plantations. In addition, there is little use of pest control techniques, with most of the plantations assessed having at least 85% of the coffee crop affected by pests or disease. There is no custom of applying fertilizers and, in the rare cases where fertilizers are used, only chemically-based fertilizers are applied. Additionally, poor processing methods of harvested beans result in final crop yields below 65% of the harvested crop. These poor management techniques dominate the coffee production systems in all the sub-basins of the AMPF and encourage the cycle of deforestation.

To effectively reduce the rate of deforestation in the AMPF, coffee producers in the AMPF must shift from unsustainable, conventional production to sustainable production of organic, shade-grown coffee. In order to do so, settlers must be provided with the necessary technology, equipment, and facilities to make sustainable coffee production a profitable endeavour in order to promote this transition on a large scale. In the absence of carbon financing, the AMPF Head Office lacks the funding, infrastructure, and equipment to promote organic, shade-grown coffee among the settlers within the AMPF. Local coffee associations and government initiatives such as PEAM (see section 1.9 of the PD, Prior Conditions), also lack sufficient funds and often are unable to provide their members with the tools, high quality materials, practical training, and monitoring necessary for such an endeavour. With the funding from carbon credits, the AMCI will provide each settler who signs a Conservation Agreement with a complete technological package that will guarantee an increase in the productivity of the plants included in the scheme compared to the business as usual scenario. The package includes the following[31]:

- tools needed for all phases of coffee production;
- materials for organic, pest control methods;
- a mix of high quality, organic fertilizers, including *guano* from the coast of Peru;
- microorganisms and other materials to apply a specialized technique for organic compost production called "bokashi";
- restoration of unproductive old coffee plantations with high quality coffee seedlings;
- access to tree nurseries with the requirement that all coffee producers plant native trees among coffee plants;
- technical assistance in each phase of coffee production with full-time technicians making on-site visits;
- extensive monitoring of the development of coffee systems; and
- support for increased access to specialized markets in organic coffee.

Through these strategies, the REDD project will make unprecedented advances in providing the necessary equipment and strengthening the technical capabilities of coffee producers in the AMPF at a scale that would not have been possible without the support from the sale of GHG credits. Once the success of initial demonstration plots is verified, local farmers are engaged in co-investment schemes to increase the amount of land under sustainable coffee production within areas already intervened.

Image 14. Fertilizing coffee plantations

Image 15. Building improved stoves

d) Barriers related to local tradition:

The population living within the AMPF is not native to the area. Most of these settlers have migrated from the Peruvian Andes, where the basic social organization and agricultural practices are very different from those of the Amazon region. Many settlers maintain these traditions and negatively impact the AMPF ecosystem by implementing agricultural practices that are not suitable to Amazonian soils. The effects

[31] Additional ddetails on the technological coffee package promoted by the AMCI are included in the REDD Strategy document (Sup.Inf_PD_1.1). Additional information will be provided to the validators by the AMCI technical coffee experts upon request.

and extent of this phenomenon is widespread in the Peruvian Amazon and has been well documented by local and international researchers (White et al., 2005; Labarta, 1998; Bedoya, 1990; for a detailed description, see Dourojeanni, 1990). This results in the unsustainable management of coffee plantations in the AMPF that lead to continual deforestation with the use of slash and burn techniques in order to clear land for new plantations.

Through the signing of Conservation Agreements, the AMCI will overcome this barrier by assisting coffee producers to implement shade-grown, organic coffee plantations that will produce higher yields with the use of effective pest control measures and organic fertilizers. These sustainable coffee production systems will eliminate the need to deforest to establish new plantations, while also managing coffee plantations with low-impact techniques.

e) Barriers due to prevailing practice:

The social conditions prevalent in the AMPF pose unique challenges to any initiative aiming to substantially reduce deforestation within the Protected Area while at the same time providing viable alternatives for the local population. Because a project of this scale and timeframe has not been conducted yet, the AMCI must develop unique strategies to overcome the barriers faced by past efforts in the region. The AMCI's efforts to implement sustainable coffee production are the first of their kind to provide individual coffee producers within the AMPF boundaries with extensive materials, inputs, training, and technical assistance needed to make the shift from conventional to sustainable, organic coffee production a viable economic alternative (see Technical Barriers discussion for more details).

The AMCI is also unique in that the use of carbon financing will provide more funding over a longer timeframe to support the AMPF than any other similar initiative in the history of the region. Additionally, the AMCI will be the first project to integrate the goal of improving the AMPF's management capabilities with the need to make the land use practices of settlers in the AMPF more sustainable. The AMCI will reduce setters' incentives to deforest by providing them with an attractive and sustainable income-generating alternative, while simultaneously ensuring that the AMPF Head Office is capable of managing and enforcing the complex dynamics within the Protected Area. The AMCI also embodies an innovative strategy by using Conservation Agreements as a tool to facilitate collaboration between the AMPF Head Office and the population of settlers within the NPA in combating deforestation. Despite the settlers not having legal claims to the land, the Conservation Agreements create a formal relationship between individual settlers and the AMPF, facilitating an exchange of services to promote sustainable land uses in the NPA. At the same time, the provision of the benefits identified in the CAs is subject to the compliance of the conservation commitments acquired by the settlers. In this way a quid-pro-quo relationship is established between the Head Office and the settlers.

f) Barriers due to local ecological conditions:

A major factor contributing to the lack of sustainability of various agricultural activities in the AMPF is that the region's soil characteristics are not ideal for intensive agriculture (White et al., 2005; Dourojeanni, 1990). The soils of the Amazon region are typically of low to medium depth and have low fertility. Nutrient-demanding crops, such as coffee, quickly deplete nutrients from the soil in the absence of the use of organic fertilizers. Cattle grazing compacts the soil and leads to increased soil erosion. The extent of this damage to soil quality is magnified in areas with dramatic slopes (White et al., 2005). The AMPF is predominantly cloud forest with mountainous terrain covering a large portion of the NPA and there are areas with very steep slopes even in the pre-montane forests of the AMPF. Settlers predominantly live in these pre-montane forests and many establish agricultural systems on steep slopes or along steep river banks, leading to a rapid deterioration of soil fertility due to erosion (see Drivers report/Sup.Inf_PD_2.2, and INRENA, 2008).

The current management practices related to coffee growing and pasture management in the AMPF reduce the ability of abandoned agricultural lands to restore its original forest cover. These intensive agricultural activities destroy native vegetation and replace it with introduced species (such as coffee, food crops, and grasses). Depending on the extent to which the soil was depleted and the extent to which seed dispersal of forest species was limited, agricultural plots may or may not be able to follow natural succession to re-establish forest stands with a natural species composition that provides the necessary habitat for native fauna.

There is no record to date of the extent of irretrievable loss of soils within the AMPF, except for the areas occupied by houses and infrastructure. In the absence of the REDD project, it is likely that not only will unrecoverable soil loss continue, but there may also be a significant decrease in the regenerative ability and resilience of natural forests within the AMPF. The expansion of agricultural and livestock operations presents a serious threat to the region and specifically to the ecosystems within the AMPF that are the source of regional watersheds. The AMCI will address this need for effective and sustainable soil management practices through the technological package provided by Conservation Agreements. Coffee farmers will be trained and provided technical assistance in creating stable agricultural systems that are designed to protect the fragility of the Amazonian soils.

g) Barriers due to social conditions and land-use practices:

The success of the AMPF in conserving its 182,000 hectares of Amazonian forest is inherently linked to the livelihoods of the people that live in and around its boundaries. In 2010, the population within the AMPF was estimated to be between three to four thousand families clustered around 35 settlements (AIDER, 2010). This population pressure results in widespread deforestation and forest degradation inside the AMPF because settlers depend on the conversion of forest to other uses for their income generating activities, mainly unsustainable coffee plantations, despite not having legal claims to the land or natural resources.

Coffee production is the primary economic activity in the AMPF, accompanied by subsistence agriculture and cattle pastures that are established on abandoned coffee plantations. However, many settlers lack the necessary technical skills to manage their agricultural production systems in a sustainable way. As discussed in the Technical Barriers section, many coffee producers in the AMPF do not utilize sustainable soil management practices, leading to the rapid conversion of these conventional coffee plantations to unmanaged pastures and food crop production. The Huasta and Yanayacu basins demonstrate the impact that these unsustainable land use practices are having in the region. In these basins alone, the population is estimated to be at least 1,000 families and these settlers have been deforesting areas of the AMPF for nearly 20 years in order to establish coffee plantations and pastures, without considerations for the environmental or economical sustainability of these operations.[32] The negative impacts of this mismanagement of natural resources within the AMPF are now being observed by the decrease in water

[32] Estimation based on the feasibility studies conducted with the AMPF personnel for these two sub-basin

levels in lower watersheds and rice farmers in the middle basin of the Mayo River are suffering from reduced water availability, highlighting the importance of the ecosystem services that this Park provides.

Additionally, the relationships between the AMPF Head Office and certain community-based organizations within the AMPF have been delicate in the past. Two such community groups are the Peasant Rounds (*rondas campesinas*[33]) and the informal committees responsible for the upkeep and construction of roads (*juntas de caminos*). These groups are perceived by some settlers as authorities in the AMPF and this perception weakens the authority and enforcement capabilities of the AMPF Head Office. In some instances, these groups have prioritized economic and development projects over the conservation goals of the AMPF and have promoted land uses that are not permitted in the AMPF. Many members of the vigilante groups are also unaware of the legal restrictions in NPAs. On several occasions, conflict has arisen between the AMPF Head Office and these groups. To promote increased cooperation, the AMPF's current administration, with the help of the AMCI's legal experts, successfully led training to explain the legal authority of the AMPF and the land use restrictions in the NPA, as well as encouraging these groups to use their influence to support the conservation goals of the Protected Area. This training was well-received by the community members involved and the AMCI aims to continue to offer this type of capacity building to local stakeholder groups as part of its project activities (see *Capacity Building Plan* in the *REDD Strategy* document, Sup.Inf_PD_1.1).

h) Barriers relating to land tenure, ownership, inheritance, and property rights:

The Law of Natural Protected Areas is clear in that NPAs are public domain and no settlements are allowed to be established within their boundaries after their creation (see Article 4 of the Law and Article 46 of its Regulation). In addition, the Law (Article 5) establishes that any rights obtained prior to the creation of an NPA, must be exercised in harmony with the goals of the Protected Area, allowing for the regulation or restriction of potential uses allowed within the NPA. Despite Peruvian laws regarding land tenure being clear, settlements were established and continue to be established illegally in the AMPF due to the AMPF Head Office not having sufficient funds or operational capabilities to successfully enforce these laws. The vast majority[34] of the people who live within the AMPF thus lack legal claim to the land on which they are settled and earn their livelihoods based on land use practices that are not permitted by the land use restrictions of NPAs. This situation of insecure land tenure creates highly strained relationships between the AMPF Head Office and the local settlers, as the former is perceived as a threat by the latter and represents an underlying condition for conflict generation during the AMPF's Head Office attempts to enforce the law.

In strict collaboration with SERNANP's legal office in Lima, the AMCI has developed a set of legal guidelines and a model Conservation Agreement that provides the necessary legal framework that will allow these barriers related to insecure land tenure and use rights in the AMPF to be overcome. Coffee producers in the AMPF will, for the first time, be able to establish a formal relationship with the AMPF

[33] Rondas campesinas are a common form of autonomous peasant patrol groups in Peru set up by the communities and recognized by the National Government, working in parallel and complementing the Regional, Provincial and Municipal governments.

[34] All settlements in the AMPF were established after the creation of the NPA, with the exception of two, namely Jorge Chavez and Afluentes, which are recognized by the AMPF Master Plan as existing prior to the formation of the NPA in 1987. According to the NPA Law, these settlements are allowed to remain within the NPA without though the possibility of claiming property rights to the land they occupy (Article 45.3). Their "possession rights" (*derechos de posesion*) are recognized and the geographical space where they are located is designated as a Special Use Zone where they are allowed to carry out activities that are aligned with the conservation goals of the NPA and in compliance with the zoning restrictions established by the PA's Master Plan.

Head Office through the signing of Conservation Agreements. CAs establish a contract[35] between the AMPF Head Office and each coffee producer that provides them with tangible benefits and extensive technical support in establishing and maintaining sustainable coffee production systems in exchange for their commitment to conservation activities. Because the delivery of benefits of the CAs is conditional on the compliance of both parties, including a gradual sanction system, settlers have strong incentives to conserve the AMPF. In addition, CAs will give settlers the legal basis necessary for them to become members of local coffee associations and legitimately access the organic coffee market in the future. In the absence of the AMCI, it is highly unlikely that these activities would take place as the AMPF annual budget would not be sufficient to implement activities beyond a basic control and monitoring plan. The relationships between the AMPF Head Office and local settlers would continue to be strained due to the illegal nature of the activities carried out within the AMPF, and conflicts would continue to rise due to the inability of the Head Office to bridge the gap between the legal mandate of the Law and the livelihood needs of the local population.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternative land use scenarios (except the proposed project activity):

The barriers described in Sub-step 3a demonstrate the complexity of the economic, legislative, social and environmental factors that define the current state of the AMPF and threaten its ecological sustainability, diversity and vital ecosystem services. These barriers must be taken into account when considering the plausibility of each alternative land use scenario and, consequently, make scenarios 2 and 3 unlikely to occur in the absence of the REDD project. The most plausible land use scenario in the absence of the REDD project is thus the baseline scenario, or continued illegal deforestation and forest conversion to coffee plantations and pastures. This scenario considers all the barriers described in Sub-step 3a and the difficulty of overcoming each one in the absence of the REDD project. The history of the AMPF demonstrates that the combination of investment, institutional, technological, social and environmental barriers described has resulted in the limited success of similar project activities in the past led by the State, NGOs, and coffee associations that attempted to reduce the deforestation rate in the AMPF. The barriers do not, therefore, prevent the baseline scenario but rather indicate the likelihood of the baseline scenario.

Many of the barriers described can only be overcome with the unprecedented scale, scope, and longevity of funding that could be provided through carbon financing and the unique REDD strategy proposed by the AMCI that combines the strengthening of the AMPF Head Office's governance and enforcement capabilities with facilitating the transition of conventional coffee production to sustainable, organic production systems.

Step 4. Common practice analysis

No record exists of any project in the region that has performed similar activities that compare to the scale and timeframe of those proposed by the AMCI. The proposed REDD project aims to implement a unique, dual strategy to combating deforestation in the AMPF that pairs the improvement of governance and enforcement capabilities of the AMPF with facilitating the transition from conventional to sustainable land use practices among the settlers of the AMPF. Although there have been several attempts in the project

[35] It is important to note that, as indicated in the legal guidelines for the implementation of Conservation Agreements, these contracts do not allocate any formal rights to local settlers; rather, they will ensure that CAs are being implemented within the framework of the NPA Law.

region in the past that have aimed to address one of the two strategies individually, no other initiatives have attempted to combine these two strategies at the scale of the AMCI. The project therefore, is clearly not a common practice in the region.

The Peruvian government has and continues to provide the AMPF, as an NPA owned and managed by the State, with annual budget appropriations to finance some of its operating costs. NGOs have donated some funds to the AMPF during the 10 years prior to the project start date and these have contributed to improving the governance and enforcement capabilities of the AMPF to a certain extent. While these combined efforts have been significant, they lacked the scale, scope and longevity necessary to achieve sustained reductions in the deforestation rate in the AMPF, as evidenced by the high rate of deforestation prior to the REDD project start date. The REDD project stands apart from these efforts in several respects. First, the REDD project will provide a sustainable financing mechanism that will bring unprecedented financial stability to the AMPF over the long-term and will invest more funds into the governance and enforcement in the AMPF than at any other time in the NPA's history. Second, the scope of these investments will expand beyond previous efforts to include the construction of new park facilities and the purchase of necessary technical and monitoring equipment, combined with extensive training for existing staff and the hiring of more park rangers and administrative and technical specialists. The AMCI will also be the first project aimed at strengthening the organizational structure and capacities of the AMPF Management Committee to increase stakeholder participation in the governance of the NPA. Third, the REDD project will, for the first time in the NPA's history, create an agreement in which a third-party organization, CI-Peru, will co-manage the AMPF jointly with SERNANP to facilitate the effective and timely execution of project activities.

Initiatives led by the regional government (PEAM) and local organic coffee associations are conducting efforts to promote organic coffee production in the project region. Various barriers have limited the success of these efforts in reaching the coffee producers within the AMPF and reducing the deforestation rate inside the Protected Area prior to the REDD project start date. There are several essential distinctions to be made between these previous efforts and the AMCI. First, the AMCI is the first project that will facilitate the signing of Conservation Agreements between the AMPF Head Office and settlers in the AMPF and, in doing so, will provide a legal basis for the production of (sustainable) coffee plantations in the NPA that will allow settlers to access organic coffee markets independently or partner with existing coffee associations. Second, under this framework, settlers will be given unprecedented incentives to join the AMPF Head Office in its goal of conservation and transition to sustainable, organic coffee production. The AMCI will provide each individual coffee producer who signs a CA with all the tools necessary to produce organic coffee using high quality organic fertilizers shipped in from the coast, and materials to produce specialized compost and organic pest control strategies. The project will also provide regular, extensive technical assistance and training to each coffee producer. Access to tree nurseries will also be provided to encourage the planting of native tree species alongside coffee plants to be used as live fences and become an integrated component of the farm production system. This level of technical intervention and investment in the implementation of sustainable, organic coffee production within the AMPF and the buffer zone is unprecedented, with local coffee associations only having been able to provide limited training and materials to their limited membership groups in the past. Finally, prior to the REDD project there were limited efforts to improve environmental awareness and promote long-term social change among the settlers in the AMPF and the communities in the buffer zone. The AMCI includes a communication strategy that will promote awareness of the project activities and the importance of conservation of the NPA and the environmental services it provides to ensure the sustainability of the initiative in the long-term. These social change elements that the project aims to fulfil can only be achieved by promoting a change in the perception of the local populations towards the AMPF, which is the long-term objective of the communications component.

In conclusion, the AMCI REDD project offers the only realistic solution to overcoming the barriers that have prevented the success of prior initiatives in reducing deforestation in the AMPF. Investments by the Peruvian government and NGOs in improving the governance and enforcement capabilities of the AMPF Head Office have had limited success in the past due to a combination of social, investment and institutional barriers, and other factors outlined in detail in Sub-step 3a. Local coffee associations and initiatives of the regional government are trying to promote organic coffee production, but have also faced barriers related to investment, land tenure, and conventional land use practices, among others mentioned in Sub-step 3a, that have prevented them from reaching the large number of settlers in the AMPF and generating the transition towards sustainable coffee production. In the absence of the REDD project, these barriers will continue to prevent effective reductions in the deforestation rate and the AMPF will continue to be one of the NPAs in Peru experiencing the highest levels of adverse human impact. The AMCI offers a unique strategy that combines improving the governance of the AMPF with reducing the major driver of deforestation, conventional coffee production, through the use of Conservation Agreements and long-term funding. With the help of carbon finance, the implementation of the AMCI will be able to overcome the historical barriers that have prevented a reduction of deforestation within the AMPF and will sustain these reductions over the long-term. The AMCI project therefore is clearly additional to the business as usual scenario.

2.6 Methodology Deviations

No methodology deviations have been applied. Please refer to the AMCI Methodological Annex for further details.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Please refer to the AMCI Methodological Annex.

3.2 Project Emissions

Please refer to the AMCI Methodological Annex.

3.3 Leakage

Please refer to the AMCI Methodological Annex.

3.4 Summary of GHG Emission Reductions and Removals

The Summary of the GHG Emission Reductions of the AMCI project is provided below. For further details, please refer to the AMCI Methodological Annex (note, the following calculation does not include the number of buffer credits to be deposited in the VCS AFOLU pooled buffer account).

Table 4. Summary of GHG Emissions Reductions generated through the AMCI

Years	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
2009	1,053,635	(526,818)	(52,682)	474,136
2010	1,008,436	(504,218)	(50,422)	453,796
2011	945,973	(472,987)	(47,299)	425,688
2012	918,620	(413,379)	(36,745)	468,496
2013	915,765	(412,094)	(36,631)	467,040
2014	837,835	(335,134)	(25,135)	477,566
2015	811,273	(283,946)	(24,338)	502,990
2016	817,296	(245,189)	(16,346)	555,762
2017	803,232	(160,646)	(8,032)	634,553
2018	1,053,635	(76,793)	0	691,138
Total	8,879,998	(3,431,204)	(297,629)	(297,629)

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	2008 Forest Cover Benchmark
Data unit:	map
Description:	Digital map showing the location of forest land within the project area at the beginning of the crediting period
Source of data:	Landsat 5 and Landsat 7 (paths 08 and 09, row 064)
Description of measurement methods and procedures to be applied:	Landsat-based land-cover classification using decision tree and see5 methods.
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	2 ha of forest patch as minimum threshold
Monitoring equipment:	ERDAS 10.0 and ArcGIS 10.0
QA/QC procedures to be applied:	The minimum map accuracy is 80% for the classification of forest/non-forest in the remote sensing imagery
Calculation method:	n/a
Any comment:	Raster format – 30m resolution – projection system UTM zone 38S – datum WGS84

Data Unit / Parameter:	Reference Region
Data unit:	map
Description:	Digital map of reference region boundaries
Source of data:	GIS data (elevation, slope, protected areas, precipitation, administrative boundaries)
Description of measurement methods and procedures to be applied:	The limits were delineated based on landscape configuration, ecological aspects, drivers and agents of deforestation, and social and economic

	conditions.
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	n/a
Monitoring equipment:	ArcGIS 10.0
QA/QC procedures to be applied:	n/a
Calculation method:	Criteria of similarity with project area
Any comment:	Vector format – 30m resolution – projection system UTM zone 38S – datum WGS84

Data Unit / Parameter:	Leakage Belt
Data unit:	map
Description:	Digital map of leakage belt boundaries
Source of data:	GIS data (elevation, slope, routes, urban centers, forest edges, project boundaries)
Description of measurement methods and procedures to be applied:	Mobility analysis using a multi-criteria evaluation. Factor maps were based on fuzzy analysis using the historical deforestation patterns as parameters.
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	n/a
Monitoring equipment:	IDRISI Taiga
QA/QC procedures to be applied:	n/a
Calculation method:	Eigenvector of weights applied in the factors maps
Any comment:	Raster format – 30m resolution – projection system UTM zone 38S – datum WGS84

Data Unit / Parameter:	ABSLRRi,t
Data unit:	ha / y-1
Description:	Annual areas of baseline deforestation in the reference region
Source of data:	Historical deforestation (1996-2006) and coffee production (1997-2009) in San Martin provinces of Rioja, Moyobamba and Huallaga
Description of measurement methods and procedures to be applied:	Annual deforestation was estimated as a function of coffee production
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	n/a
Monitoring equipment:	n/a
QA/QC procedures to be applied:	n/a
Calculation method:	= (0.1188*(604.47 *(year) – 1200357.57)) – 36.338
Any comment:	n/a

Data Unit / Parameter:	Projected Forest Cover Maps (2009-2018)
Data unit:	map
Description:	Digital maps of yearly forest cover in the project area and leakage belt for 2009-2018
Source of data:	GIS data
Description of measurement methods and procedures to be applied:	Spatial modeling based on the relationship between historical deforestation and factor maps
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	n/a
Monitoring equipment:	IDRISI Taiga

QA/QC procedures to be applied:	The minimum map accuracy is 50% using figure of merit at polygon level
Calculation method:	n/a
Any comment:	Raster format – 30m resolution – projection system UTM zone 38S – datum WGS84

Data Unit / Parameter:	ABSLPAi,t
Data unit:	ha / y-1
Description:	Annual area of recorded deforestation in the project area for 2009-2018
Source of data:	GIS processing
Description of measurement methods and procedures to be applied:	Results of the distribution of the projected deforestation rate within the reference region using the risk map from the spatial modeling
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	n/a
Monitoring equipment:	IDRISI Taiga
QA/QC procedures to be applied:	n/a
Calculation method:	n/a
Any comment:	n/a

Data Unit / Parameter:	ABSLLKi,t
Data unit:	ha / y-1
Description:	Annual area of recorded deforestation in the leakage belt for 2009-2018
Source of data:	GIS processing
Description of measurement methods and	Results of the distribution of the projected deforestation rate within the reference region

procedures to be applied:	using the risk map from the modeling
Frequency of monitoring/recording:	Every 10 years or at each baseline revision
Value applied:	n/a
Monitoring equipment:	IDRISI Taiga
QA/QC procedures to be applied:	n/a
Calculation method:	n/a
Any comment:	n/a

Data Unit / Parameter:	Ctotcl
Data unit:	t CO2e ha-1
Description:	Tons of carbon dioxide equivalents per hectare
Source of data:	Field measurements
Description of measurement methods and procedures to be applied:	Sum of carbon stock of above-ground, and below-ground pools per forest type
Frequency of monitoring/recording:	once
Value applied:	n/a
Monitoring equipment:	n/a
QA/QC procedures to be applied:	Maximum of 10% of uncertainty
Calculation method:	Allometric equations and root to shoot ratio.
Any comment:	n/a

Data Unit / Parameter:	Ctotfcl,t
Data unit:	t CO2e ha-1
Description:	Mean post-deforestation carbon stock in the post deforestation class

Source of data:	Field measurement, aerial survey
Description of measurement methods and procedures to be applied:	Biomass stock of each non-forest class was estimated through field measurements and the mean post-deforestation stock was the weighted average
Frequency of monitoring/recording:	once
Value applied:	n/a
Monitoring equipment:	n/a
QA/QC procedures to be applied:	n/a
Calculation method:	Weighted average
Any comment:	n/a

4.2 Data and Parameters Monitored

In addition to the data listed below that will be collected directly at every verification period, the following tables in the methodological annex will be updated and included in the verification report: VM tables 15a-c, 22, 24, 29a-c, 32, 33, and 34. Also, in the case of a catastrophic event, VM Tables 20e, 20f, 20g, 21e, 21f, and 21g will be updated.

Data Unit / Parameter:	Forest Cover Maps (2009-2018)
Data unit:	map
Description:	Digital map of forest cover in the project area and leakage belt for the verification period
Source of data:	Landsat 5 and Landsat 7 (paths 08 and 09, row 064)
Description of measurement methods and procedures to be applied:	Landsat-based land-cover classification using decision tree methods. GPS waypoints might be used during the ground truthing
Frequency of monitoring/recording:	At every verification period
Value applied:	2 ha of forest patch as minimum mapping unit
Monitoring equipment:	ERDAS 10.0 and ArcGIS 10.0

QA/QC procedures to be applied:	Quality Control and Assurance procedures are detailed in the Methodological Annex. The minimum map accuracy is 80% for the classification of forest/non-forest in the remote sensing imagery.
Calculation method:	n/a

Data Unit / Parameter:	ABSLPAi,t
Data unit:	ha yr^{-1}
Description:	Annual area of observed deforestation in the project area during the verification period
Source of data:	GIS processing
Description of measurement methods and procedures to be applied:	Results of overlaying the forest cover map with the project area boundaries
Frequency of monitoring/recording:	At every verification period
Value applied:	GIS files of the project boundary
Monitoring equipment:	Computer and ArcGIS software
QA/QC procedures to be applied:	Projection system and datum will be kept consistent. Clear and detailed documentation and independent desk review to assure consistency and accuracy of the GIS procedures
Calculation method:	Spatial Analysis tool (tabulate area of zonal statistics tool box)
Any comment:	n/a

Data Unit / Parameter:	ABSLLKi,t
Data unit:	ha y^{-1}
Description:	Annual area of observed deforestation in the leakage belt for the verification period
Source of data:	GIS processing
Description of measurement methods and	Results of overlaying the forest cover map with

procedures to be applied:	the leakage belt boundaries
Frequency of monitoring/recording:	At every verification period
Value applied:	GIS file of the leakage belt
Monitoring equipment:	Computer and ArcGIS software
QA/QC procedures to be applied:	Projection system and datum will be kept consistent. Clear and detailed documentation and independent desk review to assure consistency and accuracy of the GIS procedures
Calculation method:	Spatial Analysis tool (tabulate area of zonal statistics tool box)
Any comment:	n/a

4.3 Description of the Monitoring Plan

For a technical description of the AMCI monitoring plan, please refer to the Methodological Annex, Part 03. The data and parameters monitored during the project's lifetime are described in the previous section of this PD. Below follows a description of the AMCI data management plan[36].

Purpose of the AMCI GHG monitoring plan:

- Standardize methods and procedures applied for the collection, compilation and analyses of the data used to estimate the GHG benefits of the AMCI REDD project;
- Guarantee that the information is processed in a consistent way throughout the project's lifetime, comparable with the data and processes used during validation and in accordance with VCS approved methodology VM0015;
- Assure that the GHG benefits are estimated in a conservative manner with accuracy, precision and reliability;
- Document results to demonstrate the achievement of the AMCI project's goals in terms of emissions reductions in the AMPF.

Organization(s) and staff involved:

The responsible organization for the data management of the AMCI project will be Conservation International, supported by the AMCI partners as appropriate:

[36] The AMCI data management plan was designed based on the data management and publishing guidelines of the MIT Libraries, available at: http://libraries.mit.edu/guides/subjects/data-management/index.html

- Overall administration and supervision: Project manager - CI Peru
- Data storage and organization: GIS Manager - CI-Peru
- Back up and system security: IT manager - CI-Peru
- Remote sensing processing: RS Specialist - CI-Peru/HQ
- GIS analysis - GIS specialist: CI-Peru/HQ
- Documentation and outreach: Communications coordinator - CI-Peru

Description of the data to be collected:

- The GHG benefits of the AMCI project will be estimated by comparing the baseline emissions with the actual emissions during each monitoring period. The actual emissions will be estimated by measuring the forest loss in each stratum multiplied by the respective emission factor. Note that the emission factors will be constant during the project lifetime, since the carbon stock of each forest class is considered constant and the post-deforestation class is estimated as the weighted average of all non-forest classes in the historic reference period. Therefore the only data to be measured in each monitoring event will be forest loss due to land use change.
- Forest loss will be estimated in each monitoring period by analyzing a time series of Landsat images. See the methodological annex for the methods used in acquiring, pre-processing (including cloud removal), classifying, and post-processing images. Subsequently, the forest loss map will be overlaid with the project area and leakage belt to estimate the area converted to non-forest within those boundaries.
- The AMPF falls within two Landsat scenes (paths 08 and 09, row 064). Images will be compiled from USGS and UMD archives, with enough dates within one year period to ensure the least amount of cloud problems possible. In the cases where areas obscured by clouds still remain in the project area and leakage belt, these areas will be temporarily excluded from the project until the next verification period.

Plans for storage and data management:

- All the GIS data, including the raw and processed satellite images will be stored in the GIS lab of CI-Peru.
- All data will initially be backed up using an external drive with weekly backups to a network drive. The network drive uses CI's SAN server system and provides redundant backup. This will ensure that a retrieval system will be in place in case of computer, hardware, or internet connection failure.
- The folder structure will be reflected in the backup system to guarantee that the integrity of GIS map files (e.g. mxd for ArcGIS) will be maintained and links will not be broken.
- The backup system will be tested systematically (monthly) to ensure that the system is working properly.

- Any data collected in hard copy (paper) will be converted to digital (i.e. scanners), unless otherwise specified in the monitoring report. In that case, a physical location in the GIS-lab of CI-Peru will be designated to store such material. An electronic inventory document will identify the name, type of document and a brief description of all the hard copy products. This inventory will be located in the GIS-lab of CI-Peru.

- The GIS manager of CI-Peru will be responsible for keeping any hard copies in a secure location, protected from intense humidity or sunlight exposure. In addition, the GIS Manager will be in charge of collecting, copying and storing any relevant files generated by the AMCI's partners or external consultants.

Legal and ethical issues:

- The data collected or generated by the AMCI project are property of CI-Peru, unless otherwise specified. Confidentiality of research subjects, where applicable, will be maintained to ensure continuing participation in research and monitoring activities.

Access policies and provisions:

- All data collected or generated by the AMCI project will be publicly available upon request through the contact information provided in the PD, unless under contractual obligation not to be disclosed.

For further information with regards to the AMCI GHG monitoring plan please refer to the monitoring section of the Methodological Annex – Part 3 and to the Supl.Info_Meth_03.

5 ENVIRONMENTAL IMPACT

The current regulatory framework regarding environmental impact assessments falls under the System of Environmental Impact Assessments Law (Law Nº 27446), or "Ley del Sistema de Evaluación de Impacto Ambiental (SEIA)", and associated regulations. This law has among its objectives the creation of a single, coordinated system of identification, prevention, monitoring, control and correction of anticipated negative environmental impacts resulting from investment projects; and establishing a uniform process that includes requirements, milestones, and scope of environmental impact assessments for such projects. The types of projects that fall under this regulation include public works, construction, extractive and commercial projects, among others, that are likely to cause significant negative environmental impacts.

The Alto Mayo Conservation Initiative (AMCI) has, on the other hand, the conservation of natural ecosystems for the benefit of human well-being as its main objective. This objective is carried out principally by providing support for the effective implementation of the AMPF Master Plan. Because the AMCI is situated within a Natural Protected Area, it is being developed and implemented in collaboration with the national authority governing NPAs (SERNANP). SERNANP´s supervision guarantees the effective implementation of the NPA regulatory framework, and ensures that AMCI is designed consistent with the environmental protection goals and designated uses for the AMPF provided in its Master Plan (i.e., reducing deforestation, recovery of degraded areas, and enhancement of biodiversity and other ecosystem services). The activities undertaken by CI, together with local partners, are meant to build the capacity of the AMPF Head Office in order to fully implement the Master Plan, under a Framework Agreement for Inter-institutional Support signed by CI and SERNANP. These measures, paired with enhanced monitoring and enforcement by the AMPF Head Office, will lead to significant environmental benefits throughout the AMPF.

Thus, the activities undertaken by Conservation International as part of the AMCI fall outside of the scope of the SEIA and are not subject to the norm or obligations deriving from it. For a more complete explanation of the SEIA and legal opinion please see respective Supportive Information (Sup.Inf_PD_5.1).

6 STAKEHOLDER COMMENTS

One of the main goals of the AMCI is to promote the conservation goals of the AMPF by facilitating the effective implementation of its Master Plan, while taking into account the challenges and social complexity posed by the large number of populations that have settled in the area. As such, the involvement and participation of multiple stakeholder groups at the national, regional, and local level that have an interest in the management of the AMPF is essential to the success of the AMCI. As such, four main stakeholder groups have been identified, consulted, and are involved in on-going communications with the AMCI. The first key stakeholder is SERNANP, which holds authority and management responsibility over the AMPF and has been deeply involved in the planning and implementation of project activities. The second key stakeholder group is the AMPF Management Committee, a body of individuals and institutions from both the public and private sectors that ensures the compliance of AMPF management with its conservation goals. Specifically in the AMPF, the Management Committee represents 59 institutions and acts as the key mechanism to ensure local stakeholder dialogue and participation in the AMPF. The third key stakeholder is the regional government of San Martin (GORESAM), to ensure that its mission of encouraging sustainable development in the region for the improvement of the livelihoods of rural populations is integrated with the goals of the AMCI. The fourth key stakeholder group is the local population within the boundaries of the AMPF and its buffer zone, whose land use decisions are inherently linked with the future of the AMPF. Because the characteristics and role of each stakeholder group varies, different strategies have been developed for their involvement and ongoing participation. The following discussion will describe the stakeholder consultation process and levels of involvement in the AMPF of each stakeholder group individually.

I. Involvement of the National Service of Natural Protected Areas (SERNANP)

As the area where the project is being implemented is a Natural Protected Area, the main actor with whom the Project Proponent has discussed and negotiated the AMCI is the National Service of Protected Areas (SERNANP), the State agency within the Ministry of the Environment authorized with the responsibility for managing NPAs in Peru. SERNANP is a key project participant, and coordination for the AMCI occurs at both the national and local level. At SERNANP's headquarters in Lima, different offices are involved, such as the Office for the Management of Protected Areas and the Office of Legal Counsel. The AMPF Head Office is the local branch of SERNANP and, as the authority responsible for the management and administration of the AMPF, is deeply involved in the AMCI.

The partnership between SERNANP and CI has been formalized through the signing of a Cooperation Agreement that establishes a framework of inter-institutional cooperation among the two parties and that guides CI's support of SERNANP and its on-going efforts in the AMPF (Sup.Inf_PD_6.1). This agreement established the following objectives: a) promote the development of tools to strengthen the management of NPAs; b) strengthen the technical and organizational capacities of local actors; and c) encourage the design and development of strategies to access financing mechanisms for the sustainable management of NPAs. Additionally, in April 2010, CI gave an official presentation of the AMCI to the central authorities of SERNANP. This meeting resulted in establishing a formal consensus between the two parties that continues to guide the activities of the AMCI. In response to this meeting, the Managing Director of Natural Protected Areas sent the letter N° 101-2010-SERNANP-DGANP to CI to indicate his support for the initiative and express his willingness to continue coordinating to achieve the project's objectives (Sup.Inf_PD_6.2).

Significant collaboration between the partners of the AMCI and SERNANP has resulted in several accomplishments for the successful implementation of the project:

- The AMCI partners have been working with SERNANP leadership and legal departments at the national level in a series of meetings to establish legal clarity for the development and implementation of Conservation Agreements within a Natural Protected Area. Conservation International, the Peruvian Society for Environmental Law (SPDA), the Office of Legal Counsel of SERNANP in Lima, and the AMPF's Head Office and Management Committee have coordinated a series of participatory workshops and meetings to develop a model Conservation Agreement that complies with the legal restrictions of the NPA and promotes conservation actions and benefits to reduce deforestation. This collaboration culminated in the approval of the proposed model for CAs by SERNANP, which was formalized in the letter N° 34-2011-SERNANP-J and gives legality to CAs in the Alto Mayo Protected Forest to be signed between the AMPF Head Office and settlers living in the NPA (Sup.Inf_PD_6.3).

- Another significant achievement due to collaboration between CI and the AMPF Head Office and Management Committee was the elaboration of a re-zoning proposal for the NPA. Previously, the AMPF Master Plan designated significant areas of deforested land under zoning classifications that did not allow for the implementation of ecosystem restoration activities, under the assumption that no human activities were taking place in these areas and thus were not degraded. The AMCI highlighted the need to temporarily re-zone the areas of greatest deforestation in the AMPF as "restoration zones" in order to allow project activities to be conducted in these areas in line with the land use restrictions established by the AMPF Master Plan and its respective zoning. Subsequent meetings between CI and SERNANP concluded in SERNANP's Director delegating to CI the responsibility for updating the zoning classifications to reflect the actual conditions on the ground and allow for an effective restoration of the degraded areas. During an open public presentation of the re-zoning proposal, the AMPF Management Committee as a whole approved the proposal with some suggestions that were taken into consideration (Sup.Inf_PD_6.4). A final version has been presented to SERNANP and is currently under review. This re-zoning of the NPA has been an important step in facilitating the implementation of Conservation Agreements and the REDD project in the AMPF.

- In addition, CI has achieved significant progress with SERNANP to ensure the long-term sustainability of the AMCI in support of the AMPF and both parties have reached an agreement regarding CI's role in developing and implementing a strategy for long-term financial sustainability of the AMCI. CI requested an administration contract with SERNANP that would allow CI to co-manage the AMPF and execute management and administration operations set forth in its Master Plan (see also section 1.12.1 Right of use). Once CI met the necessary legal requirements set forth by the NPA Law on all relevant procedures, SERNANP sent the letter N° 146-2011-SERNANP-DGANP, followed by issuing Resolution N° 027-2011-SERNANP-DGAMP that formally initiated the Direct Grant

Process for awarding an administration contract to CI (Sup.Inf_PD_6.5). Through the administration contract, CI's involvement in the AMPF is guaranteed over the long-term.

- CI has led further efforts to ensure the sustainability of the AMCI by discussing with SERNANP authorities the objectives of the REDD component of the AMCI, as a financial mechanism that could ensure the long-term sustainability of the AMCI in support of the AMPF. As a result, SERNANP's letter N°063-2010-SERNANP-J (Sup.Inf_PD_6.6) establishes SERNANP's recognition of the importance of REDD funding in achieving the project's goals and the agency's commitment to facilitate the investment of REDD funds in the AMPF. The AMPF Head Office has also shown support for the pursuit of REDD financing and has provided assistance to technicians when conducting feasibility studies. In addition, the Ministry of Environment (MINAM), with the support of CI-Peru, produced a video on the importance of Green Economy in Peru, in which the REDD component of the AMCI initiative stands as an example of the potential for valuing the environmental services of a Natural Protected Area[37].

- As one of the main goals of the AMCI, CI is working in strict collaboration with the AMPF Head Office and provides tangible, on-the-ground support to ensure effective governance and enforcement of the AMPF. The AMCI will continue to provide technical support to the AMPF Head Office through the AMCI team of professionals in the field, combined with financial resources for hiring new personnel and buying equipment for the AMPF Head Office. Additionally, a focus of the AMCI is the training of AMPF park guards and members of the AMPF Head Office which includes instruction in the use of GPS equipment, basic cartography, the legal framework supporting NPAs, basic concepts of ecology, and the methodology for establishing Conservation Agreements, among other topics. A communications specialist is working with the AMPF Head Office to promote awareness of the AMCI in the region and facilitate continued communication with respect to the project and strengthen relationships between the AMPF Head Office and local stakeholders.

II. Involvement of the Management Committee of the AMPF

While SERNANP and the AMPF Head Office represent the main stakeholders involved in the management and administration of the AMPF and are key partners in the AMCI initiative, CI recognizes the importance of involving all local stakeholders in the AMCI, ranging from local government officials and private interests to the broader civil society and individual settlers. As previously mentioned, the Law of Natural Protected Areas (Article 15) requires that all public NPAs in Peru have a Management Committee, with at least five members, to provide local stakeholders with a voice in the management of the NPA and ensure that the NPA is being managed in accordance with its conservation goals. The AMPF Management Committee thus provides the main platform for stakeholder dialogue in the management decisions of the AMPF. Currently, the AMPF Management Committee consists of 59 institutions and represents local and regional governments, public and private sectors, and the local communities. This diverse body of stakeholders has been, and will continue to be, the main mechanism through which the AMCI will involve local interests in the project and maintain an open dialogue.

Although the AMPF was created in 1987, it was not until 2000 that the first AMPF Park Service was legally formed, which in turn led to the formation of the AMPF Management Committee. Due to a lack of funding and organization that prevented the necessary legal procedures from being followed, the

[37] The video can be accessed on You Tube at: http://www.youtube.com/watch?v=1YGpD7qZhNc&feature=related

Management Committee was not legally recognized until 2004. Between 2004 and 2007, the AMPF Master Plan was developed and its approval in 2008 represented a significant accomplishment for the Management Committee. Despite this success, the lack of training of some of the members of the Committee, and limitations on the funding available to support its activities, have prevented the Committee from being fully effective. CI recognizes these needs and aims to strengthen the Management Committee as a key goal in the AMCI.

CI has worked extensively with the current Executive Committee to develop a plan to improve the effectiveness of the Management Committee as a space for stakeholder dialogue and participation with regards to the management of the AMPF. As part of the AMCI, a comprehensive diagnosis of the Management Committee was conducted and used to establish the goals of the plan (see section 1.8 Description of the Project Activity for a summary of the plan). This plan was approved by the Management Committee and will be implemented in accordance with the priorities set forth by the Management Committee once approved by SERNANP (Sup.Inf_PD_6.7).

III. Involvement of the Regional and Local Governments of San Martin

The AMPF is located in the region of San Martin and as such, its Regional Government (GORESAM) is a key stakeholder for the successful implementation of the AMCI project. In addition, the GORESAM is the main authority in the buffer zone of the AMPF and thus, the success of the efforts undertaken by the AMCI depends on effective coordination with the regional government. GORESAM's mission to promote the sustainable development of the region provides a favorable framework for successful collaboration with the AMCI. CI has presented all the components of the project to GORESAM in order to promote information exchange and collaboration. As a result, a Cooperation Agreement for technical cooperation between CI and GORESAM was established, through which the regional government offered technical and political support to the project (Sup.Inf_PD_6.8).

On a larger scale, the AMCI is facilitating and strengthening partnership among all regional stakeholders interested in REDD-plus activities. Through the support of the Norwegian Agency for Development Cooperation (NORAD), CI is co-leading a Regional REDD Roundtable that serves as a formal platform for dialogue between GORESAM, local NGOs, and federations of indigenous peoples to discuss and coordinate all REDD-plus initiatives taking place throughout the region. The aim of this initiative is to enhance the capacities of the San Martin Government and other stakeholders in designing a subnational REDD-plus framework that is aligned with the national REDD-plus strategy, including developing a regional Reference Emission Level and/or Reference Level, and establishing a region-wide Monitoring, Reporting and Verification (MRV) system. The goal of these activities is to ensure that the emissions reductions generated by the AMCI project activities and other REDD projects in the region can be reported and accounted for at the regional level, promoting San Martin as a model for the nested approach to REDD-plus promoted by the national Government.

The provincial governments of the areas surrounding the AMPF are another key stakeholder for the long-term success of the AMCI initiative. In several instances in the past, local politicians have encouraged the illegal construction of roads and other infrastructure within the limits of the AMPF and its buffer zone that have led to conflicts between the AMPF Head Office and the local population. Thus, one of the goals of the AMCI is to align the development priorities of local politicians with the conservation goals of the AMPF through a program of communication and outreach to local government authorities in collaboration with the AMPF Head Office. Initial activities include training and capacity building for local government staff on conservation and environmental legislative issues, and providing information about the environmental values of NPAs and the AMPF.

As a first step, these efforts have focused on the Provincial Municipality of Rioja, as the lead actor responsible for promoting economic and social development in the main province where the AMPF is located. With the support of the AMCI, members of the AMPF Head Office have been chosen to serve on the Board of Directors of the newly established Municipal Environmental Commission (CAM). As members of the CAM Board of Directors, AMPF personnel were able to support the preparation of important management documents of the CAM, such as the structural plan of the CAM, CAM's 2011-2012 work plan, and CAM's local environmental agenda. Additionally, the AMPF Head Office and AMCI worked with the Environmental Manager of the CAM to schedule several training workshops on environmental issues. CI has also organized multiple workshops with local community leaders to encourage their participation and understanding of the AMCI. As an example, CI coordinated with the Natural Resources Office of the Rioja Municipality to implement workshops to strengthen the ability of municipal personnel to effectively perform their responsibilities in environmental conservation.

Image 16. Workshop with personnel from the Natural Resources Office of the Municipality of Rioia.

Image 17. Conservation Agreements Workshop in Rioja

The joint efforts of the AMCI and the AMPF Head Office have produced very promising initial results as evidenced by the inclusion of a project to conserve the AMPF in the new Provincial Development Plan. The AMCI is planning to expand its awareness building efforts in the medium term to include local authorities in the Districts of Pardo Miguel, Naranjos, Nueva Cajamarca, Elias Soplin Vargas and Awajun, located in the buffer zone of the AMPF.

IV. Involvement of the Local Population

The success of the AMPF in conserving its 182,000 hectares of Amazonian land is inherently linked to the livelihoods and land use decisions of the people who live in and around its boundaries. Recent estimates conducted by the AMCI indicate that the current population within the AMPF is 3 to 4 thousand families, not including the population in the AMPF's buffer zone. These settlers are important stakeholders in the AMCI and the sustainability of the project depends largely on their involvement. The AMCI is employing two main strategies to involve local populations, namely: a) the signing of Conservation Agreements with settlers to promote a change in the current land use practices, and b) an extensive communication strategy to promote a change in the perception of the local population towards the importance of the environmental values of the AMPF and its role in supporting their human well-being..

a) Engagement of the local population through Conservation Agreements

The central concept of CAs lies in the provision of tangible benefits to local resource users in exchange of concrete conservation actions. With the support of the AMCI, the AMPF Head Office will embark on a new era of collaboration with local settlers by making them allies in the conservation of the AMPF. The project began establishing CAs in 2008 and gradually continues to involve more individuals with the goal of signing agreements in at least eight sub-basins within the project area and buffer zone.

The signing of CAs entails a process of continuous dialogue with local settlers, and follows a specific methodology designed by Conservation International's Conservation Stewards Program (see Sup.Inf_PD_1.2). The first step in establishing CAs is to build relationships and establish open communication channels with local settlers. To do this, the AMCI invests in offering tangible start-up benefits to the population, such as the construction of tree nurseries, efficient wood stoves, or other benefits that respond to community needs. The AMCI communication strategy, discussed below, further facilitates dialogue and the establishment of trust between settlers and the AMCI by promoting a better understanding of the CA process. Once trust is created, it allows CAs to be discussed directly. Negotiation of the terms of the CAs is then led by the AMPF Head Office and the AMCI technical team, under the framework agreement established by SERNANP (Sup.Inf_PD_1.3). Finally, CAs are implemented and monitored on the ground and technical assistants continuously train and support settlers who have signed CAs. Every sixth day, the technical team meets to discuss progress during the week and plan out activities for the following week. The relationship-building and negotiation steps of the process are the building blocks of the CA approach and have involved consistent work with local settlers on behalf of the AMCI field team that has allowed the CA model to be adapted to meet the needs of the AMPF populations (see Sup.Inf_PD_6.9 for a list of all the meetings held in the field as part of the AMCI so far). To ensure that Conservation Agreements will provide net community benefits to local settlers, the project is committed to obtaining additional certification by the Climate, Community and Biodiversity Standards (CCBS).

b) AMCI Communication Strategy

The AMCI is implementing an extensive communication strategy as part of its project activities in order to raise public awareness about the importance of conserving the AMPF and ensure the engagement of the local population in the AMCI project (Sup.Inf_PD_1.5). The long-term objective of the strategy is to promote social change and a shift in how local populations and governments perceive the importance of the AMPF and its ecosystem services in supporting human well being and regional development. The communication strategy was designed by the AMCI technical experts in collaboration with AMPF park rangers, the AMPF Management Committee, and field technicians after a series of diagnostics to assess the information and awareness needs among settlers in the AMPF and the people in the surrounding area.

A key focus of the communication strategy is the population of settlers living within the AMPF, in order to improve their awareness about the Protected Area status of the AMPF and promoting a better understanding of the NPA legislation. The main strategies to achieve these goals have been a series of informational workshops that have been conducted jointly by the AMCI field technicians and AMPF park rangers, the broadcasting of radio announcements during popular local programs with high listenership, and distributing promotional materials such as calendars, T-shirts, stickers, and brochures, among others. In the Naranjos sub-basin for example, the environmental communications component has been successful in promoting ecosystem conservation/restoration awareness among the local population which has resulted in a first campaign to “clean-up the river”, which is their only source of fresh water for domestic consumption. Besides the cleaning activity of the banks of the river, the local population also participated in reforestation activities through the planting of 100 tree seedlings in the headwater region of the sub-basin and 200 tree seedlings in adjacent abandoned pastures to help restore forest ecosystems.

It is important to note the crucial role that field technicians and park rangers have in communicating the project during implementation of project activities in the field. In order to standardize the messages delivered across the project area and to promote a common understanding of the project, the AMCI communication team has prepared flipcharts explaining the Conservation Agreements approach that field technicians must use; a manual on how to use the flipcharts; and a Frequently Asked Questions leaflet on the AMPF and the AMCI project.

In addition, in order to facilitate a hands-on understanding of and greater support for Conservation Agreements among settlers in the AMPF, the AMCI provides opportunities for local community leaders from different sub-basins to visit organic coffee farmers that have signed CAs in other parts of the AMPF, in order to share their experiences and observe first-hand the tangible benefits and improvement in coffee production systems that result from the adoption of the new practices and the signing of the CAs.

Image 18. Conservation Agreements flipchart used in the field

Image 19. Environmental drawing contests with elementary school students.

Image 20. Reforestation campaign with high school students.

With respect to raising awareness of the general public, Youth Environmental Education is a major goal of the AMCI communication strategy. CI has initiated a pilot program for environmental education in collaboration with the AMPF Head Office and educational institutions located in areas where CAs are being implemented. The objective of this program is to inform students about the importance of conserving the AMPF, emphasizing the ecosystem's biodiversity value and role as the source of the headwaters of the Alto Mayo watershed. Additionally, a sense of environmental stewardship is being encouraged by organizing drawing contests for elementary school students and reforestation campaigns involving high school students. Furthermore, students from five schools in the districts of Rioja and Nueva Cajamarca have already been involved in "School Communicators" training modules that provide training in environmental journalism, video and radio editing, and radio and TV production. These students are also taught environmental concepts while field visits are conducted to the AMPF to learn about the Protected Area's ecological importance. During the field visits, the students take photos, make videos and interview the park rangers while also taking time to enjoy nature. Upon their return to the camp, they write news articles and put together TV shows for their schools, advocating the importance of preserving the natural environment and the essential services it provides. This program, coordinated in partnership with the Local Education Authority (UGEL), empowers students with the skills and information necessary to become environmental educators within their schools and wider communities. Today, it is being directly implemented by the AMPF Head Office with the financial and technical support of the AMCI.

Image 21. Environmental journalism curriculum involving high school students.

Image22. Student parades promoting conservation of the AMPF.

Image 23. Field visit to the AMPF organized as part of the AMCI's School Communicators Program

Image 24. Promoting reforestation as part of AMCI's youth environmental education activities

The AMCI has also identified local journalists as important allies in the dissemination of environmental awareness and information about project activities. Nearly 20 journalists from the districts of Rioja and

Nueva Cajamarca participated in a workshop about environmental journalism and climate change, in which they visited the AMPF to help them understand the importance of conserving the NPA. Following the workshop, the participants were invited to form the *Network of Environmental Journalists of Alto Mayo*. This network has already had its first meeting and has established a timeline of environmental programs to be released through different media outlets. Additionally, CI and its partners have established strong relationships with local media networks in Rioja (Radio Rioja and Tele Selva) as well as regional networks such as Inforegión to promote press releases and information about the AMPF. CI and its partners have also made contact with one of the most influential newspapers in the region that has already published several press releases prepared by the AMPF Head Office. The AMCI is regularly preparing radio spots and videos to disseminate information to the wider community.

Image 25. Environmental journalism and climate change workshop with local journalists.

Image 26. Journalists participating in "Environmental Journalism and Climate Change" workshop.

Image 27. Radio spots promoting awareness of the AMCI.

Image 28. Distribution of informational materials to local populations.

Beyond utilizing local media networks, the AMCI communication strategy also disseminates educational materials in the project region. Brochures have been produced and distributed to authorities in Nueva Cajamarca, Rioja, Moyobamba and the general public of these districts. Posters and calendars will be provided to people living inside the NPA as a reminder of the importance of conserving the AMPF.

Flipcharts have been produced for use during meetings conducted in the field and have been especially useful when conducting training for coffee producers who have signed CAs. Several communications materials are been produced to sensitize local populations about land trafficking. The communications products are part of a campaign promoted by the AMCI and SERNANP and include a poster, educational games for children, short videos and radio spots. Finally, CI has produced a new factsheet about the Alto Mayo (Sup.Inf_PD_6.10), which has been distributed among different actors and partners. The communications team will be updating the Alto Mayo section of the new website regularly (http://www.conservation.org/peru). A logo has also been designed for the AMPF to be included in all these distributed materials. These significant advances in outreach and education demonstrate the commitment that CI and the rest of the AMCI partners have in ensuring the participation of local populations in the efforts to reduce the deforestation in the AMPF. The communications specialist hired by the AMCI for the AMPF Head Office will work to ensure that these efforts are continued and expanded upon.

Image 29. Brochure on the AMPF

Image 30. Logo developed for the Alto Mayo Protected Forest.

Image 31. Communication material to inform about land trafficking in the AMPF

Image 32. Calendar themed on the AMPF

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METHODOLOGICAL ANNEX

This document represents the main methodological annex to the Verified Carbon Standard Project Description of the Alto Mayo Conservation Initiative (AMCI) REDD project. The project applies the "Methodology for Avoided Unplanned Deforestation" (VM0015, Version 1) approved by the VCS on July 12, 2011. As requested by the methodology, this document refers to each of the steps and sub-steps using the same titles and numbers of the methodology so that its application can be transparently validated.

Version: June15th, 2012 – (last update Aug 07th, 2015)

Acronyms

AFOLU	Agriculture, Forestry and Other Land Use
AIDER	Asociación para la Investigación y Desarrollo Integral
AMPF	Alto Mayo Protected Forest
AUDD	Avoided Unplanned Deforestation and Degradation
CDM	Clean Development Mechanism
CI	Conservation International
DFL	Displacement Leakage Factor
EI	Effectiveness Index
FAS	Fire Alert System
GHG	Greenhouse Gas
GIS	Geographic Information System
GORESAM	Regional Government of San Martin
AMCI	Iniciativa de Conservación Alto Mayo
LCM	Land Change Modeler
LMA	Leakage Management Areas
MCE	Multi-Criteria Evaluation
MINAM	Ministry of Environment
MMU	Minimum Mapping Unit
MRV	Measuring, Reporting and Verification
NORAD	Norwegian Agency for Development Cooperation
PD	Project Description
P-FOM	Figure of Merit at Polygon Level
REDD	Reducing Emissions from Deforestation and forest Degradation
REDD-plus	Reducing Emissions from Deforestation and forest Degradation, plus conservation, sustainable Management of forests, and enhancement of forest carbon stocks
SERNANP	National Service of Natural Protected Areas
SINANPE	National System of Natural Protected Areas
SRTM	Shuttle RADAR Topography Mission
tCO_{2e}	Metric ton of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
WGS	World Geodetic System

Table of Contents

List of Tables*

**In order to keep consistency with the table numeration used in VM0015, tables from the methodology will be noted as VM Table (number), while additional tables noted as Table (letter).*

Additional Tables

List of Figures

List of Equations

Part 1 – Scope, applicability conditions and additionality

1. Scope of the methodology

The Alto Mayo Conservation Initiative (AMCI) represents an integrated, multi stakeholder strategy that promotes activities to reduce deforestation in the Alto Mayo Protected Forest (AMPF) of the Peruvian Amazon. Therefore, it falls within the *Avoided Unplanned Deforestation and/or Degradation* (*AUDD*) VCS AFOLU category. The AMPF meets the most current definition of frontier configuration, as deforestation occurs in fronts along the routes and rivers in the region that provide access to the forest. Carbon stock enhancements in forests that would be deforested in the baseline are conservatively omitted in the AMCI project. Credits from reducing GHG emissions from avoided degradation are also not accounted as they are excluded in this methodology.

Baseline activities include deforestation in old-growth forests without logging while project activities include protection without logging, fuelwood collection or charcoal production; therefore, the project falls within category A of the eligible activities included in the scope of this methodology (VM Table 1).

VM Table 1. Scope of the methodology

			PROJECT ACTIVITY	
			Protection without logging, fuel wood collection or charcoal production	Protection with controlled logging, fuel wood collection or charcoal production
BASELINE	Deforestation	Old-growth without logging	A	B
		Old-growth with logging	C	D
		Degraded and still degrading	E	F
		Secondary growing	G	H
	No-deforestation	Old-growth without logging	No change	Degradation
		Old-growth with logging	IFM	IFM-RIL
		Degraded and still degrading	IFM	IFM
		Secondary growing	No change	Degradation

2. Applicability conditions

The project meets the five applicability conditions of the methodology as follows:

a. The project promotes activities that avoid deforestation in the AMPF. Therefore, it falls within the Avoided Unplanned Deforestation and/or Degradation (AUDD) VCS AFOLU category

b. Baseline activities include deforestation in old-growth forests without logging while project activities include protection without logging, fuel wood collection or charcoal production; therefore, the project falls within category A of the eligible activities included in the scope of this methodology.

c. Although there is not an official definition of forest in Peruvian legislation, the Government of Peru has adopted parameters to define forest under the CDM[1]. The forest land located in the project area meets these parameters – including a crown cover of at least 30%, a minimum tree height of 5 meters at maturity and a minimum area of 0.5 ha – at least 10 years prior to the project start date. As a conservative measure the project does not consider secondary open forests or agroforestry systems under the forest definition; only the old-growth forests.

d. The AMPF project meets the most current definition of frontier configuration. The deforestation in the region is happening in fronts along the routes and rivers in the region providing access to the forest. The unplanned conversion of forest is increasing mainly due to the establishment of conventional coffee plantations led by settlements located inside and around the AMPF boundaries.

e. The forest land located within the project area is characterized by pre-montane, cloud and dwarf forests, therefore no forested wetland is found within the project area.

3. Additionality

Please refer to section 2.5 of the AMCI VCS PD.

Part 2 - Methodology steps for ex-ante estimation of GHG emission reductions

Step 1: Definition of boundaries

1.1 Spatial boundaries

KML, Vector and raster files that unambiguously define the spatial boundaries of the project are provided to the validator with the PD. All GIS files are projected to UTM Zone 18S coordinate system and datum WGS84.

1.1.1 Reference region

At the time of validation no national or subnational baseline exists that meets VCS specific guidance on applicability of existing baselines, as specified in VM Table 2. At the time of validation, no officially

[1] http://cdm.unfccc.int/DNA/index.html

endorsed sub-divisions of the country or sub-national region exist for which baselines will be developed. Nevertheless, the project proponent is coordinating closely with the Peruvian Ministry of Environment (MINAM) and the Regional Government of San Martin (GORESAM), and is co-leading a Regional REDD-plus Roundtable which facilitates coordination among different REDD projects under development in the region with the goal of establishing a regional accounting and MRV system in the near future. The project is also closely following the evolution of the VCS Jurisdictional Nested Initiative and preparing for any new developments that might be of relevance to the project. The project proponent is committed to following any sub-national or national policies and regulations, or VCS rules, regarding jurisdictional and nested baselines as they are established in the coming years.

VM Table 2. Criteria determining the applicability of existing baseline

	Applicability criteria
1	The existing baseline must cover a broader geographical region than the project area. If a leakage belt must be defined[1], the broader region must include the leakage belt.
2	The existing baseline must cover at least the duration of the first fixed baseline period and is not outdated.
3	The existing baseline must depict the location of future deforestation on a yearly base.
4	The spatial resolution of the existing baseline must be equal or finer than the minimum mapping unit of “forest land” that will be used for monitoring deforestation during the fixed baseline period.
5	Methods used to develop the existing baseline must be transparently documented and be consistent with a VCS approved and applicable baseline methodology.

As an interim measure thus the project proponent defines a reference region which contains similar geo-physical characteristics to the project area and where agents, drivers, and overall patterns of deforestation represent a credible proxy for possible future deforestation patterns in the project area. The reference region encompasses the project area, the leakage belt, and other geographic areas relevant to determine the baseline of the project area.

The reference region has an area of 580,616 ha – approximately four times bigger than the project area – and an outer perimeter of 1,073 km. It stretches from south of the San Marcos village (lower right corner 77°5’26”W and 6°24’1”S) northwards towards the Rio Nieva Reserved Zone (upper left corner 77°52’23”W and 5°20’7”S).

The perimeter of the reference region, illustrated in Figure 1, is described below. The reference region coincides with the transition zone limits of the AMPF on the West, while the northern region is delineated by the Rio Nieva Reserved Zone and its transition zone limits. It then follows an elevation limit in the east, limited in the southern region by a forestry concession area, and in the southeast by the watersheds boundaries.

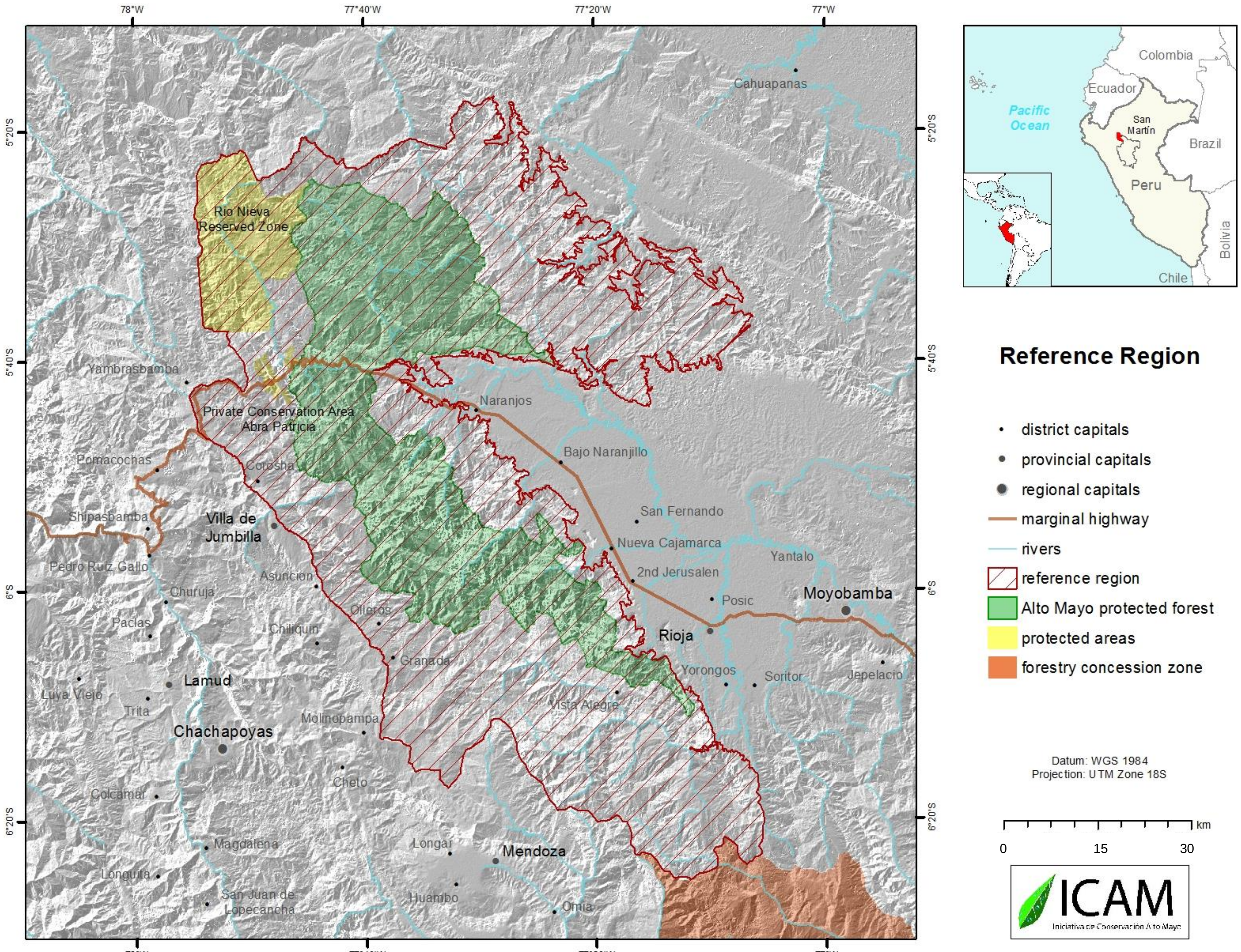


Figure 1. Map of the reference region

The criteria used to define the reference region were based on elevation, precipitation, slope, socio-economic and cultural conditions, as well as outputs from the workshop on drivers and agents for deforestation (See Sup.Inf_Meth_01).

The reference region meets the following conditions:

a. Agents and Drivers of deforestation

To analyze the agents of drivers of deforestation in the AMPF, the project proponent used participatory methods following the Open Standards for the Practice of Conservation[2]. For a detailed description of the agents and drivers of deforestation in the AMPF, please refer to the Supportive Information (See Sup.Inf_Meth_01)

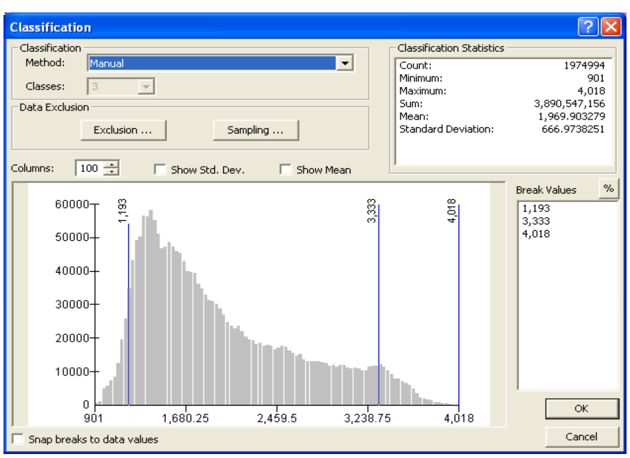
Agents groups: The agents of deforestation both within the reference region and project area are almost entirely small farm holders using conventional techniques to convert forest land to coffee plantations. Other agents are also present in the area, i.e. cattle ranchers and land speculators, but their activities are less influential and frequently linked to coffee production.

Infrastructure Drivers: no official (planned) new or improved infrastructure is expected to be developed near or inside the project area.

Other spatial drivers expected to influence the project area: No other major drivers were identified in the reference region during the public consultation and, therefore, no additional drivers are expected to emerge near or inside the project area.

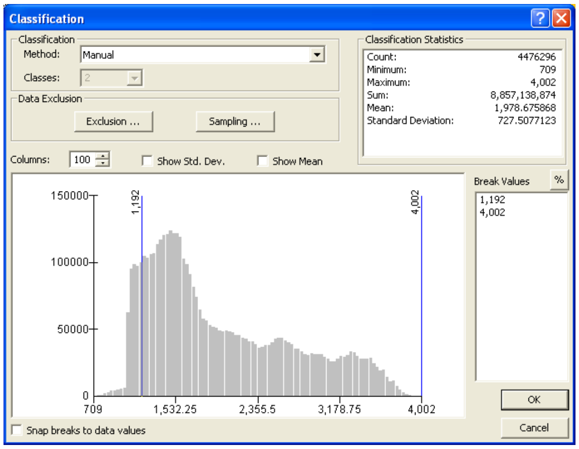
b. Landscape configuration and ecological conditions

Elevation: As demonstrated below, 90% of the project area is in the same elevation range (1193 – 3333m) as 90% of the rest of the reference region (1192 – 4002m).



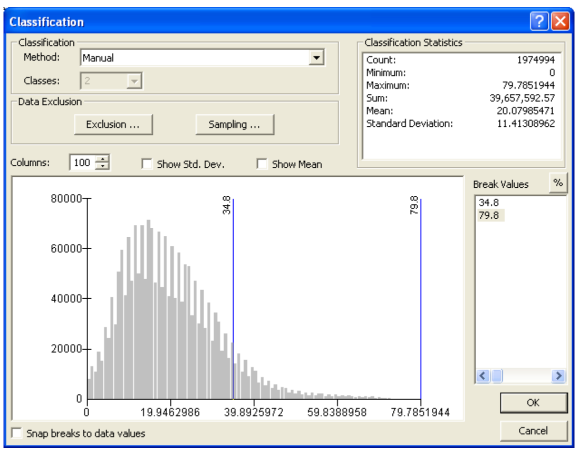
Elevation within the **project area** ranges from 901 to 4018m. Considering only 90% of the project area (taking 5% from upper and lower limits, or 98,750 pixels out of 1,974,994), the elevation ranges from **1193 – 3333m**.

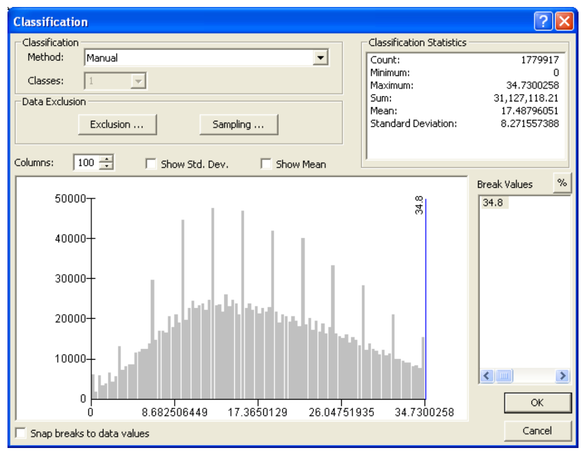
[2] http://www.conservationmeasures.org/initiatives/standards-for-project-management



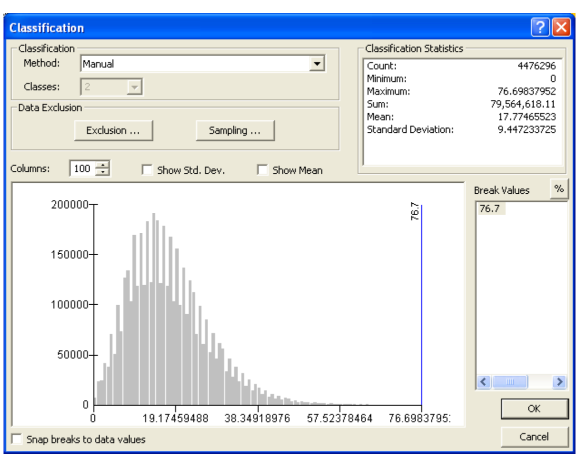
Elevation within the **reference region** ranges from 709 to 4002m. Considering 90% of the reference region (taking 10% of lower limits, or 447,630 pixels out of 4,476,296), the elevation ranges from **1192 – 4002m.**

Slope: As demonstrated below, the average slope of 90% of the project area (17.5 ^{o}) is within 10% of the average slope of the rest of the reference region (16.0^{o} to 19.6^{o})



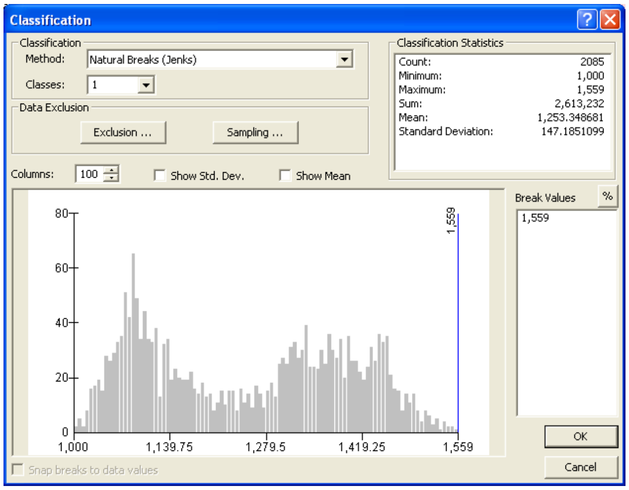


The average slope within the **project area** is 20.1^{o}, ranging from 0 to 79.8 ^{o}, and after excluding 10% of the area from the upper limit (or 197,499 out of 1,974,994 pixels), the average slope is **17.5 ^{o}** (ranging from 0 to 34.8 ^{o}).

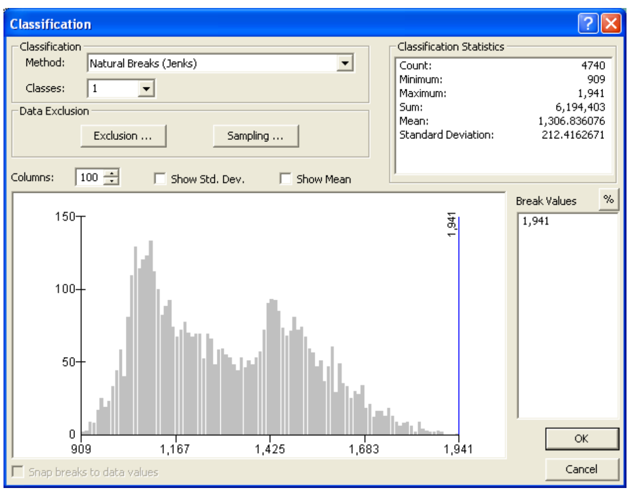


The slope within the **reference region** ranges from 0 to 76.7 ^{o} and the average is 17.8^{o}. Considering the ±10% interval, the average slope ranges from **16.0^{o} to 19.6**^{o}.

Rainfall: As demonstrated below, the average rainfall in the project area (1253mm) is within 10% of the average rainfall of the rest of the reference region (1175mm to 1437mm)



Annual rainfall within the **project area** ranges from 1000 to 1559mm, with an annual average of **1253mm**.



The annual average rainfall within the **reference region** is 1306mm, ranging from 909 to 1941mm. Considering the ±10% interval the average rainfall ranges from **1175mm to 1437mm**.

c. Socio-economic and cultural conditions:

Legal status of the land: The reference region includes rural and indigenous community lands, other Protected Areas (e.g. Abra Patricia Private Conservation Area), public lands and urban settlements. The project area is a Natural Protected Area protected by Peruvian Law, however, as explained in the additionality section of the AMCI VCS PD (2.5), under the baseline scenario there is widespread non-compliance with the land use restrictions imposed by the AMPF's designation as a NPA allowing unsustainable land use practices and new settlements to continue unabated in a similar patterns observed within the reference region.

Land tenure: The land tenure system in the project area in the baseline scenario is found throughout the reference region. Specifically, the project area is public land and the same status is found in several areas in the buffer zone and beyond within the reference region. The AMCI commissioned an extensive land tenure analysis by partner SPDA in the AMPF area which identified all titled and public lands within the boundaries of the AMPF and its buffer zone (see Sup.Inf_nprt_05).

Land use: The current and projected land use in the project area -conversion of forest to agriculture and pastures- extends throughout the Peruvian Amazon. More specifically the conversion to conventional coffee plantations occurs throughout the reference region. According to a study published by GORESAM in 2011, coffee has occupied the second largest plantation area in the San Martin region -only behind cacao plantations- with 73,587 ha, of which 57,466 ha or 78% were located in the Alto Mayo valley. Note that the flat-lowland areas along the Alto Mayo River were excluded from the reference region because the predominant land-use in this area is rice plantation and this activity is not found predominantly in the project area. Thus, the project proponent has conservatively excluded from the reference region areas of high deforestation in the lowlands that are attributable mainly to this driver (rice).

Enforced policies and regulations: Policies, legislation and regulations applicable to Natural Protected Areas are national in scope, and the project area, as well as the Abra Patricia Private Conservation Area, is governed by these laws. However, in the baseline scenario those regulations are not strictly enforced and the reality in the entire reference region is similar to the project area. Of all the NPAs in Peru, the Alto Mayo Protected Forest ranked as having the second largest area of deforested land within its boundaries as of the year 2000. In addition, the region of San Martin -where the project is located- has the highest accumulated deforestation among all the regions of Peru. See Additionality section (2.5) of the AMCI VCS PD for further details demonstrating the widespread non-compliance with the NPA legislation within the AMPF.

1.1.2 Project area

Details regarding the location of the project area, including the administrative regions within which it falls, current land tenure and ownership status, and a list of the project participants are included in sections *1.9 Project Location, 1.12.1 Proof of Title, 1.3 Project Proponent, and 1.4 Other Entities involved in the Project* of the AMCI VCS PD.

The project area includes all forested areas observed in the 2006 land cover map within the boundaries of the Alto Mayo Protected Forest, as illustrated in Figure 2. The total project area is 153,929 ha. The GIS files of the physical boundaries that define the land included in the project area are provided with the PD.

Name of the project area: Alto Mayo Conservation Initiative.

Physical boundaries of each discrete area of land included in the project area: See Figure 2

Description of current land-tenure and ownership, including legal arrangement related to land ownership and the avoided unplanned deforestation (AUD): *See section 1.12.1 Proof of Title* of the AMCI VCS PD, as well as the *Land Ownership and Resource Access/Use Rights* of the AMCI Non-Permanence Risk Report.

List of the project participants and brief description of their roles in the proposed AUD project activity: See sections *1.3 – Project Proponent* and *1.4 – Other Entities involved in the Project* of the AMCI VCS PD.

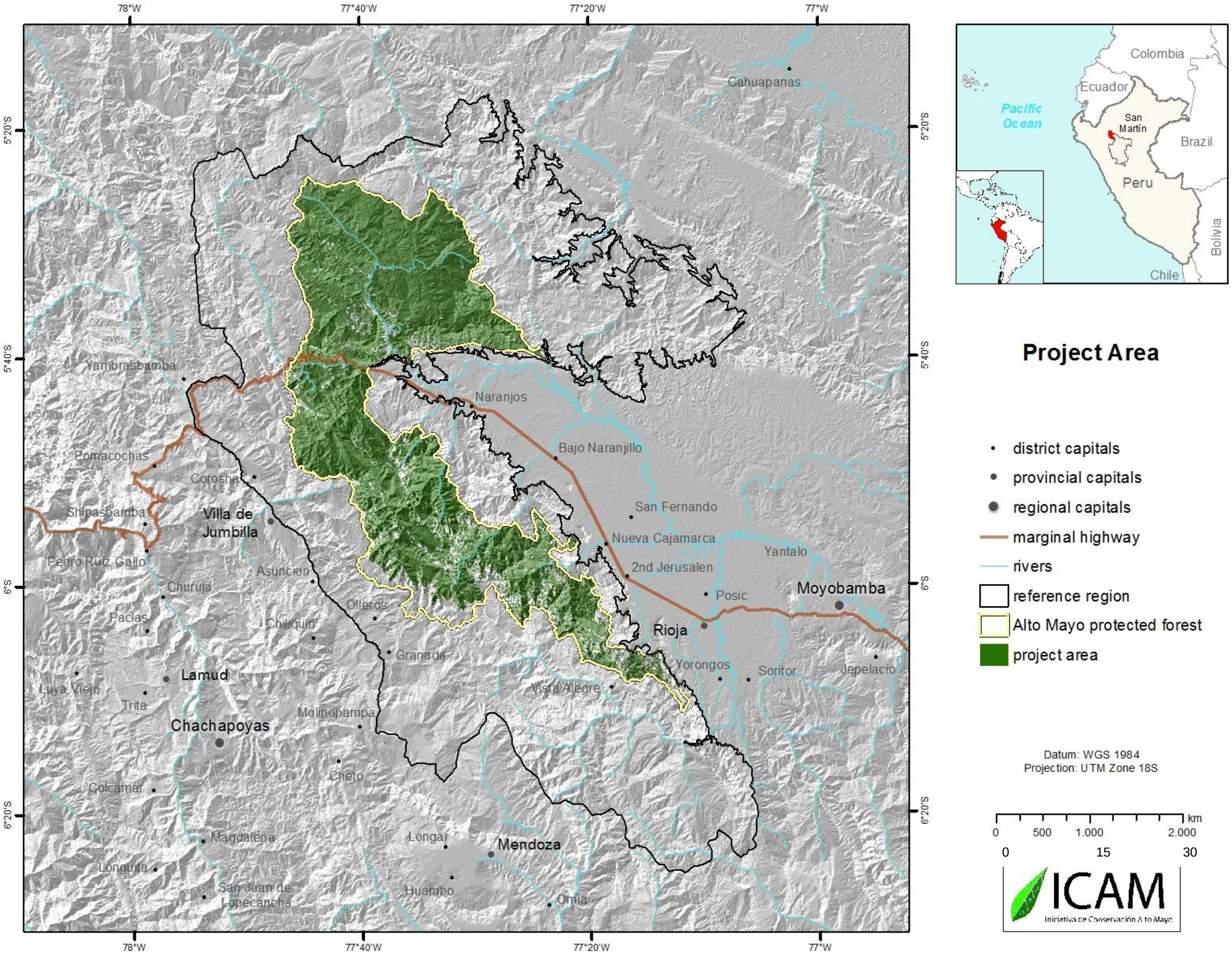


Figure 2. Map of the project area.

Note: The project area is represented by the dark green areas (forest land within the Alto Mayo Protected Forest).

1.1.3 Leakage belt

At the time of validation, no jurisdictional program had been defined for the region where the project is located and, therefore, the project proponent was responsible for delineating a leakage belt for the project area. The boundaries of the leakage belt as defined below for the AMCI do not overlap with the area or part of the areas of other registered VCS AFOLU projects in the region, not with the leakage belt of any other VCS AFOLU project.

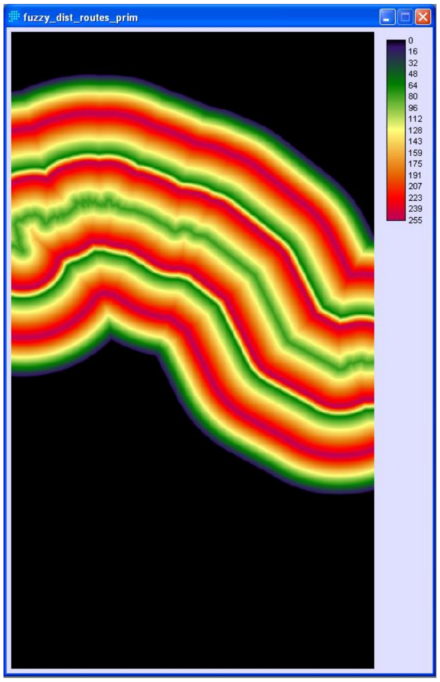
Evidence from the historic deforestation analysis in the reference region shows that deforestation does not happen in the areas where it is most profitable; rather it happens in areas with the highest accessibility due to proximity to urban centers and infrastructure networks (see figures on step 4, section 4.2) . In addition, the opportunity cost analysis of the region commissioned by the AMCI showed a homogeneous distribution of the opportunity cost for coffee and other agricultural products near the project area, with some variation due to transportation cost (see Supportive Information, Sup.Inf_Meth_02, pg.49). The location of potentially displaced deforestation is thus directly linked to the proximity to the road network and market location. This evidence was also supported by the participatory analysis of drivers and agents of deforestation that was conducted as part of the project (see Sup.Inf_Meth_01). Therefore, we considered a mobility analysis to be a more suitable method for identifying the leakage belt for the AMPF project. The greatest potential for activity displacement leakage was identified from actors shifting deforestation to areas further west to the protected area and near to the infrastructure network where they would have easier access to urban centers.

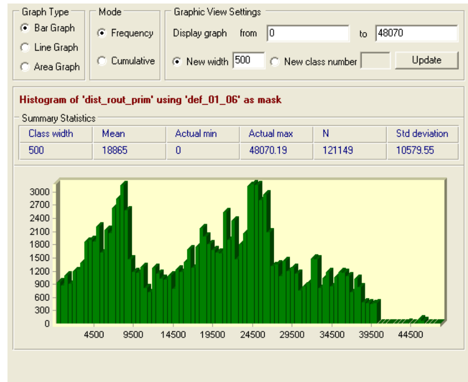
A mobility analysis was performed using the *Multi-Criteria Evaluation* (MCE) tool in IDRISI Taiga. The output of the mobility analysis is an accessibility potential map, where the leakage belt is defined based on the most accessible forest areas, as identified by the variables and criteria used in the analysis.

Based on the information collected during the workshop on drivers and agents of deforestation (Sup.Inf_Meth_01), as well as through historical data and expert opinions validated in the field, we estimated that the agents of deforestation use the primary and secondary roads to reach their destination and will walk in the forest for up to 6 hours. An adult person walks at an average speed of 4 km/h, therefore it was assumed that from the forest edge a deforestation agent can reach any location within 24km. This is considered to be conservative given the range of slopes present in the project area.

The first step of the MCE is to generate a fuzzy map for each of the variables, by applying the fuzzy function (the values range from 0 to 255, where 0 is the most suitable and 255 is the least suitable) on each of the following factor maps: (a) Distance to primary roads; (b) Distance to secondary/tertiary roads; (c) Distance to towns; (d) Slope; (e) Elevation; (f) Distance from forest edges; and (g) Distance to project boundaries. We analyzed the cumulative distribution of deforestation between 2001-2006 in relation to each factor map to define the parameters of the fuzzy function. Those parameters assisted in identifying the location where a deforestation agent would prefer to move (i.e. the most preferable areas to deforest by the agents are located between 9 and 19 degrees of elevation, while areas stepper than 50% are barely deforested).

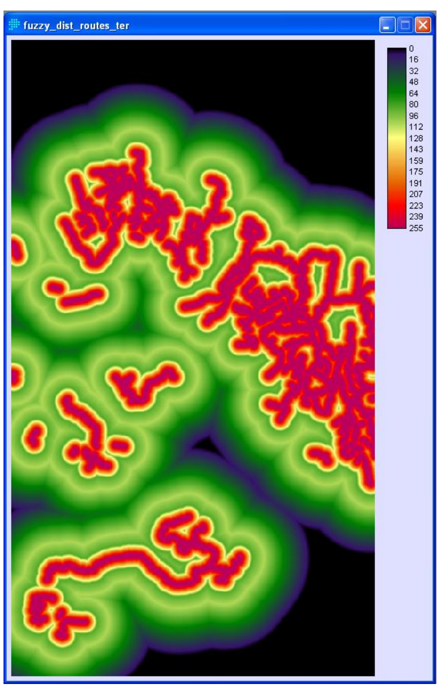
Distance to primary roads: membership function type defined by the user and based on the pattern of deforestation between 2001-2006.

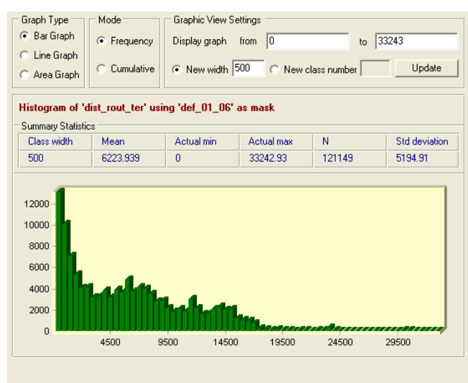




Value (dist m)	Defor 00-07 (frequency)	Fuzzy membership (index)
0	900	77
9500	3000	255
12000	700	60
22000	3000	255
24000	2400	204

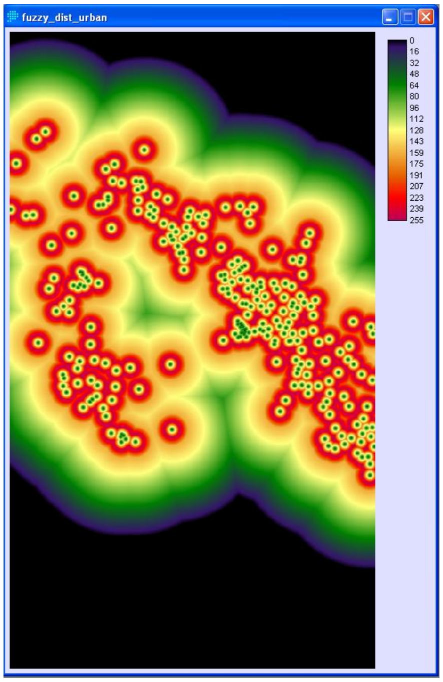
Distance to secondary/tertiary roads: membership function type defined by the user and based on the pattern of deforestation between 2001-2006.

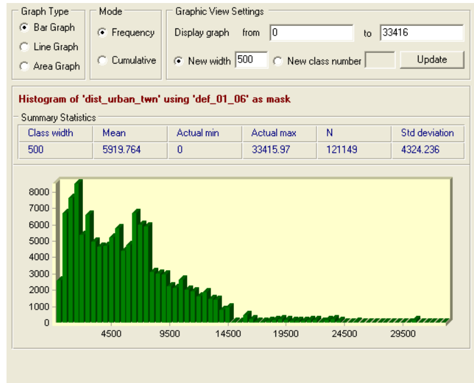




Value (dist m)	Defor 00-07 (frequency)	Fuzzy membership (index)
500	12000	255
3000	4000	85
6000	5000	106
18000	0	0

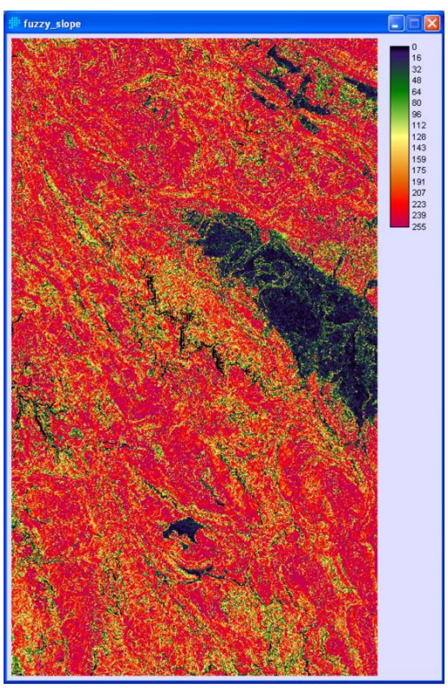
Distance to towns: membership function type defined by the user and based on the pattern of deforestation between 2001-2006.

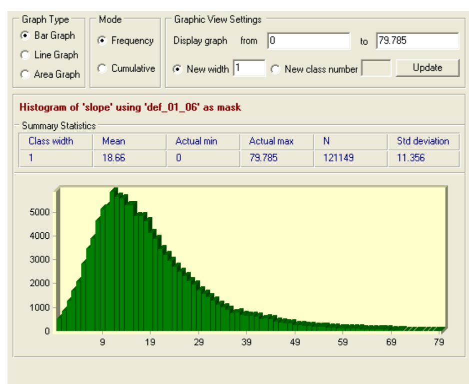




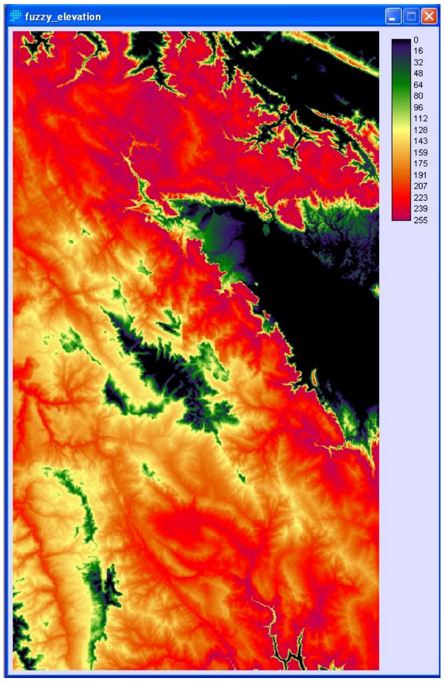
Value (dist m)	Defor 00-07 (frequency)	Fuzzy membership (index)
500	3000	95
2000	8000	255
4000	5000	160
24000	0	0

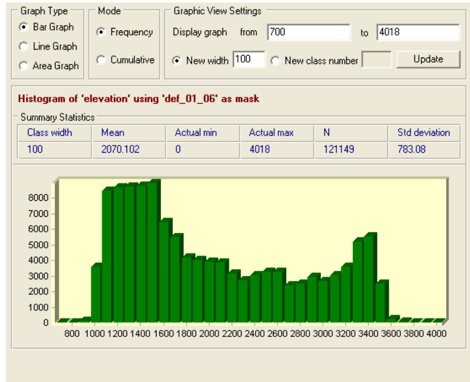
Slope: monotonically decreasing function and distributed using sigmoidal curve from 10 to 49%.





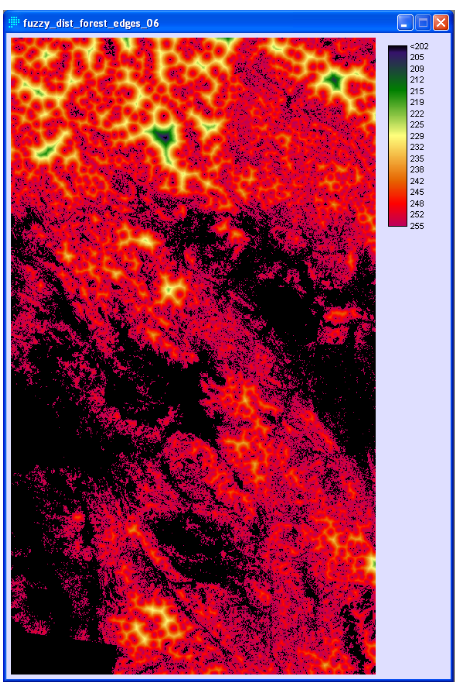
Elevation: monotonically decreasing function and distribution based on pattern of deforestation between 2001-2006.



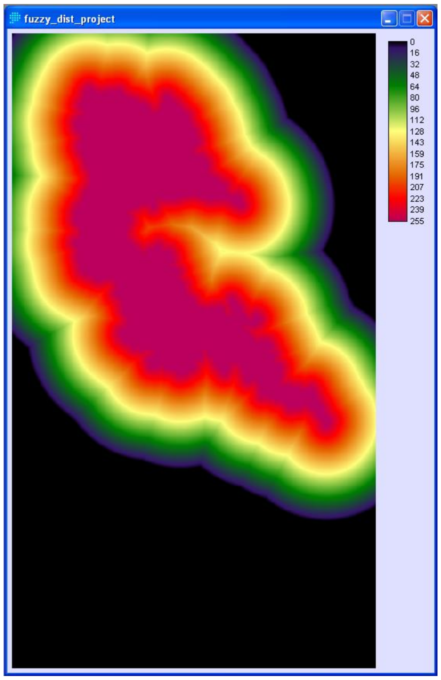


Value (m absl)	Defor 00-07 (frequency)	Fuzzy membership (index)
900	0	0
1200	8000	255
3200	4000	128
3600	0	0

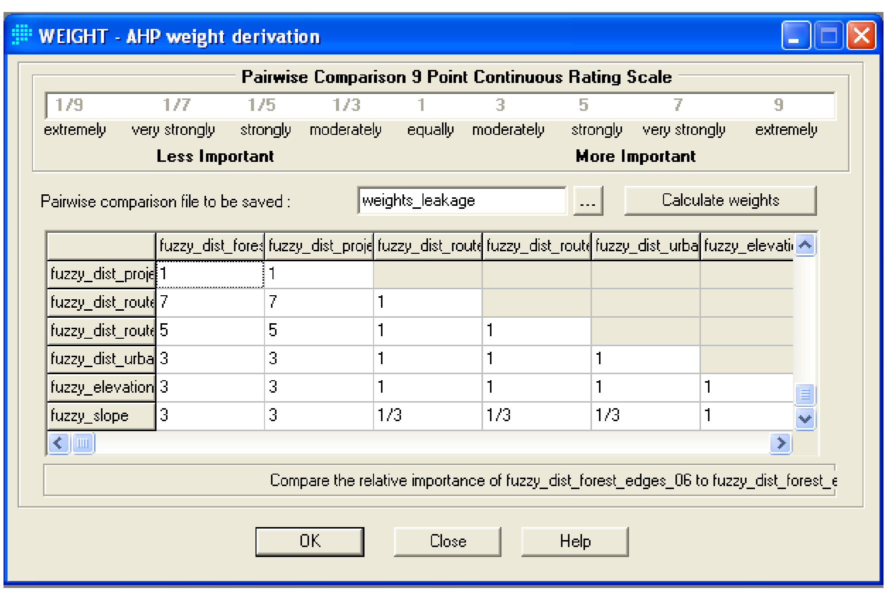
Distance to forest edges: monotonically decreasing function and linearly distributed from 0km to 6km (6km is the maximum distance from a forest edge).



Distance to project boundaries: monotonically decreasing function and linearly distributed from 0km to 24km outwards the project boundary.



The next step was to determine the relative weights for the factors maps. The weights were developed by providing a series of pair-wise comparisons of the relative importance of factors to the suitability of pixels for the activity being evaluated. The scale ranges from extremely less important (1/9) to extremely more important (9) assigned to the factor listed on the column over the factor in the row (e.g. fuzzy distance to routes is "very strongly more important" [7] than fuzzy distance to the forest. The resulting weights were used as input for the MCE module for weighted linear combination.



The resulting eigenvector of weights was:

Fuzzy distance to forest edges: 0.0439

Fuzzy distance to project area: 0.0439

Fuzzy distance to primary routes: 0.2398

Fuzzy distance to secondary/tertiary routes: 0.2155

Fuzzy distance to urban centers: 0.1912

Fuzzy elevation: 0.1627

Fuzzy slope: 0.1030, which returned a **Consistency Ratio of 0.04**. The consistency ratio ranges from 0 to 1; the closer to 0 the more acceptable the relationships (weights) are.

Finally in the MCE, we excluded (used as constraints) the areas inside the project boundary, non-forest areas in 2006, other enforced protected areas, and areas located below 1050m elevation (bellow this altitude the major driver of deforestation in the reference region is conversion of forest to rice plantations) (Figure 3).

At the time of validation there was no other AFOLU project registered under the VCS found within the remaining area, therefore no registered project or leakage areas had to be excluded in the delineation of the AMPF leakage belt.

Thus the leakage belt was defined to contain the areas with the highest potential for mobility for the deforestation agents identified, with a minimum area equal to the baseline deforestation in the project area, after discounting the baseline deforestation in the leakage belt. Thus the leakage belt contains enough forest to absorb 100% potential displacement of baseline deforestation due to the project implementation, totaling 47,428 hectares (Figure 4).

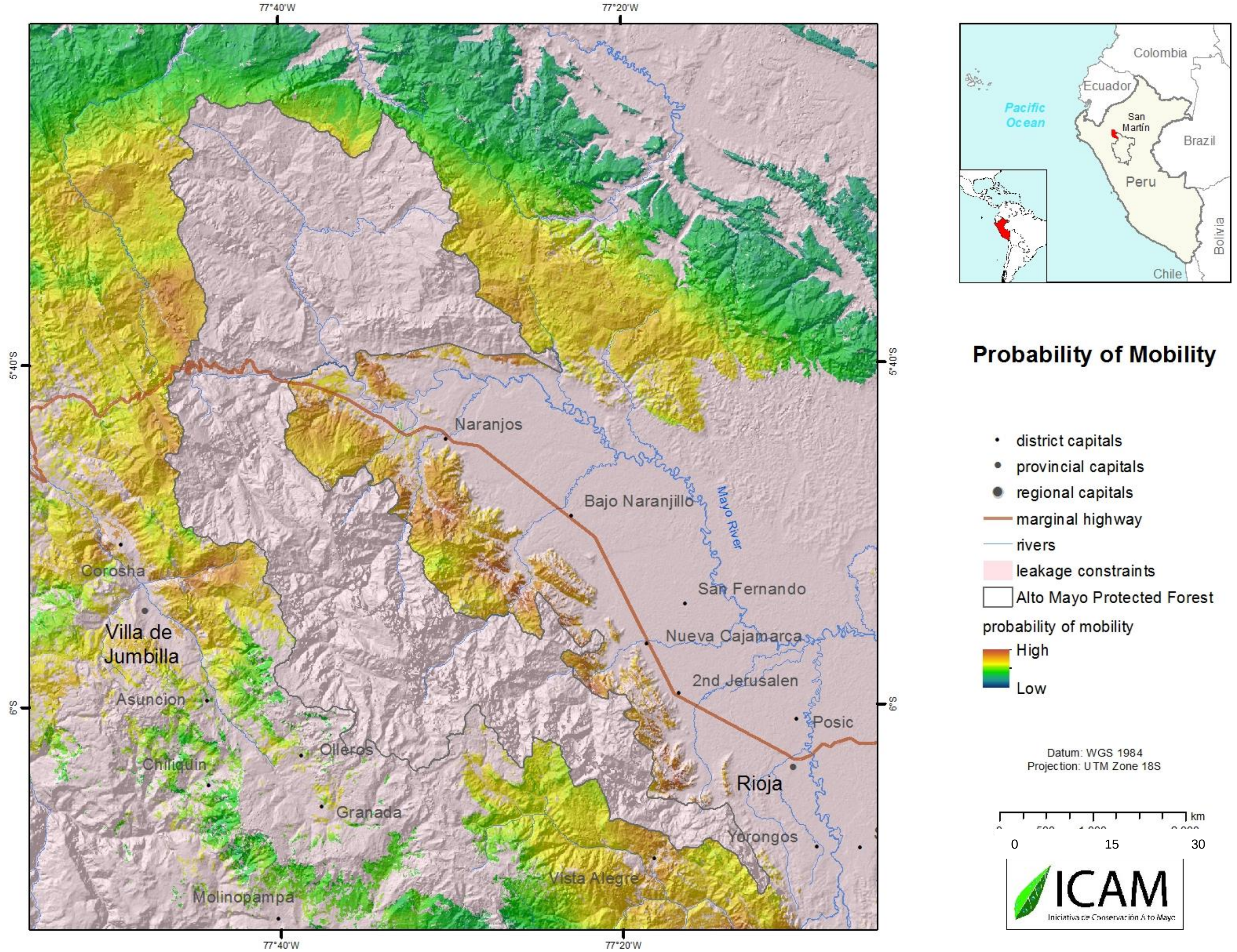


Figure 3. Map of the potential for mobility

Note: Dark brown represents high potential for mobility, decreasing until low potential represented by dark blue. Areas in pink depict the leakage constraints.

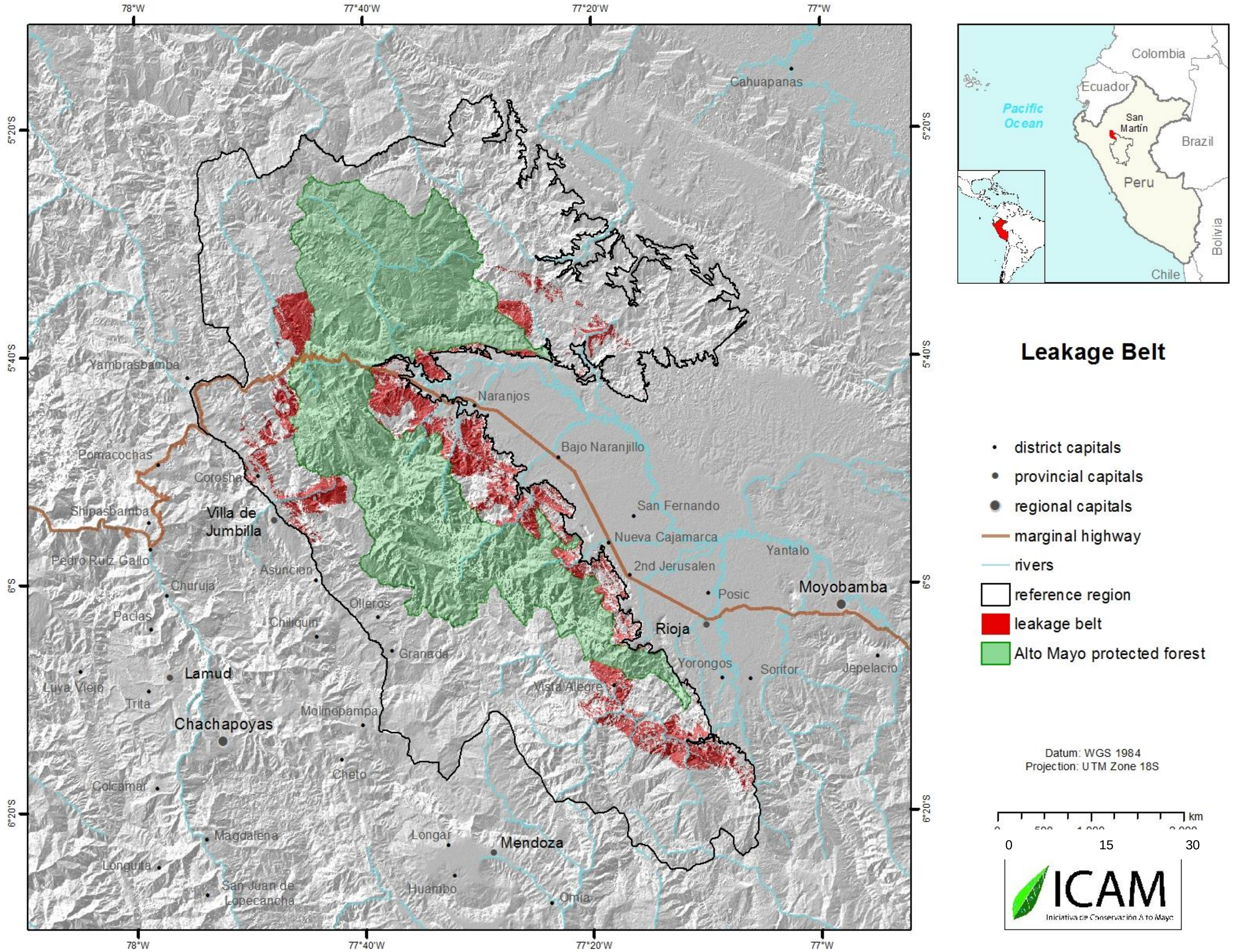


Figure 4. Map of the AMCI leakage belt

Note: Includes areas with high potential for mobility, enough to absorb 100% potential displacement of baseline deforestation (total area=47,428 ha)

1.1.4 Leakage management areas

Leakage management areas include all non-forest land within and outside the boundaries of the AMPF where activities to minimize the risk of leakage will be implemented. *Section 8.1.1 Carbon Stock Changes due to activities implemented in leakage management areas* of this document and *section 1.13 Additional Information Relevant to the Project / Leakage Management* of the AMCI VCS PD provide detailed descriptions of the leakage management areas.

1.1.5 Forest

There is no specific definition of forest within Peruvian legislation. Article 3 of the Forestry and Wildlife Law Regulations presents certain definitions of natural, primary and secondary forest. However, these definitions describe mostly subjective concepts and use broad terms such as “dominance” and “ecosystem” among others, and do not specify the exact limits of the concepts. The DNA definition of forest for Peru under the CDM of the UNFCCC is a minimum area of land of 0.5 ha, with a minimum tree crown cover (or equivalent stocking level) of 30%, and with trees with a minimum height of 5 meters at maturity in situ.

The baseline scenario is based on a multi-temporal historical analysis of deforestation. The analysis yielded a digital map of forest cover and deforestation that was filtered to a minimum-mapping unit (MMU) of 2 hectares; the forest class has an overall accuracy of 95%. The forest benchmark was generated from the multi-temporal historical analysis; see Supportive Information (Sup.Inf_Meth_03a-c) for a detailed description of the methodology used for this analysis and to generate the forest benchmark map.

1.2 Temporal boundaries

1.2.1 Starting date and end date of the historical reference period

The historical reference period is from 1996 to 2006, totaling 10 years.

1.2.2 Starting date of the project crediting period of the AUD project activity

The start and end date of the project crediting period are, respectively: 15th of June 2008 to 14th of June 2028, for a total of 20 years. The project crediting period is subject to renewals.

1.2.3 Starting date and end date of the first fixed baseline period

The fixed baseline period covers a 10 year period from 2008 to 2018.

1.2.4 Monitoring period

The minimum duration of a monitoring period will be one year and will not exceed the fixed baseline period. It is expected that monitoring reports will be issued every 2-3 years, depending on project circumstances.

1.3 Carbon pools

The pools included within the boundaries of the AMCI project are listed in the table below (VM Table 3).

VM Table 3. Carbon pools included or excluded within the boundary of the proposed AUD project activity

Carbon pools	Included / TBD / Excluded	Justification / Explanation of choice
Above-ground tree	included	Represents the pool where the greatest carbon stock change will occur.
Above-ground non-tree	included	The baseline land use in the project area is conversion of forest to perennial crops (coffee), therefore the carbon stock in this pool is likely to be relatively large compared to the project scenario.
Below-ground	included	Recommended by the methodology as it usually represents between 15% and 30% of the above-ground biomass.
Dead wood	excluded	Conservatively excluded (the carbon stock in this pool is not expected to be higher in the baseline compared to the project scenario).
Harvested wood products	excluded	Under the baseline scenario, illegal selective logging occurs in very small scale and, therefore, harvested wood products have been considered insignificant.
Litter	excluded	Not to be measured according to the latest VCS AFOLU Requirements (version 3.2).
Soil organic carbon	excluded	The baseline land-use of the project area is conversion of forest to perennial crop (coffee) followed by conversion to pasture. The soil organic carbon is not to be measured in such cases according to the latest VCS AFOLU Requirements (version 3.2).

1.4 Sources of GHG emissions

The sources of GHG emissions included within the boundaries of the AMCI project are listed in the table below (VM Table 4).

VM Table 4. Sources and GHG included or excluded within the boundary of the proposed AUD project activity

Sources	Gas	Included/ excluded	Justification / Explanation of choice
Biomass burning	CO_2	Excluded	Counted as carbon stock change
	CH_4	Excluded	The major baseline activity is conversion of forest to conventional coffee plantation using slash and burn techniques. The project aims to reduce this activity by providing technical assistance to establish sustainable, shade-grown organic coffee plantations and therefore, the non-CO2 emissions related to biomass burning are conservatively excluded.
	N_2O	Excluded	See above explanation.
Livestock emissions	CO_2	Excluded	Raising livestock is not a widespread baseline activity and the AMCI project will not promote the raising of livestock or result in an increase of this activity compared to the baseline. Therefore, livestock emissions are conservatively excluded.

	CH_4	Excluded	See above explanation.
	N_2O	Excluded	See above explanation.

Step 2: Analysis of historical land-use and land-cover change

2.1 Collection of appropriate data sources

An analysis of land-use and land-cover change of the reference region was conducted for the reference period (1996-2001-2006) using medium resolution satellite imagery and validated using a combination of high-resolution satellite images and aerial photography. All data sources used in these analyses are listed in VM Table 05.

VM Table 5. Data used for historical LU/LC change analysis

Vector (Satellite or airplane)	Sensor	Resolution		Coverage	Acquisition date	Scene or point identifier	
		Spatial	Spectral	(km^2)	(DD/MM/YY)	Path / Latitude	Row / Longitude
Landsat 5	TM	30m	0.45 - 12.5 µm	185 x 172 km	8-Jun-96	8	64
Landsat 7	ETM+	30m	0.45 - 12.5 µm	185 x 172 km	30-Jun-01	8	64
Landsat 5	TM	30m	0.45 - 12.5 µm	185 x 172 km	8-Sep-06	8	64
Landsat 5	TM	30m	0.45 - 12.5 µm	185 x 172 km	4-Sep-96	9	64
Landsat 7	ETM+	30m	0.45 - 12.5 µm	185 x 172 km	24-Aug-01	9	64
Landsat 5	TM	30m	0.45 - 12.5 µm	185 x 172 km	15-Sep-06	9	64
Landsat 5	TM	30m	0.45 - 12.5 µm	185 x 172 km	25-Aug-01	9	64
Landsat 5[3]	TM	30m	0.45 - 12.5 µm	186 x 172 km	8-Sep-06	8	64
Landsat 5[3]	TM	30m	0.45 - 12.5 µm	187 x 172 km	12-Aug-08	8	64
Landsat 5[3]	TM	30m	0.45 - 12.5 µm	188 x 172 km	1-Aug-07	9	64
Landsat 5[3]	TM	30m	0.45 - 12.5 µm	189 x 172 km	9-Nov-01	9	64
CBERS	CBERS-2	2.5m	0.45 - 0.89 µm	113 x 113 km	6-Jul-08	190	107
CBERS	CBERS-2	2.5m	0.45 - 0.89 µm	113 x 113 km	27-Aug-08	190	107
RapidEye	RapidEye	5m	0.44 - 850 µm	77 x 77 km	21-Set-10	64	1
RapidEye	RapidEye	5m	0.44 - 850 µm	77 x 77 km	21-Set-10	64	2
RapidEye	RapidEye	5m	0.44 - 850 µm	77 x 77 km	21-Set-10	63	1
RapidEye	RapidEye	5m	0.44 - 850 µm	77 x 77 km	21-Set-10	63	2
airplane[4]	aerial survey			transects	20 to 29-Oct-10	flight plan	flight plan

[3] Images used to fill areas obscured by clouds

[4] See Sup.Inf_Meth_05b_J_Musinsky_AMPF_overflight_Oct10.

2.2 Definition of classes of land-use and land-cover

There is no specific definition of forest in Peruvian legislation. The DNA definition of forest for Peru under the CDM of the UNFCCC is a minimum area of land of 0.5 ha, with a minimum tree crown cover (or equivalent stocking level) of 30% and with trees with a minimum height of 5 meters at maturity in situ. The land-use land-cover change analyses conducted meets these criteria and applies criteria that result in a conservative estimate of both forest cover in the benchmark map and forest loss between the period analyzed.

Best practice in the remote sensing field emphasizes the use of medium resolution imagery as a very cost-effective method for classifying and monitoring forest cover and loss, and the type of spectral analysis possible using such imagery is sufficient to accurately distinguish closed-canopy forest from many vegetation formations[5]. Landsat imagery, one such type of medium resolution imagery, was used in this project to map the forest cover and loss. In order to assure a high quality analysis the methods, rules, and procedures closely followed Conservation International's standard change detection methodology. See Supplementary Information (Sup.Inf_Meth_03a-c) for details on the methodology applied.

For the validation process, very-high resolution images (i.e. CBERS, RapidEye, with one-meter to five-meter resolution, and aerial photos[6]) were used such that individual tree crowns could be visually identified. Forests were identified as those areas with visually-interpreted closed canopy. Also, the size and appearance of canopies observed in these images strongly indicates that the forest must be mature or at least tall forest, i.e. taller than the five-meter criteria in the CDM context definition. Thus, our estimate of the classification accuracy is based on criteria that are similar or more conservative compared to the national DNA definition. It should be noted that mature forests throughout the entire reference region are humid-evergreen forests, being cloud forest the predominant forest type, with some areas of pre-montane and dwarf forest, and natural Andean grasslands at very high altitudes. No deciduous forests or open woodlands are found in the project area or reference region, thus the issue of open-canopy forests is insignificant in this area.

The third criterion of the DNA forest definition is a minimum patch size of 0.5 ha. Remote sensing data analysis becomes increasingly complex and more expensive with smaller minimum-mapping units (MMU), and more detailed MMUs require increased mapping efforts and can result in decreased change mapping accuracies[5]. The multi-temporal analysis of forest cover and loss has been filtered to a MMU of 2 ha, thus yielding a conservative estimate of forest area, and a conservative estimate of the area in which forest loss could potentially be recorded.

Perhaps most important in the study area is the ample area of secondary forest or shrub fallows. Most fallows in the area are young, as the agricultural practices include short fallow periods of around seven years or less. Some of these fallows may reach a stature that meets the structural criteria of the national

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[5] GOFC-GOLD. 2010. A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals caused by deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation. GOFC-GOLD. Report version COP16-1, (GOFC-GOLD Project Office, Natural Resources Canada, Alberta, Canada), http://www.gofc-gold.uni-jena.de/redd

[6] See Sup.Inf_Meth_05b_J_Musinsky_AMPF_overflight_Oct10.

forest definition, although only temporarily. Moreover, even if they do, they are part of an agricultural use cycle. Attempts to distinguish which fallows are above or below five meters in height from any source of satellite or airborne images would be very unreliable. This would enter un-necessary errors in the baseline and monitoring analyses. This would also cause confusion, as the clearing of fallows would be considered forest clearing, and a further step to separate this from the clearing of mature forest would be needed.

The fallows are part of an agricultural cycle, and in almost all cases they are soon to be re-cleared. These cycles imply a mostly steady-state carbon stock, if the fallow periods are not shortened or the proportion of land in fallow is not reduced. Fallow biomass, however was accounted via the field sampling of the different cover types within the deforested landscape. The proportion of land under fallow was estimated from interpretation of aerial photos taken in 2010[6].

Forest types were characterized by several parameters: elevation above sea level, number of trees per hectare, canopy density, topographic position and others. Based on a literature review, the forest class was further divided into subclasses to separate different carbon densities. Elevation turned out to be the main characteristic for distinguishing between forest types[7]. Forest land was therefore stratified by elevation, namely pre-montane forest, found between 500-1000 mabsl; cloud forest, located between 1000 and 2500 mabsl and covering 95% of the project area; and dwarf forest with shorter vegetation found above 2500 mabsl. See Sup.Inf_Meth_03a-c for further details.

All land-use and land-cover classes existing at the project start date within the reference region are listed in VM Table 6. No significant logging for timber, fuel wood collection or charcoal production is taking place in the baseline scenario as identified through the background analyses and participatory workshop on the agents and drivers of deforestation (Sup.Inf_Meth_01). Forest classes include mature primary forests thus carbon stocks are conservatively considered to have reached a steady-state. Coffee plantations have a decreasing trend in carbon stocks as they are converted to pastures once unproductive. Fallows also have a decreasing trend in carbon stocks as they are cleared as part of an agricultural cycle until they become pastures. Carbon stocks in pastures are assumed constant since it is considered the final land use.

However, one broad class of non-forest land use was used due to the high uncertainty in distinguishing areas covered by each of the non-forest classes present in the reference region (i.e. coffee plantation, pastures and fallow).

VM Table 6. List of all land use and land cover classes existing at the project start date within the reference region

Class Identifier		Trend in Carbon stock	Presence in	Baseline activity			Description
ID_{cl}	Name			LG	FW	CP	
1	cloud forest	constant	PA, RR, LK	n	n	n	forest area above 1000 mabsl and under 2500 mabsl

[7] Instituto Nacional de Recursos Naturales e Intendencia de Áreas Naturales Protegidas. 2008. Plan Maestro Bosque de Protección Alto Mayo 2008 - 2013. Lima. 272p

2	pre-montane forest	constant	PA, RR, LK	n	n	n	forest area above 500 mabsl and under 1000 mabsl
3	dwarf forest	constant	PA, RR, LK	n	n	n	forest area above 2500 mabsl and under 3,300 mabsl
4	non-forest	decreasing	RR, LM	n	n	n	includes coffee plantations (occasionally mixed with native trees), pasture land, and fallows (woody successional vegetation). Carbon stocks decrease until reaching final land use consisting of degraded pastures.

*RR = Reference region, LK = Leakage belt, LM = Leakage management Areas, PA = Project area.
**LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production (yes/no).

2.3 Definition of categories of land-use and land-cover change

The project defined four land-use and land-cover classes (three initial and one final), and three possible combinations of land-use and land-cover change categories, as showed in VM Table 7.a and 7.b.

VM Table 7.a. Potential land-use and land-cover change matrix

	ID_{cl}	**Initial LU/LC class**		
		cloud forest	*pre-montane forest*	*dwarf forest*
Final LU/LC class	*Non-forest*	I1/F4	I2/F4	I3/F4

VM Table 7.b. List of land-use and land-cover change categories

ID_{ct}	**Name**	**Trend in C stock**	**Presence in**	**Activity in the baseline case**			**Name**	**Trend in C stock**	**Presence in**	**Activity in the project case**		
				LG	FW	CP				LG	FW	CP
I1/F4	cloud forest	constant	PA, RR, LK	n	n	n	non-forest	decreasing	RR, LM	n	n	n
I1/F4	pre-montane forest	constant	PA, RR, LK	n	n	n	non-forest	decreasing	RR, LM	n	n	n
I1/F4	dwarf forest	constant	PA, RR, LK	n	n	n	non-forest	decreasing	RR, LM	n	n	n

2.4 Analysis of historical land-use and land-cover change

Land-cover change data for the reference region were mapped by Conservation International, via analysis of Landsat-5 and Landsat-7 images, for the reference period of 1996 to 2006. The map was further refined and updated using additional imagery acquired in circa 2001, and circa 2006 to create a multi-temporal map with minimal cloud cover. The result is a map with five classes including forest cover and loss, non-forest, cloud and water.

In order to assure a high quality analysis, pre-processing, interpretation, classification and post-processing steps closely followed Conservation International's standard change detection methodology. See Supplementary Information (Sup.Inf_Meth_03a-c) for details on the methodology applied. The methodological steps used to generate the maps follow standard remote sensing analysis techniques and are published in Harper, et al. 2007[8].

To estimate forest loss, change rates were calculated in percentage per year for areas that were cloud-free in both time periods -1996-2001 and 2001-2006- within the reference region (Table A). Based on the results, the deforestation rate in the reference period increased from 0.12% y^{-1} for the period 1996-2001, to 0.36% y^{-1} for the period 2001-2006. The areas covered by cloud represented less than 0.4% of the reference region.

Table A. Forest cover and loss in the reference region during the reference period 1996-2001-2006

	observed forest 1996	observed forest 2001	observed forest 2006	cloud cover index	observed change 1996-2001	observed change 2001-2006	observed change 1996-2006	observed change 1996-2001	observed change 2001-2006	observed change 1996-2006
	ha	ha	ha	%	ha/y	ha/y	ha/y	%/y	%/y	%/y
Pre-montane	2,301	2,283	2,276	-	4	1	3	0.16	0.06	0.11
cloud forest	398,419	395,357	388,021	0.36	583	1,201	892	0.15	0.30	0.22
dwarf forest	87,545	87,467	84,152	0.38	15	560	287	0.02	0.64	0.33
reference region	488,265	485,107	474,449	0.36	602	1,762	1,182	0.12	0.36	0.24

A series of maps were produced from this analysis (Figures 5 to 10). The GIS files are provided to the validator with the AMCI VCS PD.

[8] Harper, G. J., M. K. Steininger, C.J. Tucker, D. Juhn and F. Hawkins, 2007. Fifty years of deforestation and forest fragmentation in Madagascar. Environmental Conservation 34(4):325-533

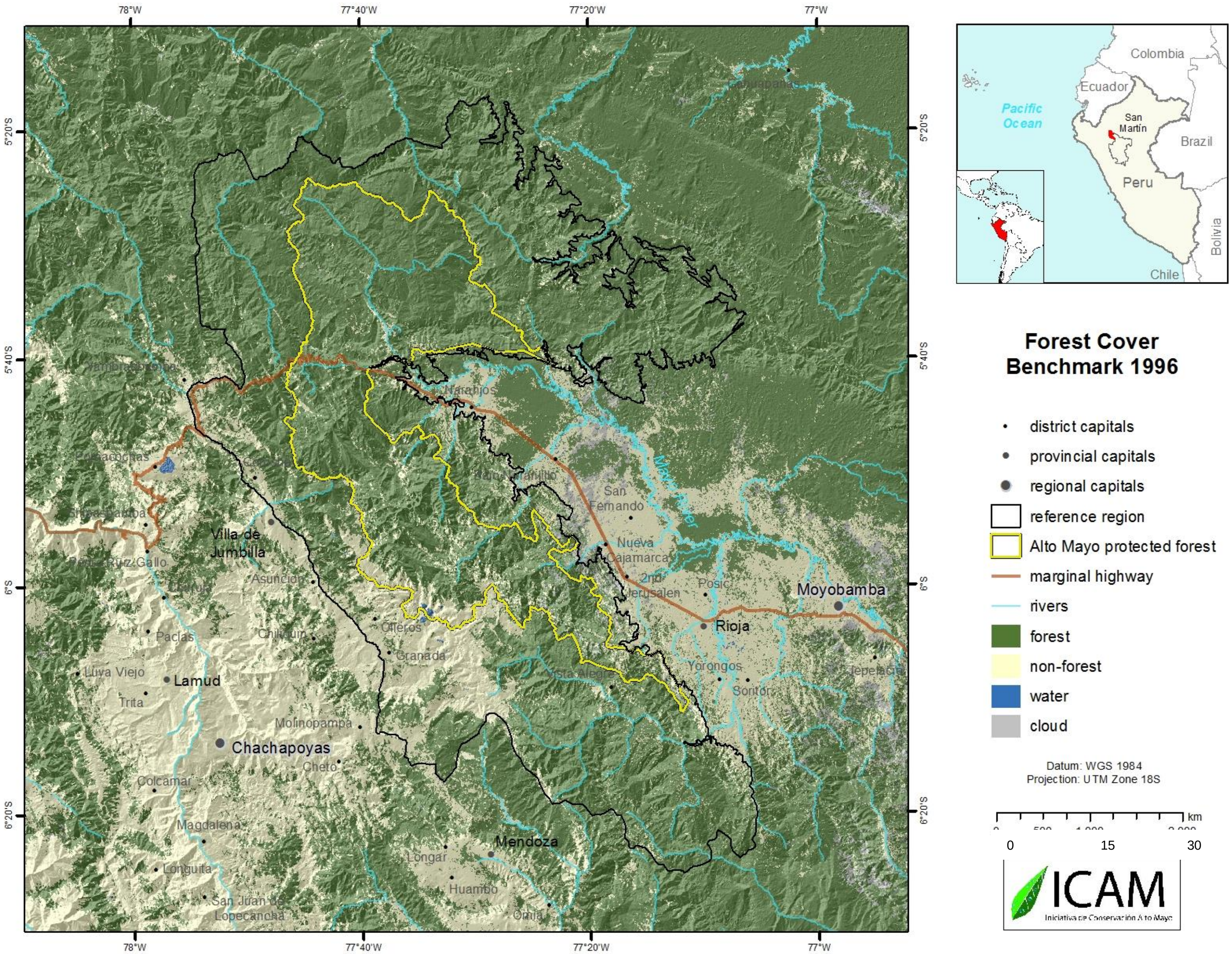


Figure 5. Forest cover benchmark map 1996

Note: It shows forest and non-forest classes within the reference region and project area in 1996

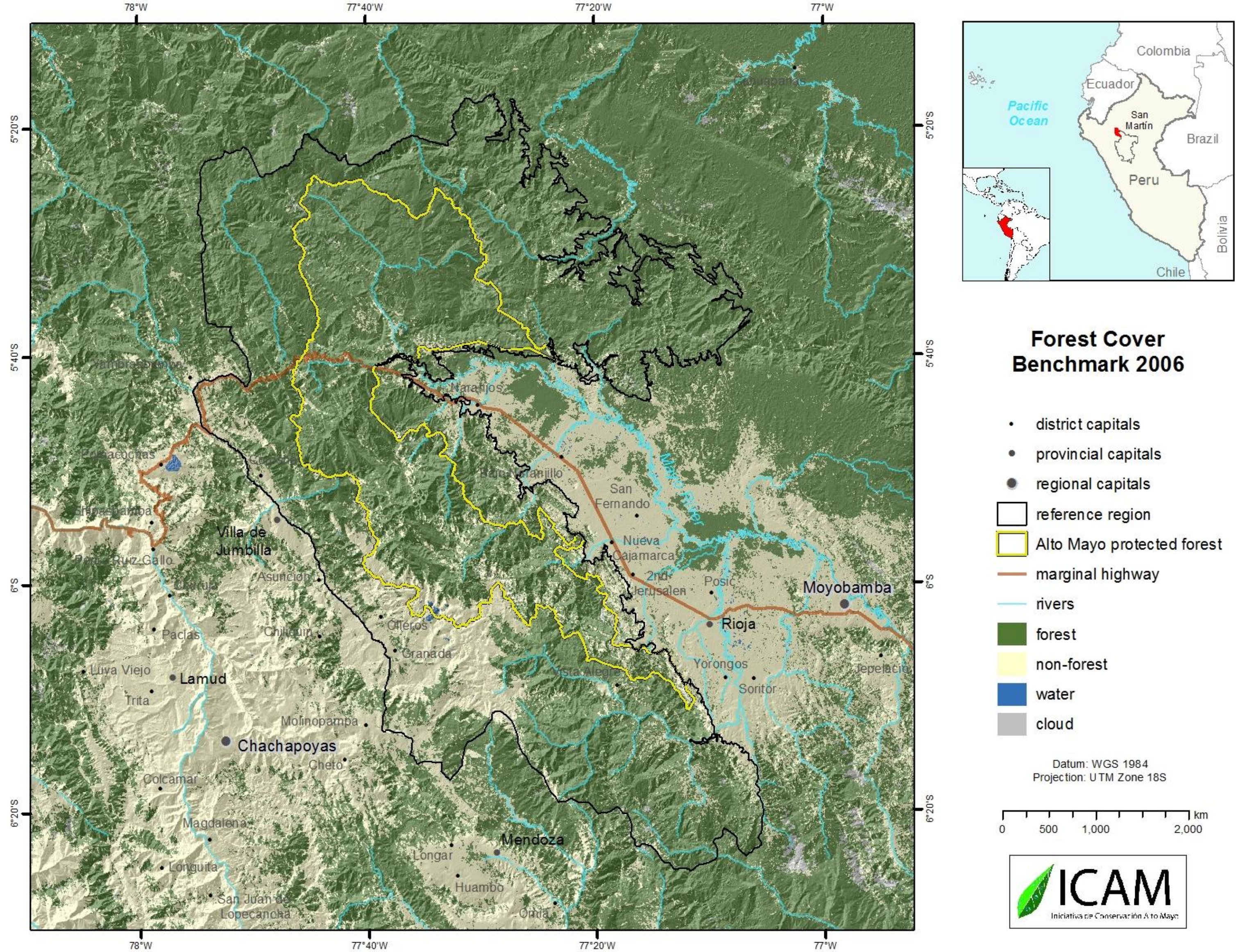


Figure 6. Forest cover benchmark map 2006

Note: It shows forest and non-forest classes within the reference region and project area in 2006.

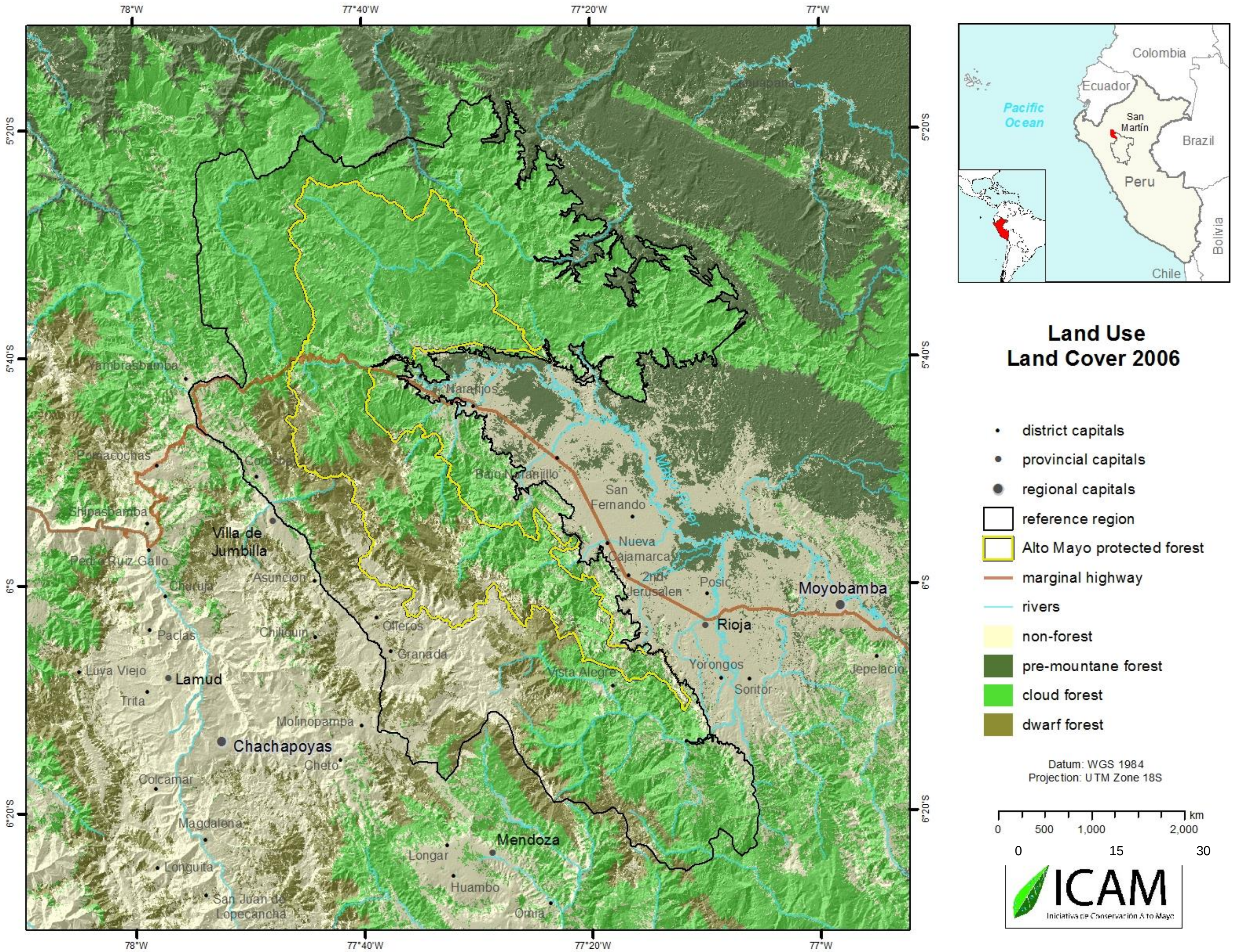


Figure 7. Land use and land cover map 2006.

Note: It shows the land-use and land-cover classes (dwarf forest, cloud forest, pre-montane forest, non-forest, cloud and water) within the reference region and project area.

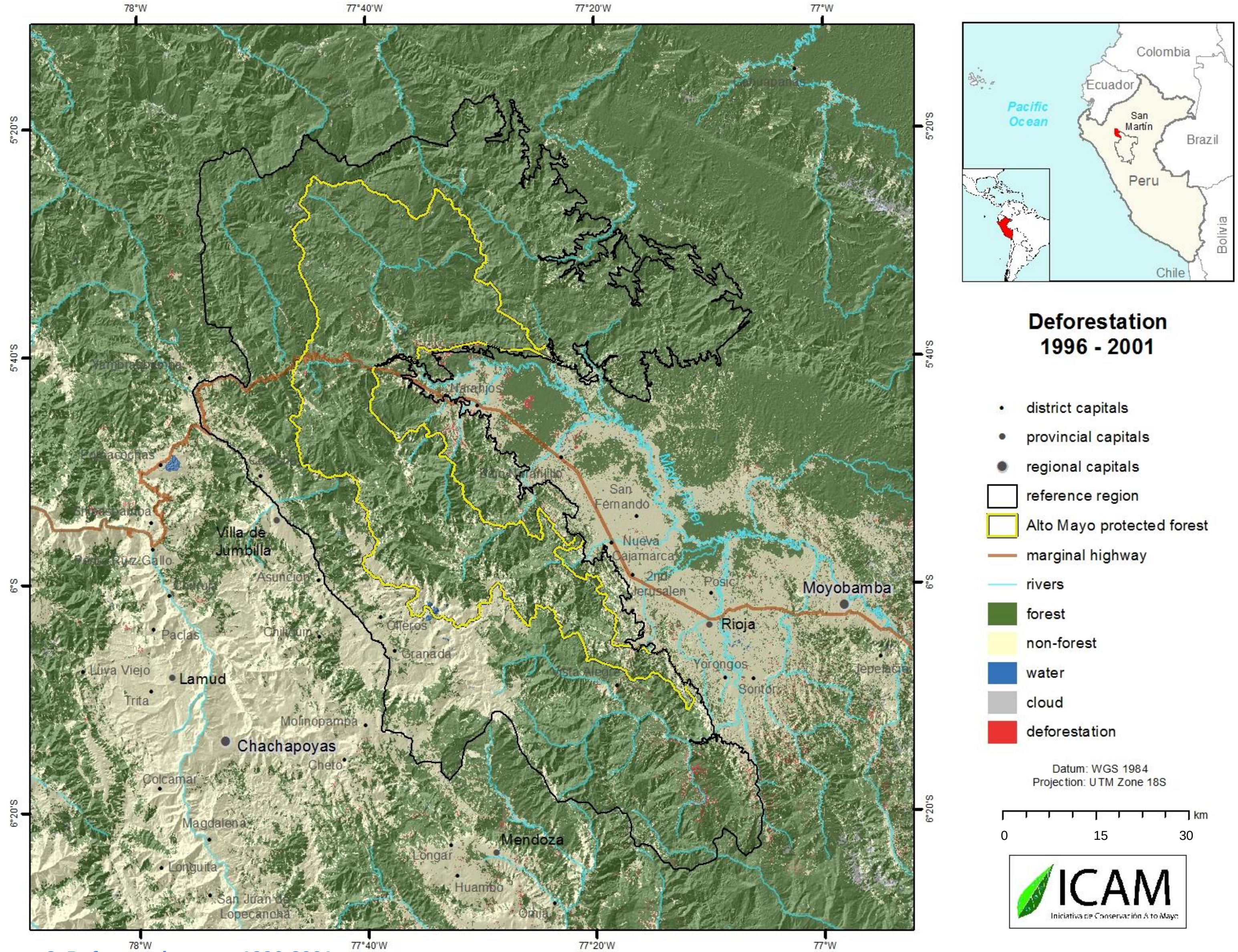


Figure 8. Deforestation map 1996-2001

Note: It shows the change between forest class and non-forest class within the reference region and project area for the period 1996-2001.

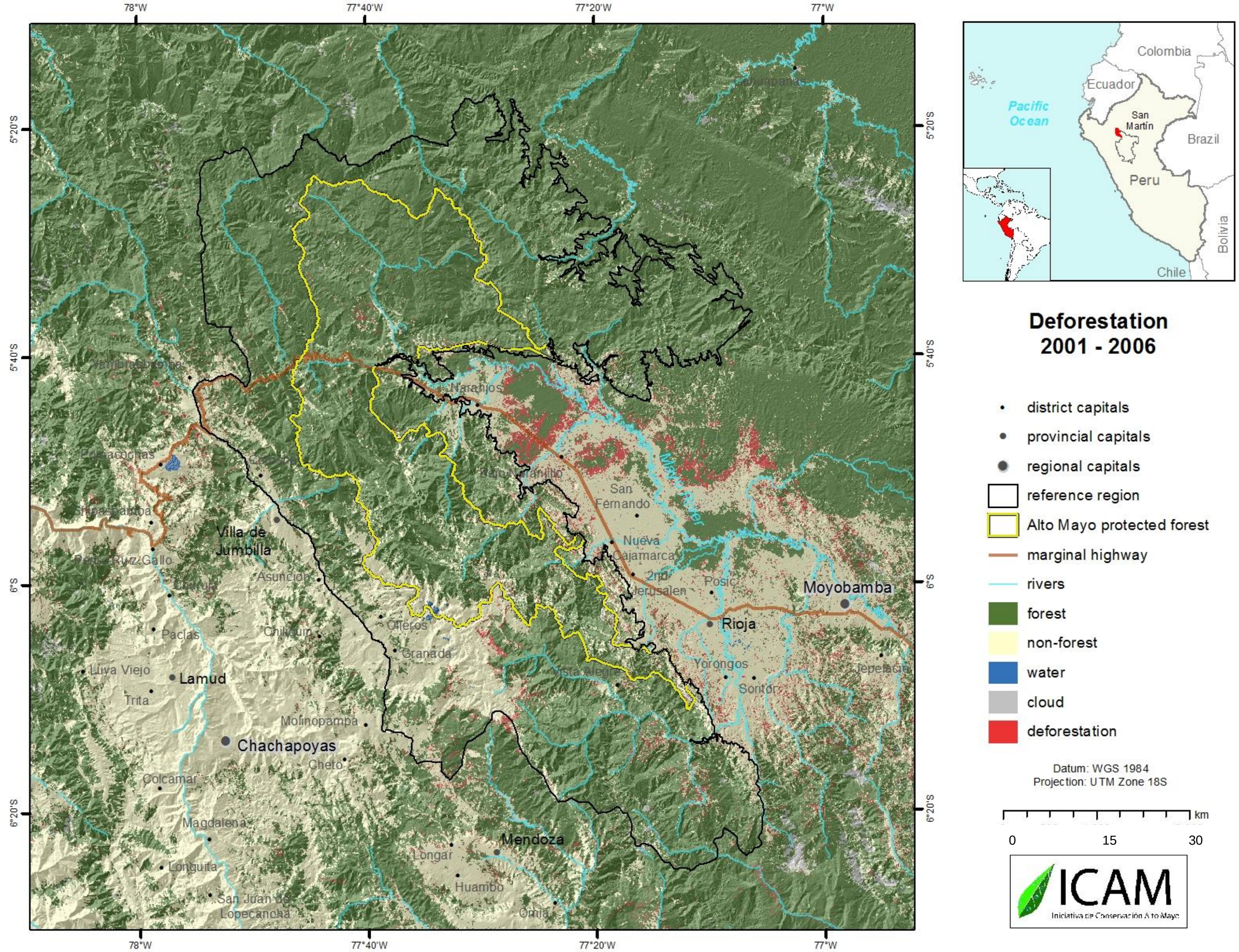


Figure 9. Deforestation map 2001-2006

Note: It shows the change between forest class and non-forest class within the reference region and project area for the period 2001-2006.

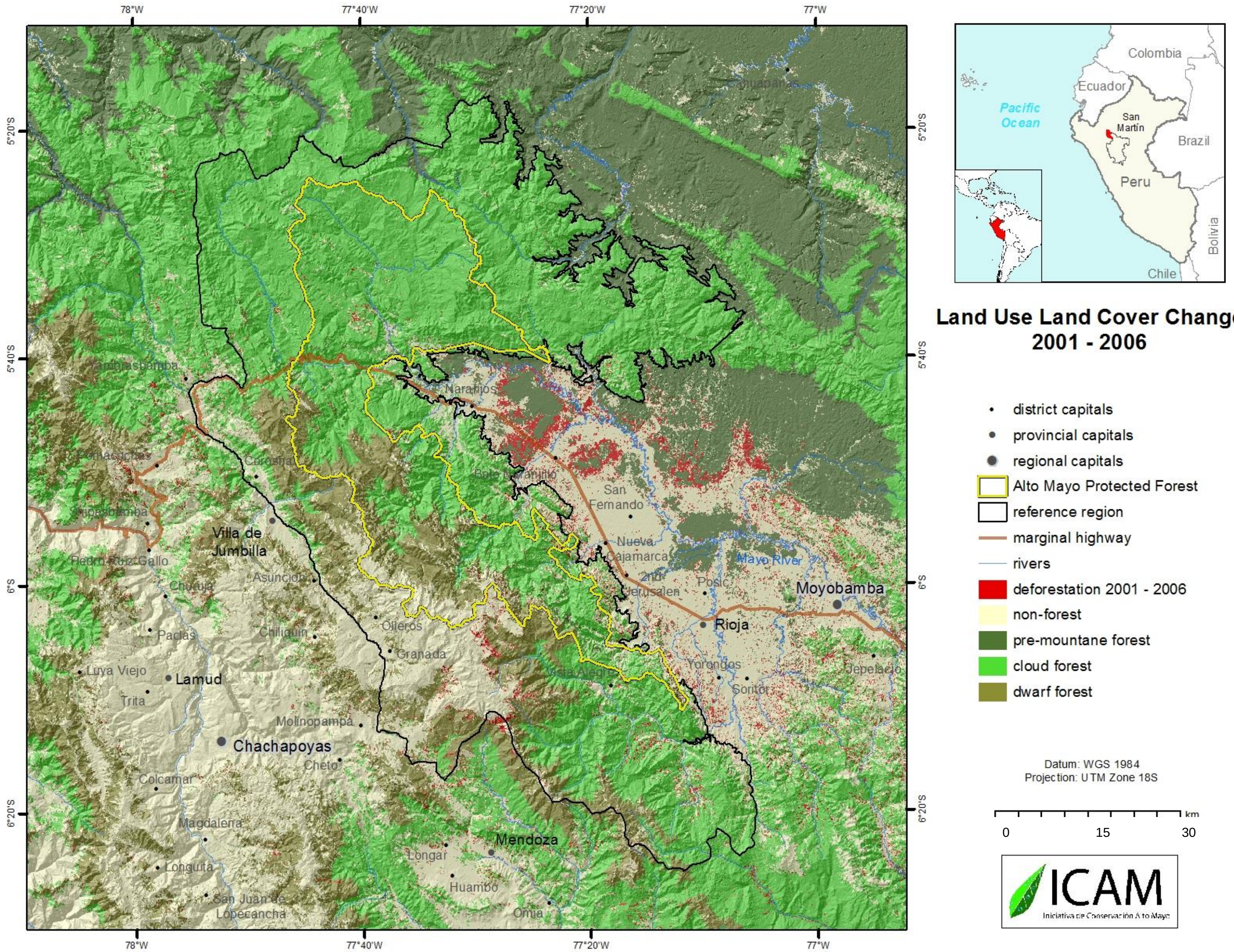


Figure 10. Land use and land cover change map 2001-2006

Note: It shows the forest classes (dwarf, cloud and pre-montane forest), non-forest classes and the change in 2001-2006 within the reference region and project area.

Land use land cover change matrix: shows the area (hectares) of each forest class converted to non-forest during the last period analyzed 2001-2006 (Table B).

Table B. Land use land cover change matrix

Land-use land-cover change matrix (2001-2006) in ha	
final / initial	non-forest
pre-montane	7
cloud forest	6,003
dwarf forest	2,798

2.5 Map accuracy assessment

The 2006 land cover classification was validated by visually inspecting a set of 200 randomly generated points within the reference region, against a set of RapidEye and CBERS scenes, and aerial photos[9]. The resulting confusion matrix is presented in Sup.Inf_Meth_03a. The overall accuracy was 95%, while the accuracy of each land cover and land use change was above 90%.

2.6 Preparation of a methodology annex to the PD

A detailed description of the remote sensing methodology and procedures used to classify the satellite imagery based on CI's standard change detection methods is reported in Sup.Inf_Meth_03a-c, as well as in Harper, et al. 2007[10]. These publications describe the pre-processing, classification methods, post-classification processing, and accuracy assessment steps followed as well as the image sources used.

Step 3: Analysis of agents, drivers and underlying causes of deforestation and their likely future development

The agents, drivers, and underlying causes of deforestation in the project area were identified from the expert opinions gathered through a background analysis commissioned by the AMCI to local partner AIDER, which included a review of existing socio-economic studies, interviews with local experts (such as park guards, government officials and community leaders), and was completed by a participatory workshop following the Open Standards for the Practice of Conservation methodology[11].

Based on these sources, seven agent groups were identified. Coffee producers represent the main agent group responsible for deforestation in the AMPF region, followed by a number of less significant agent

[9] See Sup.Inf_Meth_05b_J_Musinsky_AMPF_overflight_Oct10.

[10] Harper, G. J., M. K. Steininger, C.J. Tucker, D. Juhn and F. Hawkins, 2007. Fifty years of deforestation and forest fragmentation in Madagascar. Environmental Conservation 34(4):325-533

[11] http://www.conservationmeasures.org/initiatives/standards-for-project-management

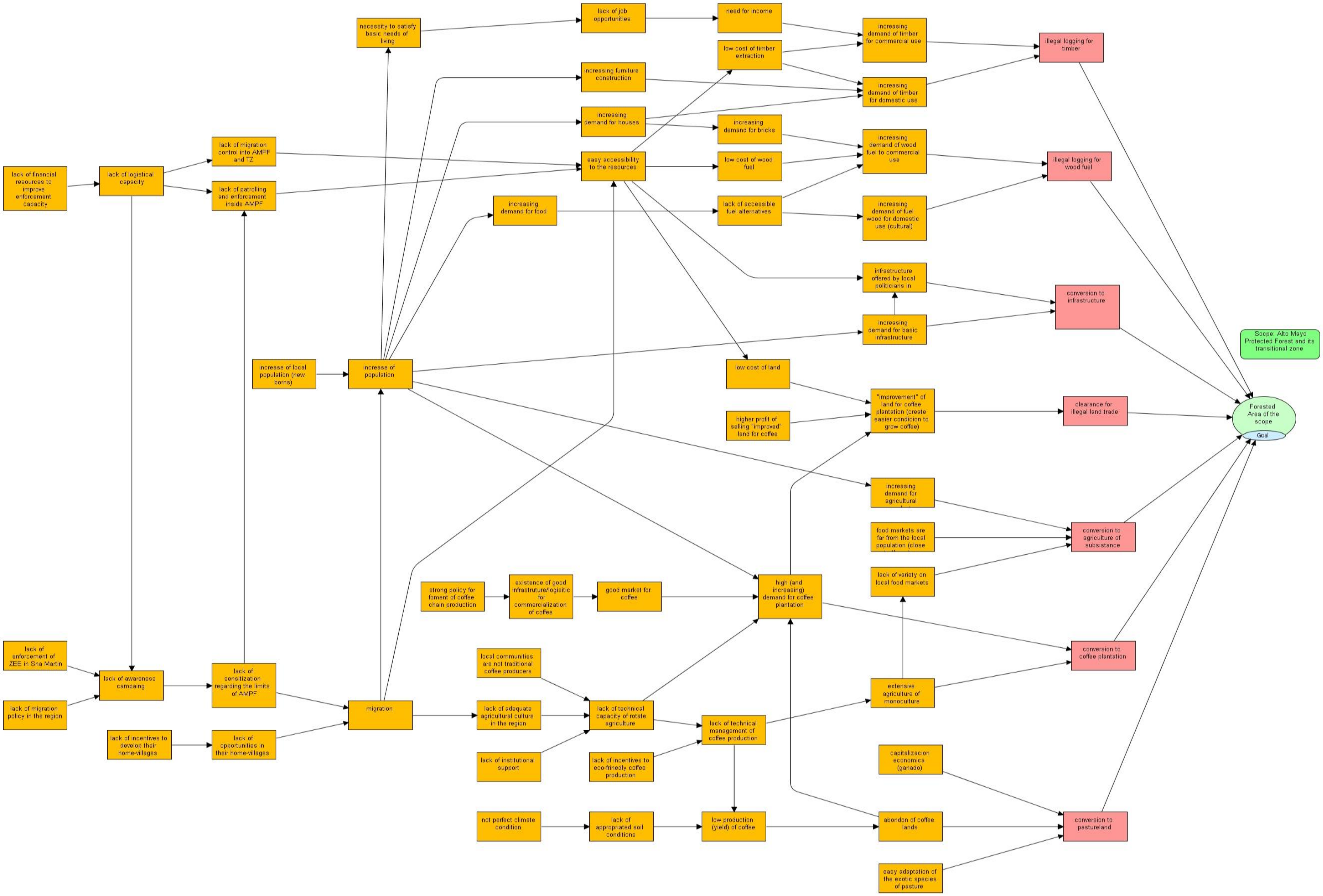
groups including cattle farmers, subsistence farmers, local politicians promoting the illegal construction of infrastructure, illegal loggers and timber merchants, land traffickers, and firewood collectors.

For each agent, their key social and cultural features were identified, as well as the impact each group has had on historical deforestation in the region and a general prediction of the future development of each agent group. In addition, the results from the literature review and interviews in the field conducted by AIDER, identified deforestation drivers that specifically affect the decisions of each agent group regarding how much forest to deforest and where to conduct these activities. Larger, underlying drivers of deforestation were also identified that affect the actions of all the agents of deforestation collectively and the dynamics of deforestation in the region as a whole, based on which an analysis of the chain of events that lead to deforestation was produced (Figure 11).

Generally, growing local populations and the lack of income generating opportunities are the underlying causes that begin the cycle of deforestation. Increasing numbers of individuals are pressed to make their livelihoods and, in many cases, turn to the most profitable economic activity in the region: coffee production. The underlying causes of poor soil conditions, lack of political support for conservation, and the limitations of the AMPF park service in enforcing the land use restrictions of the NPA further fuel the establishment of coffee production in the AMPF. Coffee production influences other land uses, often leading to pasture establishment and subsistence farming. It becomes clear that there is significant overlap between the groups of agents identified as many individuals diversify their income generating activities as much as possible, meaning that the same individuals who are coffee producers are also cattle farmers, subsistence farmers, and timber merchants, as well as firewood collectors for mostly domestic use. Land traffickers are the only exception to this, many of which do not live within the AMPF, but they use the trails and paths created by loggers and firewood collectors to access forest plots to clear for sale. The actions of land traffickers and local politicians are mainly driven by increasing populations in the region that demand more agricultural lands and infrastructure. All these agents are, therefore, interconnected and generally are driven by the same drivers and underlying causes. This interconnectedness is further visualized in the conceptual model of the chain of events leading to deforestation in the AMPF that was developed based on the theory of change.

These results are discussed in detail in the report *Analysis of Agents, Drivers and Underlying Causes of Deforestation in the Alto Mayo Protected Forest* (Sup.Inf_Meth_01), providing conclusive evidence that the future deforestation trend in the AMPF will be increasing.

Figure 11. Analysis of chain of events (conceptual model) leading to deforestation in the AMPF



Further research conducted by the AMCI support these arguments. According to a study published by the Regional Government of San Martin (GORESAM)[12] in 2011, coffee has occupied the second largest plantation area in the San Martin region with 73,587 ha, only behind cacao plantation. Of these, 57,466 ha or 78% of the total area were located in the Alto Mayo valley. Coffee plantation is thus the major economic activity in the reference region. Data from the Agricultural Department of the GORESAM indicate that coffee production has been steadily increasing in San Martin during the last decade. However, this increase in coffee production cannot be explained by a parallel increase in productivity, as the production per hectare did not increase substantially, as shown in Table C. Rather, it is more likely a result of an expansion in the area cultivated with coffee[13]. In fact, between 2001 and 2010, the area occupied by coffee plantations in San Martin increased almost 115% (36,162 ha). However, the total yield showed a similar trend with an increase of 103%, or 26,817 tons. Thus, productivity increased only by 4% in the same period. This implies that increase of coffee production in the region is directly linked with new areas converted to coffee plantations.

Table C. Annual coffee production in the San Martin region

Year	Area of coffee Plantation ha	Area Harvested ha	Yield t	Productivity t /ha
2001	31,455.50	28,844.00	26,097.71	0.905
2002	32,379.50	30,718.00	29,104.74	0.947
2003	32,534.50	32,217.00	30,641.15	0.951
2004	43,901.50	32,294.00	30,202.78	0.935
2005	44,906.50	36,776.50	34,758.23	0.945
2006	46,088.50	42,433.50	39,413.79	0.929
2007	49,653.50	41,795.50	36,312.22	0.869
2008	58,438.50	47,657.50	44,423.03	0.932
2009	62,911.50	51,822.60	48,644.04	0.939
2010	67,617.60	56,162.10	52,914.92	0.942

Essentially, there is a large international demand for coffee and Peru is taking advantage of this opportunity to establish itself as one important exporter in the global market. Consequently, the San Martin Region has responded to this demand by increasing its supply. In 2011, coffee production in San Martin was among the 5 highest coffee productions[14] in Peru, of which 78% were produced in the Alto Mayo region. In 2010, Peru exported over US$ 880 million in coffee, the highest volume of coffee exportation in its history, while the goal for 2011 was to reach US$ 1,300 million. There is a high

[12] Gobierno Regional de San Martín (GORESAM), 2011. Diagnóstico del Sector de Productores Agrarios – Mapa de Iniciativas del Desarrollo Económico en la Región San Martín
[13] GORESAM / Dirección Regional de Agricultura www.agrodrasam.gob.pe/sites/default/files/CULTIVOSPERAMNTES.pdf
[14] http://www.minag.gob.pe/cafe/produccion/4.html

possibility that this trend will be maintained, as countries traditionally known as fine coffee exporters (i.e. Colombia and countries in Central America) are having problems with their production[15,16].

A further analysis shows that the upward trend in coffee production cannot be explained by the oscillation of coffee price obtained in Peru. Between 1997 and 2002, the price per ton of coffee decreased by a factor of nearly five, while coffee production increased steadily[17]. Thus, it is unlikely that a future drop in coffee price would be sufficient to bring about a reduction of coffee production (and thus deforestation) in the region. As showed in Figure 12, between 2000 and 2008 the oscillation in price was as big as 500 US$/ton, however annual production (Table C) increased almost constantly in the same period, independently from coffee price. The boost of coffee production resulted in an increase of the cultivated area, therefore intensifying forest loss, primarily in the Alto Mayo region.

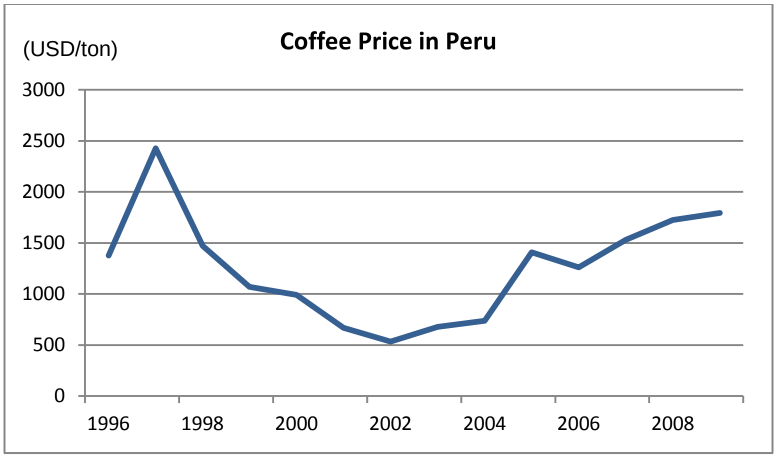


Figure 12. Coffee price in Peru

Furthermore, the Coffee National Board recognizes that the market for organic coffee might suffer some variations due to the global financial situation, however the conventional coffee that is largely produced in the Alto Mayo region, is not expected to be affected by the international crisis and is likely to keep an increasing trend[17]. Field observations in the AMPF indicate that coffee producers will obtain a surplus if the *quintal* of coffee (56kg) is commercialized by at least US$ 250. In 2011 the minimum price for a *quintal* was US$ 380 and the maximum reached US$ 550[18]. If nothing is done, the constant demand for coffee coupled with high prices will continue to fuel deforestation in the Alto Mayo region threatening the forests of the AMPF.

Data on annual coffee production in San Martin were also gathered for the provinces included in the reference region of the AMPF (Rioja, Moyobamba and Huallaga)[19]. The project assumed that coffee production was evenly distributed within the non-forested areas, and then estimated the production proportional to the area of the province within the reference region. The total coffee production per year

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15 ESAN – Escuela de Administración y Negocios http://www.esan.edu.pe/conexion/actualidad/2011/03/04/el-amanecer-del-cafe-peruano/

16 http://elcomercio.pe/economia/1327406/noticia-record-exportaciones-cafe-sumaron-us914-millones-entre-enero-setiembre

17 FAO - http://faostat.fao.org/site/570/DesktopDefault.aspx?PageID=570#ancor

18 http://frenteweb.minag.gob.pe/sisca/?mod=consulta_cult

19 DRASAM (Dirección Nacional de Agricultura en San Martín) http://www.agrodrasam.gob.pe

was available since 1997 and is shown in Figure 13. The data covers the historical period until 2010 and confirmed an increasing pattern in production (R^2 = 0.86).

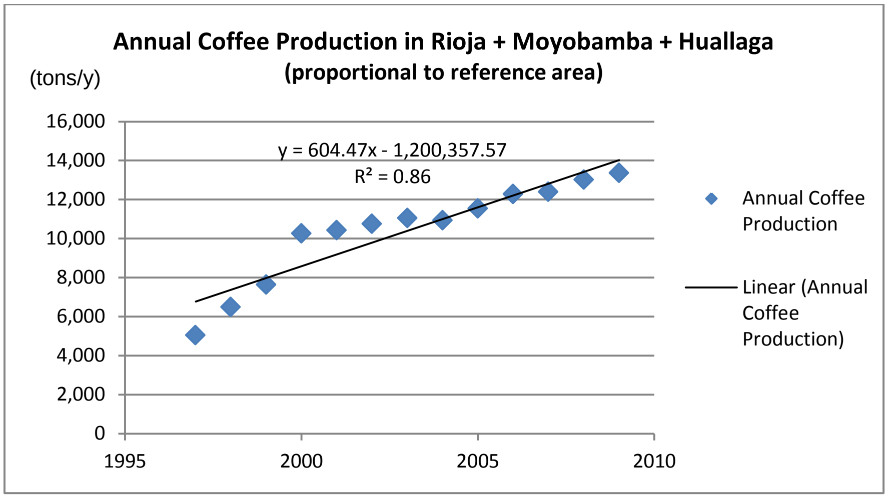


Figure 13. Annual coffee production in the Rioja, Moyobamba and Huallaga provinces

The observed historical deforestation, in addition to the results of this analysis, indicate that future deforestation in the project area will most likely continue along the same trend, providing an overall **conclusive** prediction that the future deforestation trend will be increasing.

Step 4: Projection of future deforestation

4.1 Projection of the quantity of future deforestation

The VM0015 methodology suggests stratifying the reference region according to the results from the analysis of agents and drivers of deforestation (Step 3). In the case of the AMPF, the causes of deforestation described in the previous step are homogeneously widespread in the reference region (lowland areas have conservatively been excluded from the reference region as the drivers of deforestation there -mainly rice production- are not predominant in the project area), and are likely to maintain this pattern; therefore there is no need to subdivide the reference region into different strata (VM Table 8).

VM Table 8. Stratification of the reference region

Stratum ID			Area
ID_i	Name	**Description**	ha
1	Reference region	The causes of deforestation are homogeneously distributed in the reference region, therefore there is no need to be subdivided in different strata.	580,616

4.1.1 Selection of the baseline approach

As illustrated in Step 3, coffee production is the main economic activity for local communities and is the major driver of deforestation in the project area. Other drivers, such as the conversion of forest to pastureland and subsistence agriculture, illegal land trafficking and road construction, although less significant and are all linked to coffee production directly or indirectly. For example, farmers create pastures from unproductive coffee plantations and plant subsistence crops to sustain themselves in remote areas near their coffee plantations, while land trafficking and road construction aim to make more land available for coffee production.

According to the VM0015 methodology, if the deforestation rates measured in different historical sub-periods in the reference region reveal a clear trend and this trend is increasing, and if conclusive evidence emerges from the analysis of drivers and agents of deforestation explaining the increased trend and making it likely that this trend will continue in the future, then the project proponent should use approach "b" (time function approach), whereby the rate of baseline deforestation is estimated by extrapolating the historical trend observed within the reference region as a function of time using either linear regression, logistic regression or any other statistically sound regression technique.

The project mapped historical land-cover and land-use for three periods in the reference region: 1996, 2001 and 2006. The analysis of historical deforestation showed a clear increasing trend between the historical reference periods of 1996-2001 and 2001-2006. In addition, conclusive evidence that this trend is likely to continue during the future periods emerged from the drivers and agents of deforestation analysis, as described in step 3. Therefore, the project will use the time function approach (approach "b") to estimate the rate of baseline deforestation in the reference region.

4.1.2 Analysis of constraints to the further expansion of deforestation

The department of San Martin, where the project area and reference region are located, has a large portion of its remaining forest located within the Amazon biome. All the forest within the reference region is susceptible to deforestation based on the agents, drivers and underlying causes prevalent in the area and identified in our analyses.

Biophysical constraints

Deforestation was observed in all types of soil, elevation and climate in the region, including areas with high slope. For instance, deforestation was observed in areas with slope ranging from 0 to 70 degrees. Likewise, forest loss occurred in all elevation between 900m and 3600m, which covers 98% of the project area. While families living in the sub-basin areas of intermediate to high altitudes (1000m to 1750m) mainly produce coffee, families in the lower altitude areas (below 1000m) generally produce rice[20], thus these lower altitude areas have been excluded from the reference region. Therefore, no biophysical constraints are considered to limit the geographical area where deforestation agents could expand their land use activities within the reference region.

Socioeconomic constraints

Historical evidence, validated through the analysis of agents and drivers of deforestation, also shows that no socioeconomic constraints limit the geographical area where deforestation agents could expand their land use activities within the reference region. During the early stages of colonization of the Alto Mayo basin, the deforestation pattern in the reference region was mainly driven by accessibility through the primary road infrastructure (namely the Marginal, or, Fernando Belaúndre Terry Highway, FBT) (see also

[20] GTZ, 2005. Un estudio Participativo. Pobreza Rural en las Microcuencas de Yuracyacu, Almendra, Rumiyacu-Mischquiyacu, Sonito y El Avisado. Lima, Peru.

section *1.9 Prior Conditions* of the AMCI VCS PD). Large deforested areas were created per family -some over 300ha- which resulted in the formation of urban centers adjacent to the marginal highway. Gradually, new settlements started forming in further areas promoting the opening of new secondary roads and trails, mainly along the rivers and creeks, bringing new patterns of settlement in the area:

- New settlements were created further away from the marginal highway and often inside the AMPF, converting new areas of forest land to coffee and pastures in the areas surrounding these new settlements and up to 10 km away;
- New houses were built around these new settlements, primarily near the creeks and rivers or in the paths between the agricultural fields and the rivers. This pattern of occupation generated a mosaic of deforested areas with sparse houses in between coffee plantations, pastures and subsistence agriculture.
- Other forms of settlement included areas with temporary presence of the settlers in their newly deforested fields, mainly during harvest periods, with basic rudimentary housing facilities established. Usually these settlers have their residence in the urban centers near the marginal highway and tend to sell the land under their ‘possession’ rather than set it up as their permanent residence.

Deforestation in the reference region thus happens more frequently near urban centers and roads and less in isolated areas further away. However, as the forest resources become scarcer near the more accessible areas, agents move into less accessible areas. This pattern is observed in areas along primary roads, which have been under pressure for a long period and where deforestation peaks at approximately eight kilometers away from the road (see figures in Step 4.2.2).

As mentioned before, these patterns of deforestation occur independently of the altitude and/or slope. In addition, the drivers of deforestation are more correlated with forest accessibility rather than with biophysical characteristics. Several factor maps were produced to represent the forest accessibility characteristics. The spatial model, used to predict the location of the most suitable areas for deforestation, takes into consideration the relationship of historical deforestation and the factor maps.

As there are no biophysical or socioeconomic constraints to the expansion of deforestation, the entire reference region is susceptible for conversion to the current land-uses in the baseline scenario. Furthermore, the remaining available forest for conversion to non forest uses is more than 100 times the average area annually deforested within the reference region during the historical reference period: (1,182 ha y^{-1} * 100 y) **<** 580,616 ha.

In conclusion, since there are no biophysical or socio-economic constraints to limit the amount of land in the reference region accessible to the deforestation agents, and given that the remaining forest in the reference region could absorb more than 100 times the average area annually deforested during the historical reference period, a single optimal stratum was defined for the reference region.

4.1.3 Quantitative projection of future deforestation

4.1.3.1 Projection of the annual areas of baseline deforestation in the reference region

The AMPF is currently being impacted by the significant population of settlers within and around its boundaries that rely heavily on forest conversion to cropland to sustain their income generation activities.

Coffee production is the primary economic activity in the AMPF, accompanied by subsistence agriculture and cattle grazing on pastures that are established on abandoned coffee plantations.

As explained in 4.1.1, it is appropriate to use a time function approach (or approach “b”) to estimate the rate of baseline deforestation in the AMPF. In order to apply the time function approach, we used a Cumulative Deforestation Model (CDM) as described in approved VCS Methodology for Avoided Mosaic Deforestation of Tropical Forests (VM0009)[21], developed by Wildlife Works. The model is based on the deforestation behavior over time, which is essentially delimited by the size of the available forest and presents a logistic regression curve[22]. The model is parameterized from observations of forest state change in the reference area over the reference period, and predicts the future degree of deforestation at any point in time after the project start date, expressed as a proportion. The Wildlife Works toolkit[23] was used to assist in generation of the input data for the CDM. The input data was produced by classifying the land cover of randomly distributed points over satellite imagery during the historical period.

The steps followed to estimate the baseline deforestation rate based on the CDM are described below:

a) Image selection

Landsat Thematic Mapper (TM) images of different dates were compiled from the United States Geographical Survey (USGS) (Table D)

Table D. Imagery used in to built the cumulative deforestation model

Path/Row	Imagery year	Imagery date	Sensor
08/64	1996	07/26/1996	Landsat 5-TM
08/64	1997	08/30/1997	Landsat 5-TM
08/64	1998	09/18/1998	Landsat 5-TM
08/64	2001	08/25/2001	Landsat 5-TM
08/64	2002	06/17/2002	Landsat 5-TM
08/64	2005	06/17/2005	Landsat 5-TM
08/64	2006	09/08/2006	Landsat 5-TM
09/64	1996	09/03/1996	Landsat 5-TM
09/64	1998	05/20/1998	Landsat 5-TM

[21] http://www.v-c-s.org/methodologies/VM0009

[22] Arellano-Neri, O., & Frohn, R. C. (2001). Image-based logistic regression parameters of deforestation in Rondonia, Brazil. *IGARSS 2001. Scanning the Present and Resolving the Future. Proceedings. IEEE 2001 International Geoscience and Remote Sensing Symposium (Cat. No.01CH37217)* (Vol. 0, pp. 2236-2237). IEEE. doi: 10.1109/IGARSS.2001.977960.

Linkie, M., Smith, R. J., & Leader-Williams, N. (2004). Mapping and predicting deforestation patterns in the lowlands of Sumatra. *Biodiversity and Conservation*, *13*(10), 1809-1818. doi: 10.1023/B:BIOC.0000035867.90891.

Ludeke, a, Maggio, R., & Reid, L. (1990). An analysis of anthropogenic deforestation using logistic regression and GIS. *Journal of Environmental Management*, *31*(3), 247-259. doi: 10.1016/S0301-4797(05)80038-6.

Mahapatra, K., & Kant, S. (2005). Tropical deforestation: a multinomial logistic model and some country-specific policy prescriptions. *Forest Policy and Economics*, *7*(1), 1-24. doi: 10.1016/S1389-9341(03)00064-9.

[23] Downloaded from http://www.wildlifeworks.com/redd/resources.php

09/64	2000	08/29/2000	Landsat 5-TM
09/64	2001	08/24/2001	Landsat 5-TM
09/64	2003	07/21/2003	Landsat 5-TM
09/64	2006	09/15/2006	Landsat 5-TM
09/64	2007	08/01/2007	Landsat 5-TM

The dates of historic imagery were then plotted over a timeline (Figure 14) to demonstrate that on average they were distributed over the entire historical reference period, thus avoiding any bias in the image weights used to estimate the observation weights.

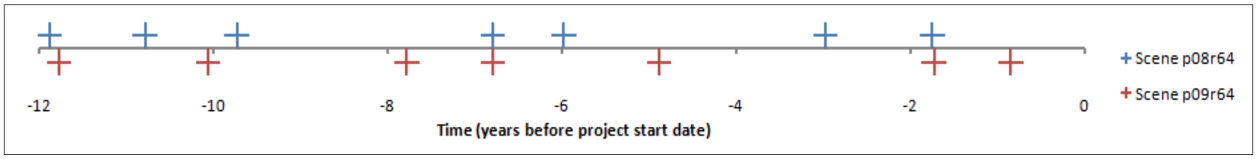


Figure 14. Timeline plot of historic images demonstrating stationarity

b) Observation points

The total number of observation points in the reference region was estimated based on the variance of a small sample data. Initially 144 points were distributed over the reference region and classified according to the land cover observed in the satellite imagery above listed. The Wildlife Works toolkit and the relevant equations listed in VM0009 (1, 2, 3, 4, 5, 6, and 17) were used in this process. As result, a systematic grid of 2186 points with random origin was generated covering the entire reference region.

c) Land cover classification

The state of forest of each point was then visually classified based on each Landsat scene covering the historical period. One of the following classes was assigned to each point: Forest; Non-Forest; Cloud/Shadow; Build-up; or no images.

A number of guidelines were employed to minimize interpretation errors in the evaluation of forest state in the images used to develop the CDM. All the images used in the model were interpreted by the same analyst, well experienced with the classification of remotely sensed data, using a standard description of the set of thematic land-cover classes to be interpreted, with reference to historical land-cover maps from three time periods within the historical reference period. If a point fell in a pixel that the land cover was not clear the general rule applied was to classify as forest, following the principle of conservativeness.

After forest state interpretation was completed for all the images within the historical period, the data was independently checked for inconsistencies and systematic misinterpretation. This was accomplished by using an algorithm that flagged any points that had an unlikely forest state transition over the reference period (an example being a transition from built-up to forest). These points were then re-evaluated by examining all images at each point (the temporal span) in order to accurately identify and rectify any misinterpretations.

A total of 60 points were flagged for inconsistencies. A spreadsheet was used to evaluate and track the forest state change over the historic reference period. The images were then re-interpreted for each point and the errors were documented. After the points were reclassified, the check algorithm was run again to ensure that all flagged forest state transitions had been corrected.

The data was also assessed for double-coverage to assure that all points had at least two observations in the historical period. As shown in Figure 15, across the entire reference region eight points were observed less than twice, mainly due to cloud cover. This means that over 99% of the reference region had double coverage. The points without double-coverage were excluded from the sample.

In addition, an observation weight was calculated for each point. The weight is the correction factor based on number of times each point is observed over time and number of points observed in each grid. The observation weights are used to fit the model, which uses Iteratively Reweighted Least Square (IRLS) to correct for spatial and temporal artifacts from the observation sampling.

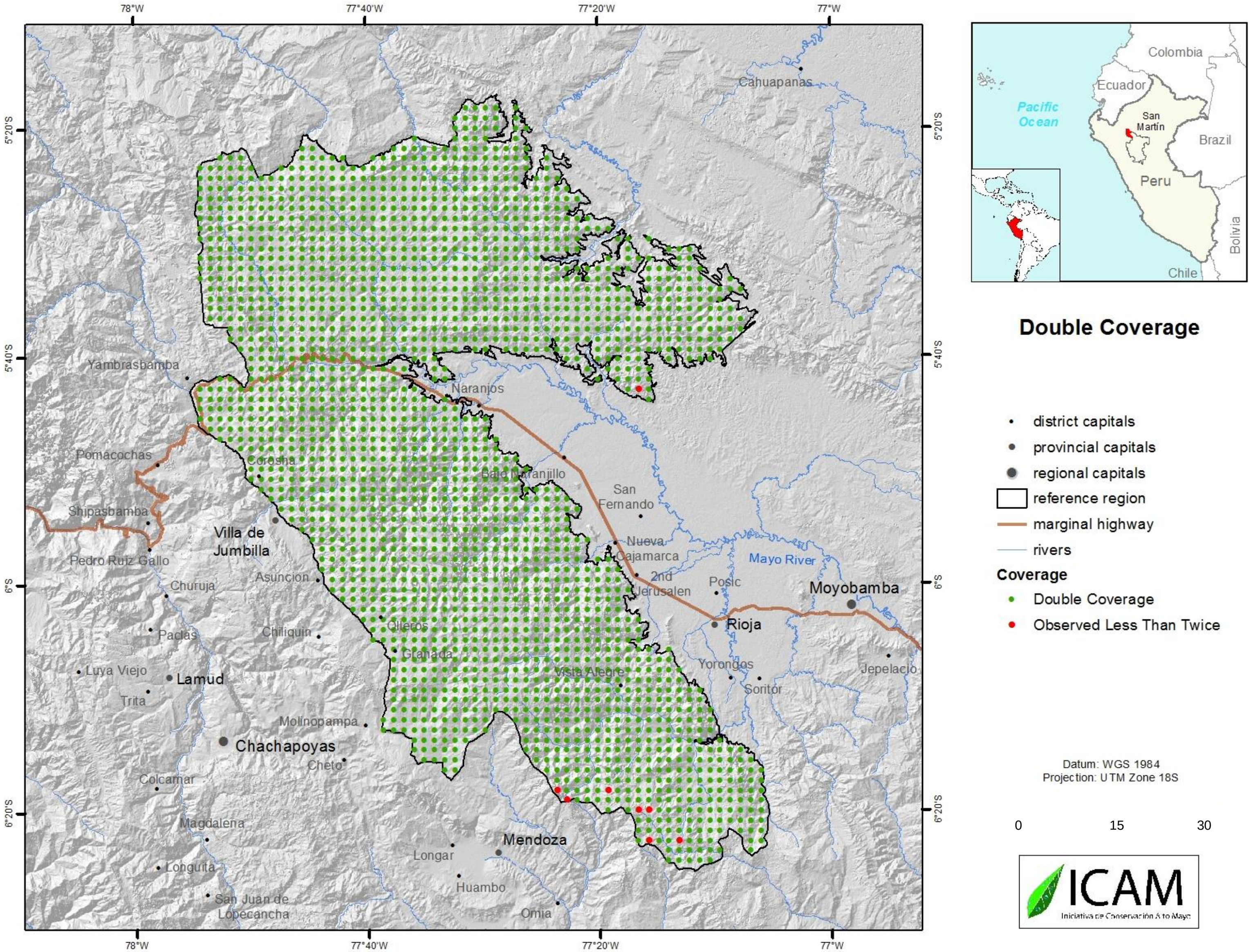


Figure 15. Map of observation points with double-coverage

d) Predicting Cumulative Deforestation

The Wildlife Works toolkit was used to export the data for the Cumulative Deforestation Model. The output data summarizes each observation from all of the grids and the observation weight.

Observations of forest state from the reference region were used to fit the cumulative deforestation model. No additional covariates were included in the model due to a lack of accurate census information for the reference region; in addition, we consulted expert opinion familiar with the methodology to confirm that the simplest model (i.e. using time as the only variable) tends to perform the best[24]. The logistic function used to fit the cumulative deforestation model was run using the free statistical package R. The resulting model from R had an AIC of 4 (Figure 16).

The resulting selected linear predictor was show in the Equation 1:

Equation 1. Linear predictor

$n = -1.6409867 + 0.0005904x$

where x is the number of days since the project start date.

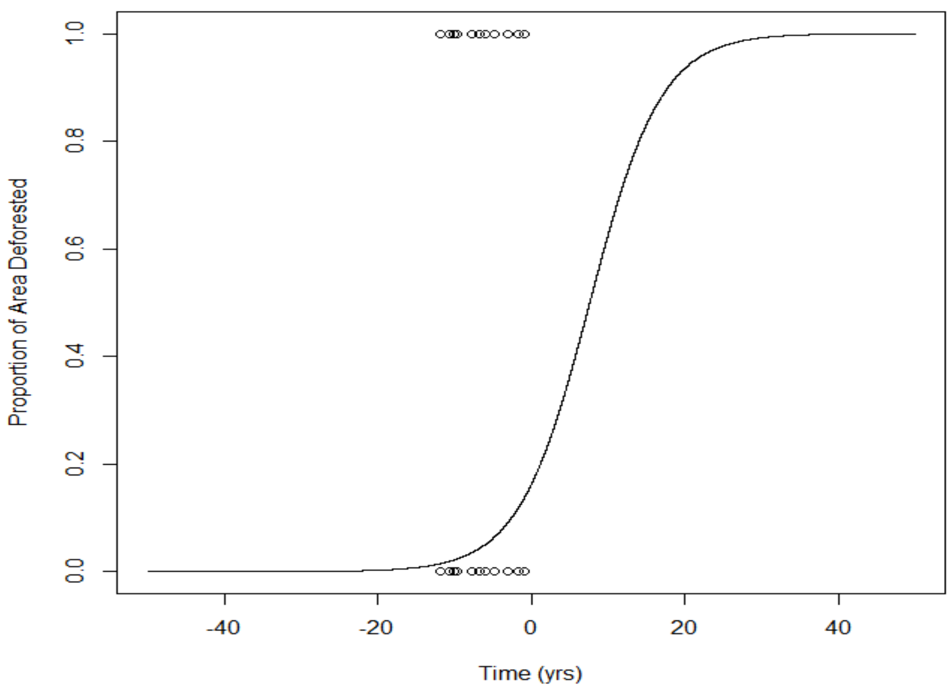


Figure 16. Graph of the state vector over time showing ones (forest) and zeros (non-forest) plotted over the logistic model based on the linear predictor. Time 0 represents the project start date (2008).

The linear predictor was then integrated in the logistic regression curve (Equation 2) that simulates the cumulative deforestation in the baseline period.

---

[24] Jeremy Freud – VM0009 Editor – pers. communication

Equation 2. Logistic regression curve of CDM

$$F_{DF}(t,\eta) = \frac{1}{1 + \exp[-\eta(t,\boldsymbol{\theta})]}$$

Where F_{DF} is the proportion of cumulative deforestation; and

η is the linear predictor given time and deforestation covariates.

To estimate the deforestation rate in the baseline scenario, a linear function was selected (Equation 3). The linear function chosen intercepts the y axis at the project start date (time = 0) and does not cross the CDM function within the next 100 years, which represents the maximum crediting period under VCS rules (Figure 17). This rate is considered conservative given the results of the CDM and the future patterns of deforestation expected to encroach in the reference region.

Equation 3. Linear function of deforestation rate

$y = 0.00998\,x$

where x represents the number of years since the project start date and y is the proportion of area deforested.

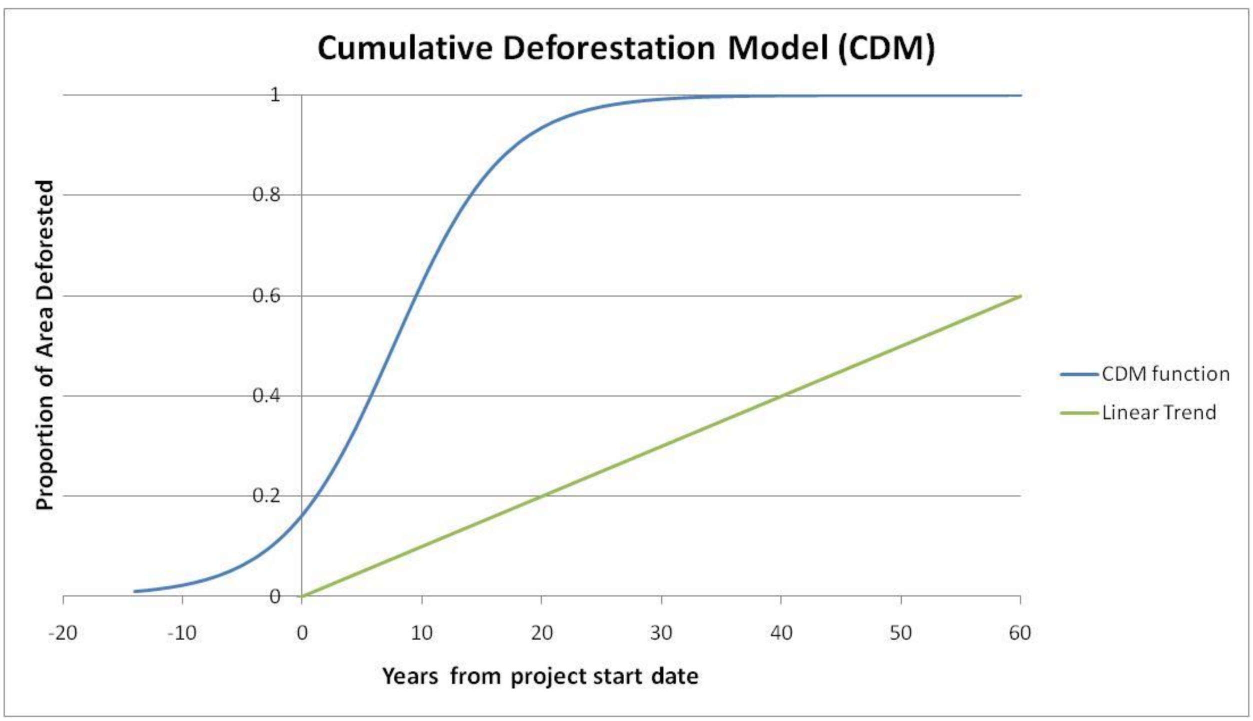


Figure 17. Graph of the Cumulative Deforestation model (blue curve) over time and the linear rate of deforestation (green line) chosen by the project. Time 0 represents the project start date (2008).

e) Model Uncertainty

Uncertainty in the cumulative deforestation model was estimated from the sample of observed forest states and is used to determine the confidence deduction. A Horvitz-Thompson statistic predicts the standard deviation of forest state (Equation 4) which is used to estimate the uncertainty of the cumulative deforestation model (Equation 5).

Equation 4. Horvitz-Thompson statistic

$$\hat{O}_{DF} = \sqrt{\left[\sum_{i \epsilon J} w_i o_i\right]\left[1 - \sum_{i \epsilon J} w_i o_i\right]}$$

$$\hat{O}_{DF} = \sqrt{0.047767(1 - 0.047767)}$$

$$\hat{O}_{DF} = 0.213273$$

Where $\sum_{i \epsilon J} w_i o_i$ is the sum of the state observation for the i^{th} sample point multiplied by the weight applied to the i^{th} sample point.

Equation 5. Model uncertainty

$$U_{DF} = \frac{1.96(\hat{O}_{DF})}{\sqrt{N_{DF}} \times \sum_{i \epsilon J} w_i o_i}$$

$$U_{DF} = \frac{1.96(0.213273)}{\sqrt{11344} \times 0.047767}$$

$$U_{DF} = 0.082164$$

Where N_{DF} is the number of state observations made to fit the cumulative deforestation model;

$\hat{O}_{DF}$ is the Horvitz-Thompson estimate of the standard deviation of deforestation state;

U_{DF} is the approximate estimate of uncertainty at the 95% confidence level for the cumulative deforestation model, assuming a normal approximation. The estimated uncertainty of the model is 0.082164.

4.1.3.2 Projection of the annual areas of baseline deforestation in the project area and leakage belt

The portion of the annual areas of baseline deforestation for each forest class within the project area and leakage belt was determined using GIS. The map of forest classes was overlaid with the projected yearly deforestation maps developed in step 4.2.

4.1.3.3 Summary of step 4.1.3

The results of this step are presented in VM Table 9a, 9b, and 9c

VM Table 9.a. Annual areas of baseline deforestation in the reference region

Project year *t*	Stratum *i* in the reference region $ABSLRR_{i,t}$ ha
2009	4,735
2010	4,735
2011	4,735
2012	4,735
2013	4,735
2014	4,735
2015	4,735
2016	4,735
2017	4,735
2018	4,735

VM Table 9.b. Annual areas of baseline deforestation in the project area

Project year *t*	Stratum *i* of the reference region in the project area $ABSLPA_{i,t}$ ha	Total *annual* $ABSLPA_t$ ha	 cumulative *ABSLPA* ha
2009	2,478	2,478	2,478
2010	2,368	2,368	4,846
2011	2,220	2,220	7,066
2012	2,155	2,155	9,221
2013	2,149	2,149	11,369
2014	1,966	1,966	13,335
2015	1,903	1,903	15,239
2016	1,917	1,917	17,156
2017	1,884	1,884	19,040
2018	1,802	1,802	20,842

VM Table 9.c. Annual areas of baseline deforestation in the leakage belt

Project year *t*	Stratum *i* of the reference region in the leakage belt	Total	
	1	*annual*	cumulative
	$ABSLLK_{i,t}$	$ABSLLK_t$	*ABSLLK*
	ha	ha	ha
2009	1,318	1,318	1,318
2010	1,332	1,332	2,650
2011	1,348	1,348	3,997
2012	1,371	1,371	5,368
2013	1,332	1,332	6,700
2014	1,514	1,514	8,214
2015	1,574	1,574	9,788
2016	1,487	1,487	11,275
2017	1,490	1,490	12,765
2018	1,516	1,516	14,280

4.2 Projection of the location of future deforestation

Several software packages exist that enable spatially explicit modeling of future land use change. The VM0015 methodology references the GeoMod model, which is available as part of the IDRISI software for geographical analysis, however a newer and more robust model, the Land Change Modeler (LCM), is available in the more recent editions of IDRISI. We selected LCM for its relative ease of use and non-reliance on independence among driver variables, as it is based on a neural network rather than on multiple regression analysis[25].

After defining the total deforestation baseline rate for the modeled period based on the previous step, we prepared spatial data on driver variables, produced a map of locations' "potential" for deforestation (or "transition potential", "risk" or "suitability" for deforestation - different authors use different terms for the same concept), and produced a map of projected locations of future deforestation.

LCM uses a neural network approach for modeling the "risk" map. Neural network is a multilayer perceptron in which a first set of known areas of change (historical deforestation) are used as training areas to develop a relationship with factor maps using an activation function. Once the development of the relationship is complete a second set of known areas of change is used to test the relationship and confirm the activation level maps.

[25] Ronald Eastman, Megan E. Van Fossen, and Luis A. Solórzano, 2005. *Transition potential modeling for land cover change* – In GIS, spatial analysis, and modeling. Ed D J Maguire; Michael Batty; Michael F Goodchild – ESRI Press, Redland USA.

For the geographical analysis, the model was calibrated using observed data on deforestation from 1996 to 2001, and then validated using the projected deforestation against the observed deforestation for 2001-2006. The distribution of deforestation events during the calibration period was compared to the suite of driver variables, and a neural network was produced that maximized the power of the combination of driver variables in explaining observed deforestation. Following this, the resulting neural network was used to produce a risk map of deforestation, scaled from 0 to 1 (section 4.2.3).

4.2.1 Preparation of factor maps

The categories of drivers identified for the AMPF (based on step 3 and 4.1) were: access to the forest via rivers, proximity to urban centers and road infrastructure within the project area and reference region, and terrain. The relation between these variables and deforestation are represented in the Figures included in section 4.2.2. This analysis applied an **empirical approach** to create the factor maps. More specifically distance maps were generated using Euclidean distances and slope and elevation were used as continuous variables. Factor maps for discrete data, like soil type and administrative units, were generated by evidence likelihood variables. The evidence likelihood variables estimate the probability of deforestation in each unit (polygon) based on the historical deforestation and use an index of deforestation. LCM automatically created classes (virtual nodes) based on the spatial correlation between the factor maps and the historical deforestation data.

The following spatial data, available in digital format, were used to represent these drivers:

Access to the forest:

- Settlements: a Euclidean distance map was created based on proximity to the nearest settlement, subdivided into capitals, towns and villages;

- Rivers: a Euclidean distance map was created based on proximity to the nearest rivers, subdivided into primary and secondary rivers;

- Roads: a Euclidean distance map was created based on proximity to the nearest roadways, subdivided into major roads, secondary roads and trails;

Terrain:

- Elevation: obtained from the Shuttle RADAR Topography Mission (SRTM) of NASA, with a 90-meter horizontal resolution and 10-meter vertical resolution;

- Slope: derived from the SRTM dataset;

Other variables tested in the model: These variables were initially considered in the model, however they did not have a strong power of explanation and the results from the model did not predict the deforestation location with a high accuracy (i.e. Figure of Merit above 50%).

- Population: static population in 2007, and population growth rate for 1993-2007 per district of the reference region, used as evidence likelihood variables;

- Soil: soil type used as an evidence likelihood variable;

- Administrative boundaries: departments, provinces and district boundaries used as evidence likelihood variables;

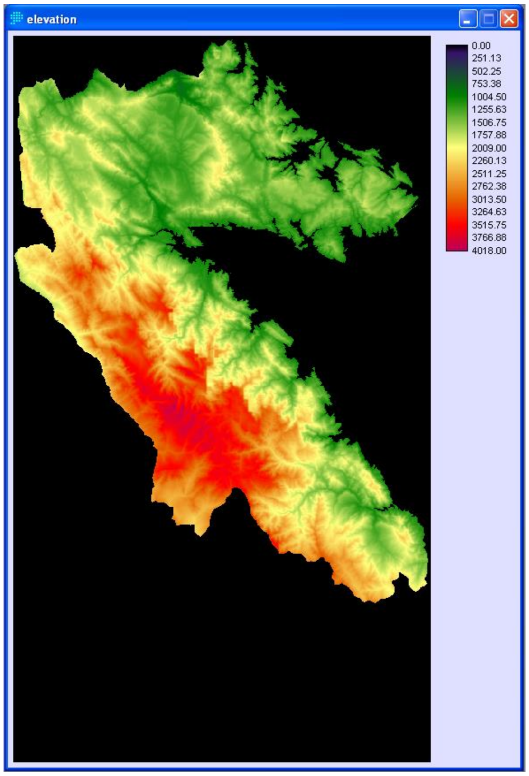
No major infrastructure development is planned in the reference region for the baseline period. Unplanned new infrastructure development was thus conservatively excluded from the deforestation model.

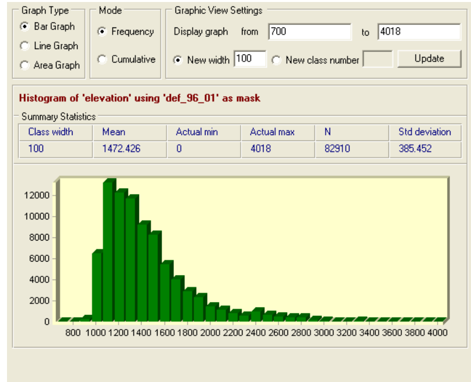
4.2.2 Preparation of deforestation risk maps

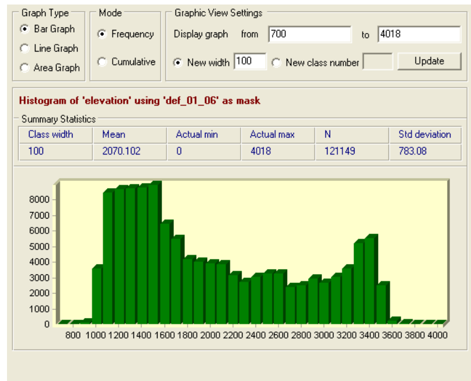
Various combinations of the above driver variables and the deforestation between the 1996-2001 period were used to produce maps of deforestation risk. These maps were produced for every pixel in the reference region.

Each resulting map of deforestation risk was then used to predict the deforestation location in the confirmation period 2001-2006. The actual deforestation rate for 2001-2006 was entered, therefore only the model’s performance to predict the location was assessed. Below are the factor maps used in the final model and the plotted relationship between each driver variable and deforestation. The maps show the driver’s spatial variation within the reference region, while the top graphs show the relationship between the driver variable and deforestation in the calibration period (1996-2001); the bottom charts show the relationship between the driver variable and deforestation in the validation period (2001-2006).

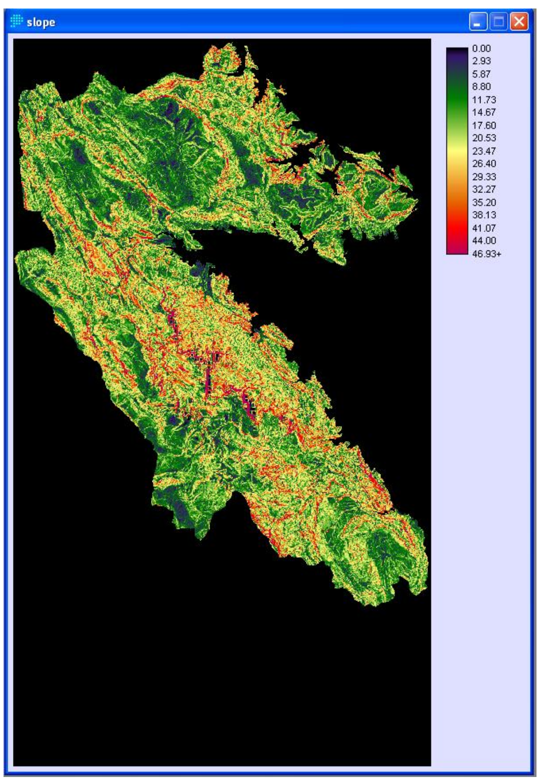
Elevation (unit: meters above sea level)

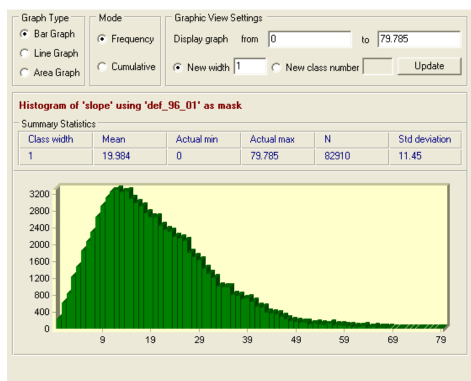


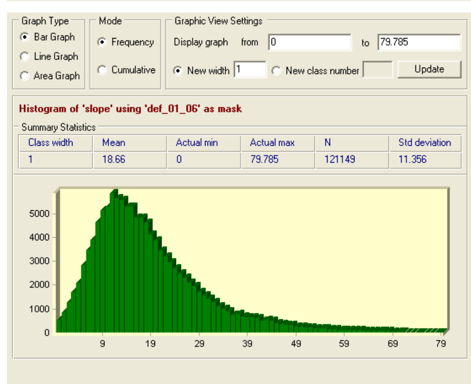




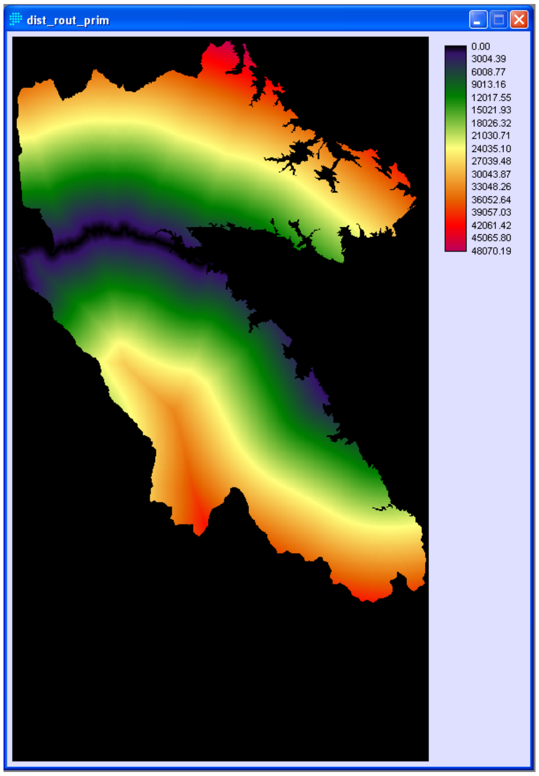
Slope (unit: degrees)

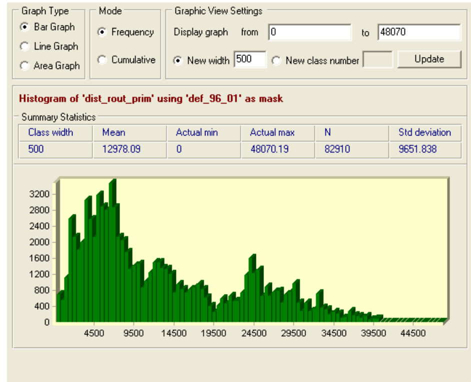


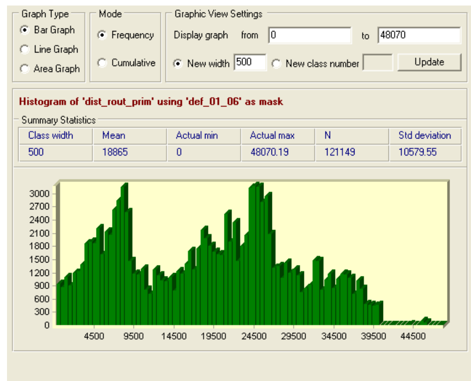




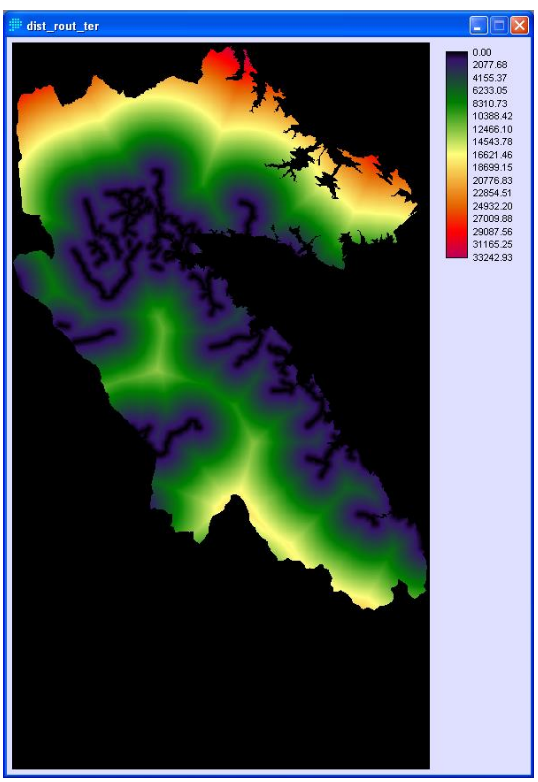
Proximity to primary routes (units: meters)

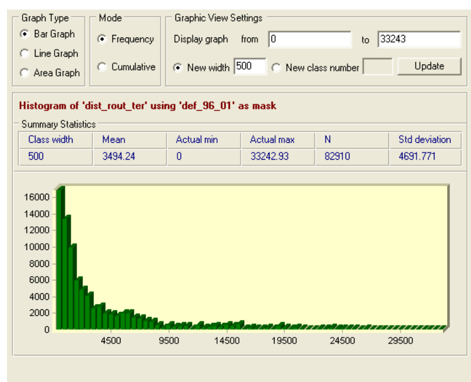


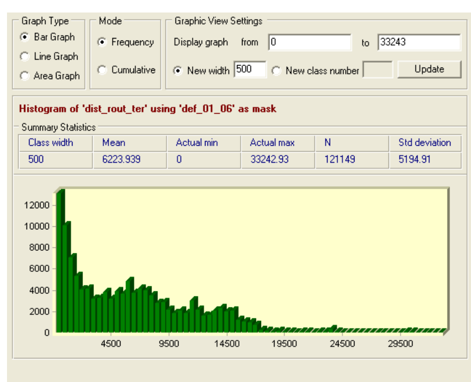




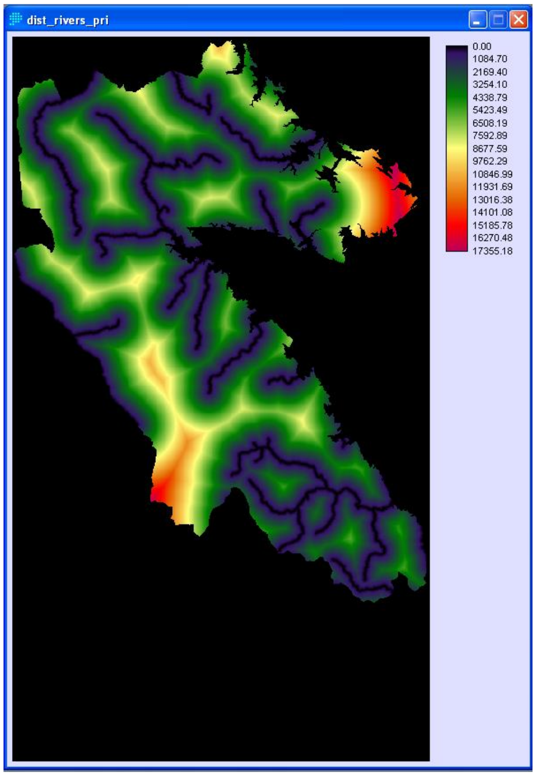
Proximity to tertiary routes - trails (units: meters)

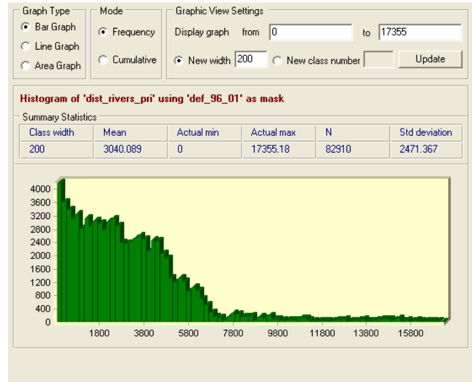


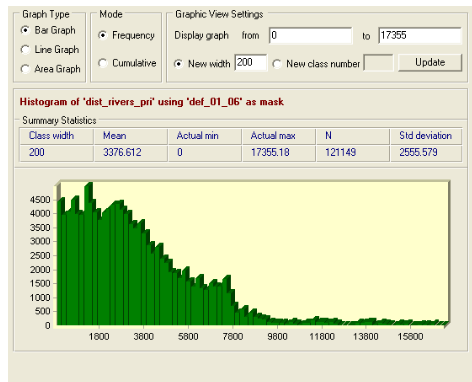




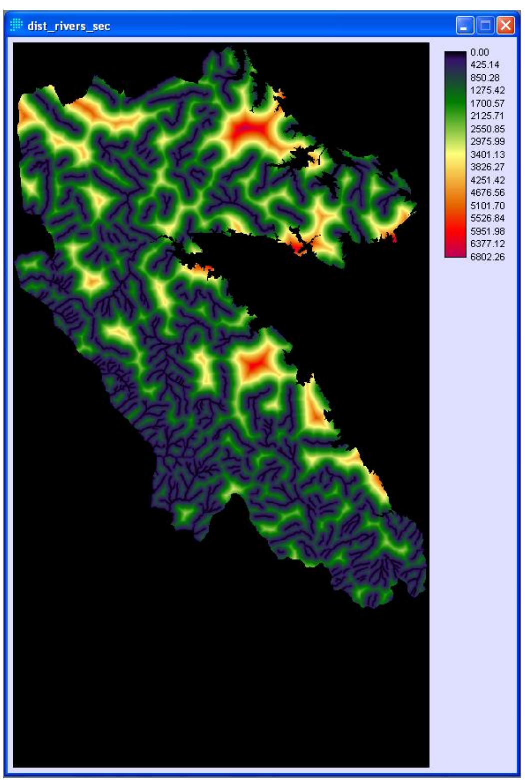
Proximity to primary rivers (units: meters)

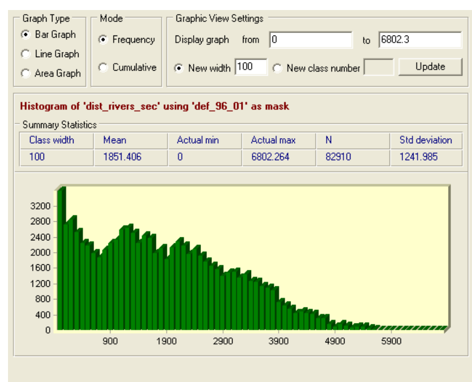


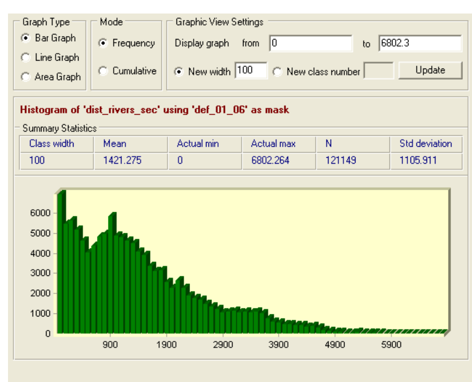




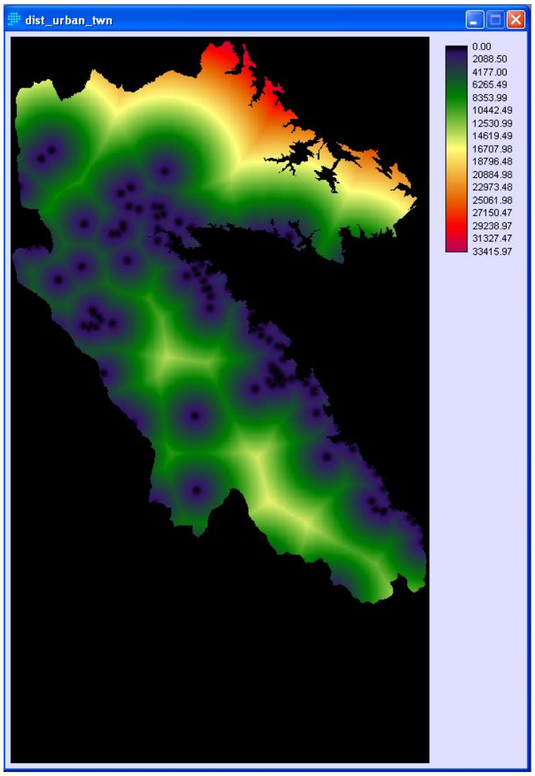
Proximity to secondary rivers (units: meters)

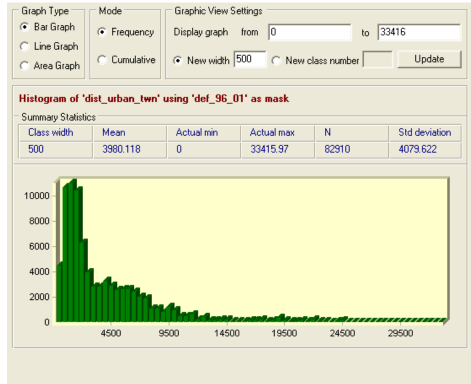


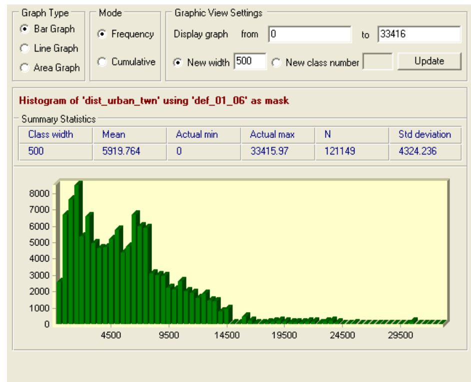




Proximity to towns (units: meters)







The below flowchart illustrates the process used to model future land cover maps and a list of the factors maps used in the final deforestation risk map (Figure 18).

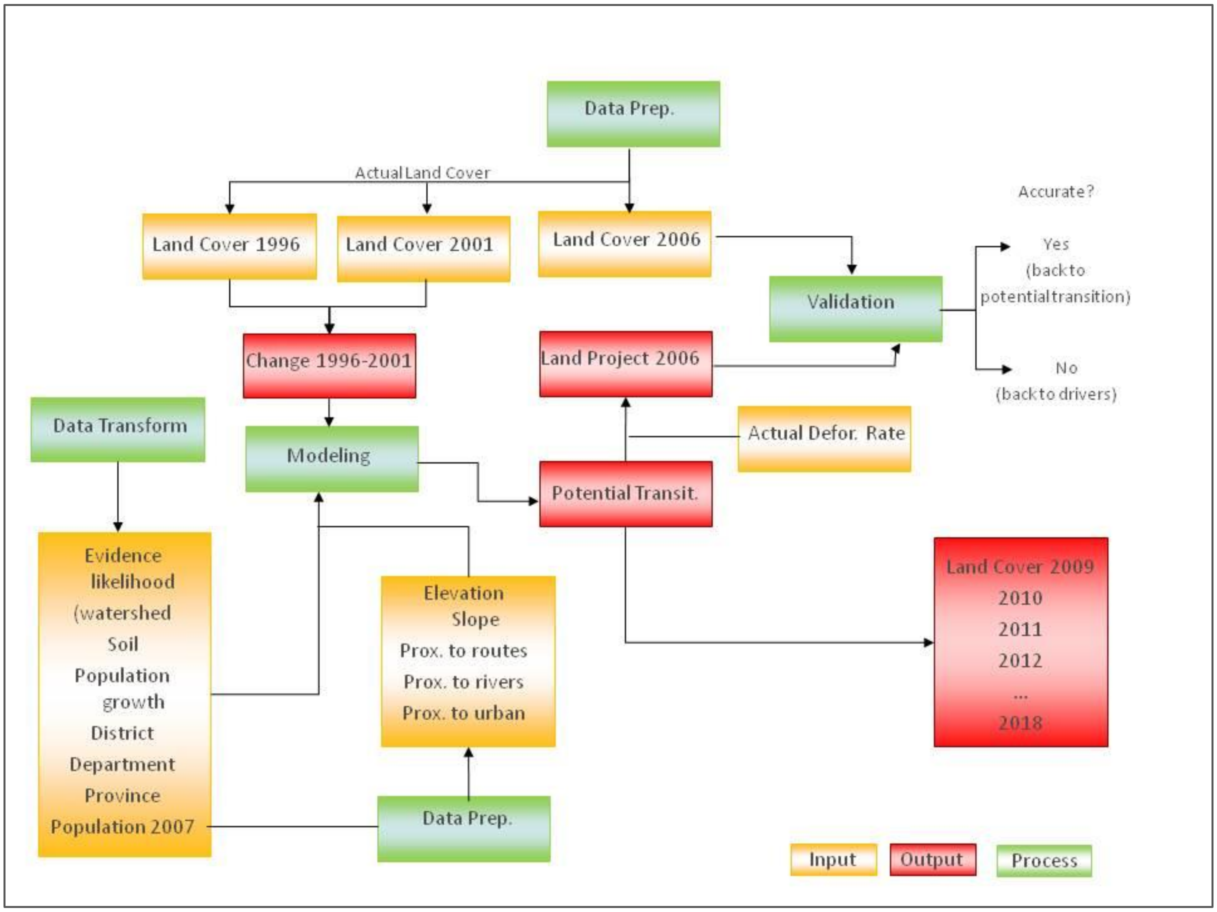


Figure 18. Flow-chart diagram of land cover prediction using IDRISI's LCM tool

VM Table 10. List of variables, maps and factor maps

Factor Map		**Source**	Variable represented		Meaning of the categories or pixel value		Other Maps and Variables used to create the Factor Map		**Algorithm or Equation used**	**Comments**
ID	File Name		Unit	Description	Range	Meaning	ID	File Name		
elevation	elevation	Aster - Global Digital Elevation Model	meter ABSL	-	709-4018	meters	-	-	-	-
slope	slope	derived from elevation - Aster - Global Digital Elevation Model	degree	-	0-79.8	degrees	-	-	-	-
proximity to primary routes	dist_routes_prim	field survey using GPS	Km	-	0-48070	km	routes (features)	routes_all	eucledean distance	-
proximity to tertiary routes	dist_routes_ter	field survey using GPS	Km	-	0-33242	km	routes (features)	routes_all	eucledean distance	-
proximity to primary rivers	dist_rivers_pri	IGN - Instituro Geografico Nacional	Km	-	0-17355	km	rivers (features)	rivers_all	eucledean distance	-
proximity to secondary rivers	dist_rivers_sec	IGN - Instituro Geografico Nacional	Km	-	0-6802	km	rivers (features)	rivers_all	eucledean distance	-
proximity to urban centers	dist_urban_twn	INEI - Instituto Nacional de Estadistica e Informatica	Km	-	0-33415	km	urban centers (features)	urban_centers	eucledean distance	-

4.2.3 Selection of the most accurate deforestation risk map

After the risk map of deforestation was created, the LCM process was used to distribute spatially the total deforestation rate. LCM assigns deforestation sequentially to the pixels of greatest potential, with a filter function to produce more realistic patches of deforestation.

To perform this task, option A was used, in which the predicted deforestation map is evaluated by comparing with a “true” observation using two sub-periods.

The actual rate of deforestation between 2001 and 2006 was then assigned to the model to predict the deforestation location in 2006. The resultant change map (2001-2006) was confirmed with the actual change map produced in step 2.4, by overlapping both maps in GIS.

The technique assessment - Figure of Merit (FOM) - was applied to assess the accuracy of the model in each forest stratum. FOM ranges from 0%, where there is no overlap between observed and predicted change, to 100%, where there is a perfect overlap between observed and predicted change. The VM0015 suggests 50% as a minimum threshold for best fit for frontier configurations as measured by the Figure of Merit approach.

If one would strictly follow the methodology, the comparative analysis of the predicted versus the observed deforestation in the project area would return a near 0% FOM, since the project area is forest land at the project start date. Conservation International, in collaboration with Clark Labs, is testing several alternative approaches to determine a representative polygon-to-project area where the model accuracy would be assessed. In addition, CI is conducting further tests and research with scientific rigor to propose an alternative statistic to assess the model at polygon level. The equation used as Figure of Merit by VM0015, should be more properly called the *Jaccard Index.* The results of our research will be discussed with the methodology developers to be incorporated in the next methodology revision. However, the results of this research might not be completed by the time of this validation, therefore we are opting to test three models as suggested by the methodology and use the one with best FOM.

Where the minimum 50% standard is not met, the methodology asks the project proponent to demonstrate that at least three models have been tested, and that the one with the best FOM is used. The FOM within our forest strata polygons was less than 50%, therefore two other models were tested (logistic regression and multi-criteria evaluation) and the one with the best FOM was chosen (neural network). The models tested will be provided to the validator for review.

Figure 19 illustrates the risk map selected based on the highest FOM. The colors in the map describe the risk of deforestation, with dark red representing high potential, decreasing until low potential represented by dark blue. The left panel shows the parameter used in the model, including start and end leaning rates and final running statistics.

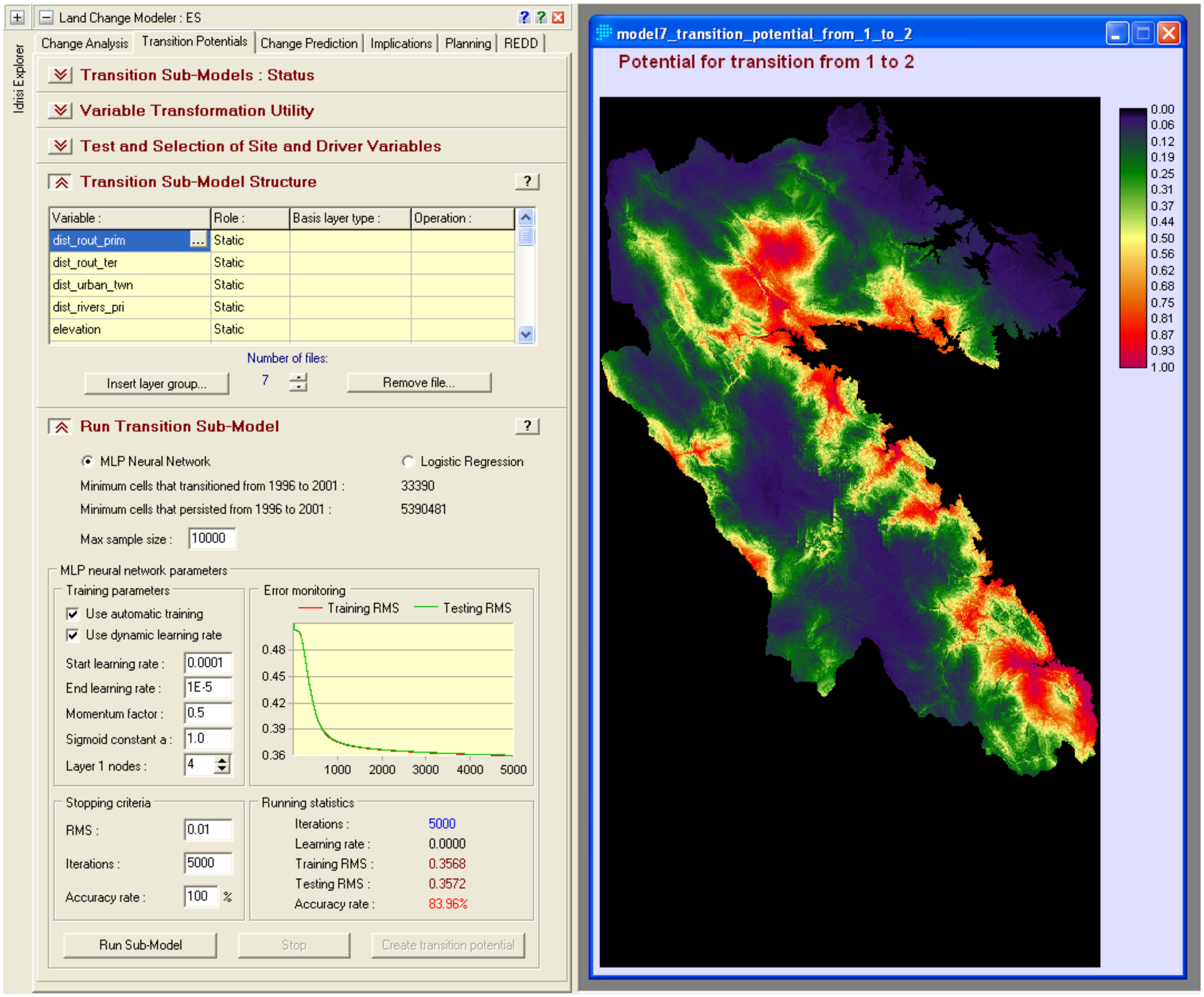


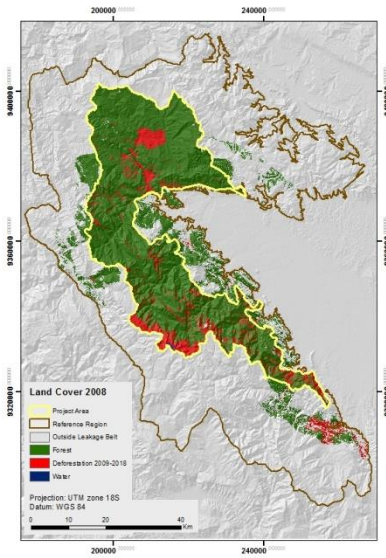
Figure 19. Deforestation risk map and LCM parameters

4.2.4 Mapping of the locations of future deforestation

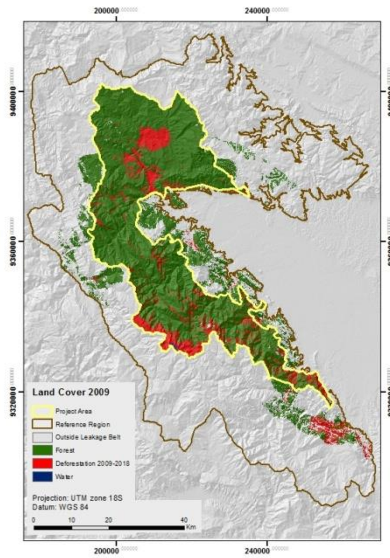
The prediction of deforestation during the project crediting period requires a forest benchmark map for the project start date, 2006. The benchmark map includes all forest observed in 2006 and excludes during the project crediting period areas covered by cloud in 2006. The rates estimated in step 4.1.3 and described in VM Table 9.a were applied to the risk map to determine the location of future baseline deforestation (2009-2018), as illustrated in Figure 20. Future deforestation is assumed to happen first at the pixel location with the highest deforestation risk value. After the completion of this step, the project area and leakage belt boundaries were overlaid using GIS to estimate the quantity of deforestation that will happen in the baseline scenario within those boundaries. The results are reported in VM Table 9.b, and 9.c.

The annual Maps of Baseline Deforestation within the project area and leakage belt are shown below:

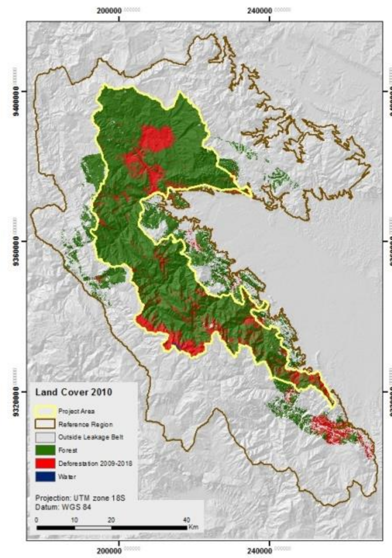
2008



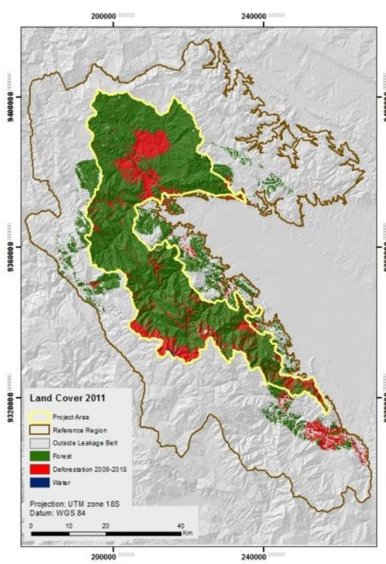
2009



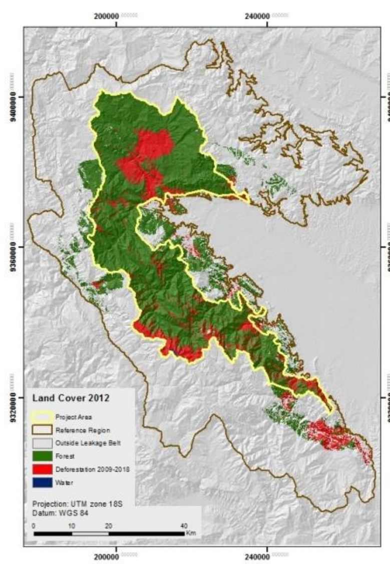
2010



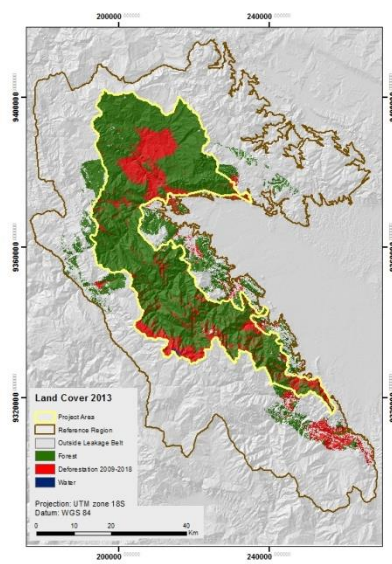
2011



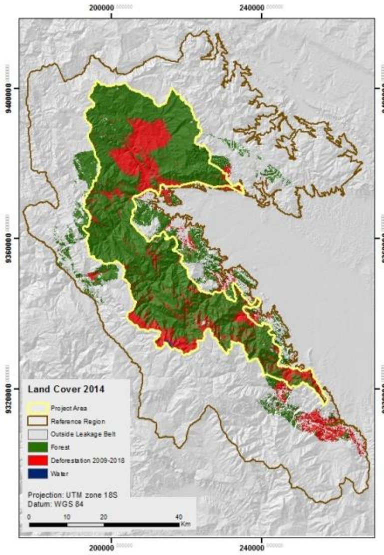
2012



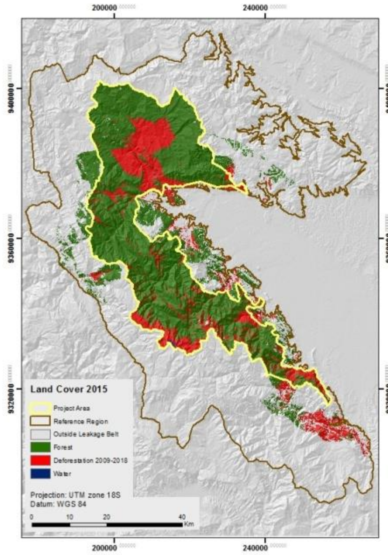
2013



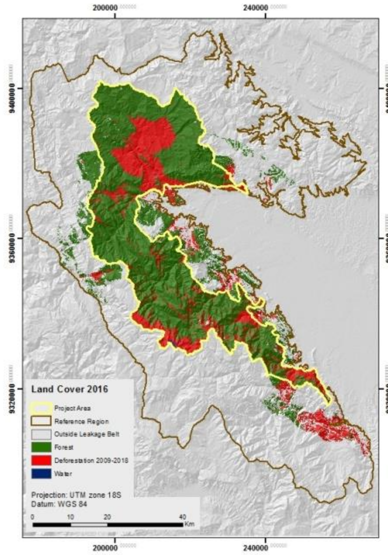
2014



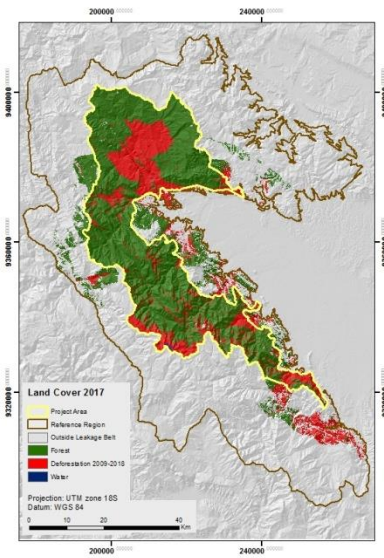
2015



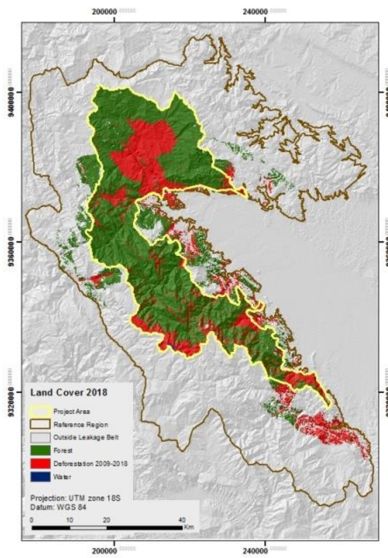
2016



2017



2018



Deforestation 2009-2018

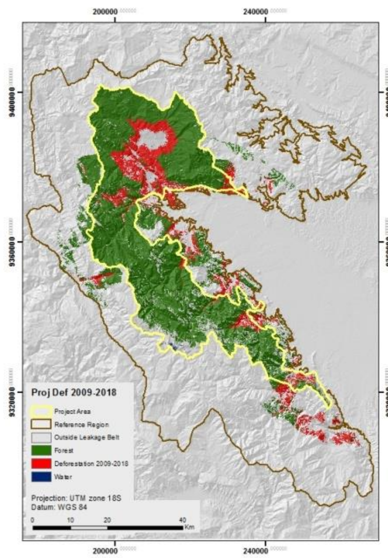


Figure 20. Annual Maps of Baseline Deforestation (2009-2018) within project area and leakage belt

Step 5: Definition of the land-use and land-cover change component of the baseline

5.1 Calculation of baseline activity data per forest class

In order to estimate the area in hectares of each forest class within the project area (pre-montane, cloud and dwarf forest) deforested under the baseline scenario, we combined the maps of Annual Baseline Deforestation for 2009-2018 with a land cover map, depicting the spatial distribution of forest types in 2008. The results are shown in VM Table 11. In the baseline scenario, the carbon stocks and boundaries of each forest class within the project area and leakage belt are assumed to remain constant. It's not expected that areas will lose carbon stocks due to degradation, logging for timber, charcoal production or fuel wood collection.

VM Table 11. Annual areas deforested per forest class within the project area in the baseline case (baseline activity data per forest class)

Area deforested per forest class *icl* within the project area				Total baseline deforestation in the project area	
IDicl>	1	2	3		
Name >	pre-montane forest	cloud forest	dwarf forest	***ABSLPA$_t$*** **annual**	***ABSLPA*** **cumulative**
Project year *t*	ha	ha	ha	ha	ha
2009	21	2,456	0	2,478	2,478
2010	9	2,359	0	2,368	4,846
2011	3	2,217	0	2,220	7,066
2012	1	2,154	0	2,155	9,221
2013	2	2,147	0	2,149	11,369
2014	2	1,964	0	1,966	13,335
2015	1	1,902	0	1,903	15,239
2016	1	1,917	0	1,917	17,156
2017	0	1,884	0	1,884	19,040
2018	0	1,801	0	1,802	20,842

5.2 Calculation of baseline activity data per post-deforestation forest class

The estimation of baseline activity data was analyzed using **Method 01** – where historical land use and land cover changes are assumed to be representative of future trends. The land-use and land-cover map for the historical period was generated by interpreting Landsat imagery. This imagery has a spatial resolution of approximately 30 meters, thus allowing for an accurate distinction between closed-canopy forest and non-forest areas. Reflectance from non-forest uses though, like pastureland and coffee plantations, are similar, resulting in a high degree of uncertainty when separating these areas in the classification. Therefore, the project considers only one non-forest land use class replacing forest vegetation and, thus, no further stratification is required. The results reported in VM Table 12.a, 12.b and 12.c are thus similar to VM Table 9.a, 9.b, and 9.c respectively.

VM Table 12.a. Annual areas of post-deforestation classes fcl within the reference region in the baseline case

Area established after deforestation per class *fcl* within the reference region		Total baseline deforestation in the reference region	
ID_{cl}	1		
Name >	non-forest	*ABSLRR_t* annual	*ABSLRR* cumulative
Project year *t*	ha	ha	ha
2009	4,735	4,735	4,735
2010	4,735	4,735	9,470
2011	4,735	4,735	14,205
2012	4,735	4,735	18,940
2013	4,735	4,735	23,675
2014	4,735	4,735	28,410
2015	4,735	4,735	33,145
2016	4,735	4,735	37,880
2017	4,735	4,735	42,615
2018	4,735	4,735	47,350

VM Table 12.b. Annual areas of post-deforestation classes fcl within the project area in the baseline case

Area established after deforestation per class *fcl* within the project area		Total baseline deforestation in the project area	
ID_{cl}	1		
Name >	non-forest	*ABSLRR_t* annual	*ABSLRR* cumulative
Project year *t*	ha	ha	ha
2009	2,478	2,478	2,478
2010	2,368	2,368	4,846
2011	2,220	2,220	7,066
2012	2,155	2,155	9,221
2013	2,149	2,149	11,369
2014	1,966	1,966	13,335
2015	1,903	1,903	15,239
2016	1,917	1,917	17,156
2017	1,884	1,884	19,040
2018	1,802	1,802	20,842

VM Table 8.c. Annual areas of post-deforestation classes fcl within the leakage belt in the baseline case

Area established after deforestation per class *fcl* within the leakage belt		Total baseline deforestation in the leakage belt	
ID	1		
Name >	non-forest	*ABSLRR$_t$* annual	*ABSLRR* cumulative
Project year *t*	ha	ha	ha
2009	1,318	1,318	1,318
2010	1,332	1,332	2,650
2011	1,348	1,348	3,997
2012	1,371	1,371	5,368
2013	1,332	1,332	6,700
2014	1,514	1,514	8,214
2015	1,574	1,574	9,788
2016	1,487	1,487	11,275
2017	1,490	1,490	12,765
2018	1,516	1,516	14,280

5.3 Calculation of baseline activity data per LU/LC change category

Not applicable to the project.

Step 6: Estimation of baseline carbon stock changes and non-CO_2 emissions

6.1 Estimation of baseline carbon stock changes

6.1.1 Estimation of the average carbon stocks of each LU/LC class

Average carbon stocks were estimated based on field measurements of forest classes present in the project area and leakage belt, as well as non-forest classes projected to exist in the project area and leakage belt under the baseline scenario; and carbon stocks existing in leakage management areas.

The AMCI commissioned the collection of initial biomass data for the Yuracyacu sub-basin by local partner AIDER in early 2008, while a complete forest inventory for the entire AMPF was completed in 2011. A total of 175 plots were measured in the field, 119 of which were located within forested areas and 56 were located within non-forested areas. Field measurements focused on above-ground biomass, while below-ground biomass was estimated through default root-to-shoot ratios and data provided in scientific literature and following IPCC Guidance (IPCC, 2003 and IPCC, 2006).

Above-ground carbon stocks:

To identify appropriate allometric equations, the AMCI conducted an extensive literature review and identified regionally-derived allometric equations specific to our forest types and appropriate for the conditions of our project site. Specifically, the equations used for broadleaf species, which are predominant in our forest inventory (82.6%), are derived from a study developed by Alvarez et. al. (2012)[26] in the nearby forests of Colombia and are similar to the altitudinal and precipitation conditions of the forest strata in our project site, based on the Holdridge classification (see AMPF Management Plan, pages 36-39). The equations chose where of the Type II.1 (without height) which according to the authors, provided the results with the lowest bias in Colombia. In addition, the equations chosen include wood density as one of the parameters, which were derived from national data-bases[27], complemented by Reyes et al. (1992)[28]. Similarly, allometric equations for palms (6.2%) and lianas (10.5%) were derived from a study developed by Sierra et. al. (2007) [29] in pre-montane forests sites in Colombia. Species-specific equations were used for the wasai palm (0.2%) and Cecropia (0.4%), derived from Pearson et. al. (2005)[30]. The equations used are illustrated in Table E below; a copy of the original studies will be provided to the validator for review.

Table E. Allometric equations identified for use in the AMPF

Forest type/ species group	Equation	Source	Original location
Pre-montane	$1.96 - 1.098 \ln(D) + 1.169 (\ln(D))^2 - 0.122 (\ln(D))^3 + 1.061 \ln(\rho)$	Alvarez et al. (2012)	Colombia (pre-montane moist)
Cloud	$1.836 - 1.255 \ln(D) + 1.169 (\ln(D))^2 - 0.122 (\ln(D))^3 - 0.222 \ln(\rho)$	Alvarez et al. (2012)	Colombia (lower montane wet)
Dwarf	$3.13 - 1.536 \ln(D) + 1.169 (\ln(D))^2 - 0.122 (\ln(D))^3 + 1.767 \ln(\rho)$	Alvarez et al. (2012)	Colombia (montane wet)
Palms	$0.360 + 1.218 \ln (H)$	Sierra et al. (2007)	Colombia (pre-montane)
Lianas	$0.028 + 1.841 \ln (D)$	Sierra et al. (2007)	Colombia (pre-montane)
Palms (*wasai*)	$6.666 + 12.826 H^{0.5} \ln(H)$	Pearson et al. (2005)	Bolivia
Cecropia species	$12.764 + 0.2588 (dbh)^{2.0515}$	Pearson et al. (2005)	Bolivia

In addition, the applicability of the allometric equations developed by Alvarez et al. (2012) to our project site were validated by following the steps of the "Limited measurements" method included in VCS Module

[26] Alvarez E., Duque A., Saldarriaga J., Cabrera K., De las Salas G., Del Valle I., Lema A., Moreno F., Orrego S., Rodríguez L. 2012. Tree above-ground biomass allometries for carbon stocks estimation in the natural forests of Colombia. Forest Ecology and Management, Volume 267: 297-308.

[27] Conferencia Peruana de la Madera. 2008. Compendio de Información Técnica de Especies Forestales 32. Tomo I y II. Lima, Perú.

[28] Reyes, G; Brown, A; Chapman, J; Lugo, A. 1992. Wood Densities of Tropical Tree Species. Gen. Tech. Rep. SO-89 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15p.

[29] Sierra C. A., Del Valle J. I., Orrego S. A., Moreno F. H., Harmon M. E., Zapata M., Colorado G. J., Herrera M. A., Lara W., Restrepo D. E., Berrouet L. M., Loaiza L. M., Benjumea J. F. 2007. Total carbon stocks in a tropical forest landscape of the Porce region, Colombia, Forest Ecology and Management, Volume 243, Issues 2–3: 299-309.

[30] Pearson, T; Walker, S; Brown, S. 2005. Sourcebook for Land use, Land-use Change and forestry Projects. Winrock international. EEUU. 57 p.

VMD000[1]: "*Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB), v1.031"*. The results confirmed the applicability of these equations to our project site, showing conservative estimates compared to the volume-based calculations. Furthermore, as shown in Table F, the application of this set of allometric equations has generated more conservative results compared to pantropical equations commonly used such as those included in Brown (1997)[32] and Chave (2005)[33], as shown below:

Table F. Comparison of total carbon stocks/ha in Alto Mayo based on pantropical vs Alvarez models (tC/ha)

AMPF Forest Classes	Brown (1997) (pantropical)	Chave Type II (pantropical)	Alvarez Type II.1 (Colombia)
Pre-montane	147.4	152.94	130.0
Cloud	156.6	157.02	141.7
Dwarf	63.1	63.21	35.9

In fact, as pointed out by the authors: *"The new models presented here can be considered as an alternative option for assessing carbon stocks in the above-ground biomass of natural forests in neotropical countries."*

In this context it is also relevant to note that the allometric equations developed by Alvarez et al (2012) are part of a broader project developed by the Colombian Ministry of Environment in collaboration with IDEAM named "*Building institutional and technical capacity to support REDD projects*", and that these equations are expected to greatly contribute to the Colombian MRV system for REDD[34].

The above-ground carbon stocks of coffee plantations, pastures and fallows were also measured in field. For coffee species, allometric equations were based on Pearson et al (2005)[35] while for fallows, the same equations were used as for the forest classes (Alvarez et al., 2012). Above-ground biomass of pastures was estimated through destructive sampling.

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[31] Available at: http://www.v-c-s.org/methodologies/VMD0001

[32] Brown, S. 1997. Estimating biomass and biomass change of tropical forests: a primer. FAO Forestry Paper 134, Rome, Italy.

[33] Chave, J., Andalo, C., Brown, S., Cairns, M.A., Chambers, J.Q., Eamus, D., Folster, H., Fromard, F., Higuchi, N., Kira, T., Lescure, J.P., Nelson, B.W., Ogawa, H., Puig, H., Riéra, B., Yamakura, T., 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145, 87–99.

[34] For further information on the project, please visit: http://www.siac.gov.co/contenido/contenido.aspx?catID=697&conID=1076

[35] Pearson, T; Walker, S; Brown, S. 2005. Sourcebook for Land use, Land-use Change and forestry Projects. Winrock international. 57 p.

Below-ground carbon stocks:

Below-ground carbon stocks of forest classes were estimated based on root-to-shoot ratios (Equation 6) provided by Cairns et al. (1997)[36] (cited in IPCC, 2003)[37] for broadleaf and *cecropia* species, as shown below:

Equation 6. Root-to-shoot ratio biomass

Biomass = exp (-1.0587 + 0.8836 * ln (AGB))

Where:
AGB= Aboveground biomass

ln = natural logarithm

With regards to palms, the standard root-to-shoot ratio for tropical rainforests was used (0.37) as established by the IPCC (2006)[38].

Below-ground carbon stocks of non-forest classes were estimated based on the root-to-shoot ratios used for forest classes in the case of fallows, and data identified in regional literature for pastures and coffee based on IPCC guidance, as illustrated below.

According to the IPCC AFOLU Guidelines, Chapter 5 on Croplands, limited data is available for below ground biomass in perennial woody vegetation (such as coffee) thus, as far as possible, empirically-derived root-to-shoot ratios specific to a region or vegetation type should be used (IPCC, 2006). Data from two studies were identified and compared to estimate the belowground biomass of coffee plantations in the AMPF. Siles et al (2010)[39] report total coarse roots dry biomass of 5.2 ± 0.4 (Mg ha^{-1}) for coffee monocultures in San Pedro de Barva, Costa Rica. These numbers are comparable to those reported by Dossa et al (2008) in the Tongo[40]. Therefore, the upper value of Siles et al (2010) were used to estimate the belowground carbon stocks of coffee plantations in the AMPF.

According to the IPCC 2006 AFOLU Guidelines, Chapter 6 on Grasslands, estimating below-ground biomass can be an important component of biomass surveys of grassland but field measurements are laborious and difficult. Hence, expansion factors to estimate below-ground biomass from above-ground biomass are often used (IPCC, 2006). However, the IPCC also notes that root-to-shoot ratios vary significantly at both individual species (e.g., Anderson et al., 1972) and community scales (e.g., Jackson

[36] Cairns M. A., Brown S., Helmer E. H., Baumgardner G. A. 1997. Root biomass allocation in the world's upland forests. Oecologia, Volume 111, Issue 1: 1-11.

[37] IPCC (Intergovernmental Panel on Climate Change). 2003. Good Practice Guidance on Land Use, Land Use Change and Forestry. IPCC, Geneva, Switzerland.

[38] Values provided for Tropical Rainforest in Table 4.4, IPCC, 2006.

[39] Siles P., Harmand J. M., Vaast P.. 2010. Effects of Inga densiflora on the microclimate of coffee (Coffea arabica L.) and overall biomass under optimal growing conditions in Costa Rica. Agroforestry Systems 78: 269-286.

[40] Dossa E. L., Fernandes E. C. M., Reid W. S., Ezui K. 2008. Above- and belowground biomass, nutrient and carbon stocks contrasting an open-grown and a shaded coffee plantation. Agroforestry Systems 72:103-115.

et al., 1996; Cairns et al., 1997). Thus it is recommended to use, as far as possible, empirically-derived root-to-shoot ratios specific to a region or vegetation type.

Data from three regional studies were identified and compared to estimate the belowground biomass of pastures in the AMPF. Amezquita et al (2006)[41] measured the root biomass component of pastures in sites with similar climatic conditions with the AMPF in the Andean Hillsides of Colombia reporting a value of 3.3 (±2.2%) tC ha^{-1}. These numbers are comparable to those found by Rojas (2003)[42] and Ramos (2003)[43] for *Brachiaria* pastures in Costa Rica, reporting values of 2.25 ha^{-1} and 3.125 ha^{-1} respectively. Therefore, the upper bound of the value reported by Amezquita et al (3.38 tC ha^{-1}) were used to estimate belowground carbon pool of pastures in the AMPF.

Due to the high uncertainty in mapping the post-deforestation classes, the project combined the common non-forest classes (conventional coffee plantations, pasture land and fallows) into a single non-forest class and estimated the weighted-average carbon stock based on the area fraction observed in the field. The proportion of each non-forest class in relation to the total non-forest area in the reference region was estimated by sampling aerial photos. Five fixed-location points in each of 50 random photos covering the reference region and project area were analyzed, and the land-cover/land-use of each point described. See (Sup.Inf_Meth_05a-b) for a full list of the points and proportion estimation equations.

Due to the high uncertainty in mapping the post-deforestation classes, the project combines the common non-forest classes (conventional coffee plantations, pasture land and fallows) into a single non-forest class and estimated the weighted-average carbon stock based on the area fraction observed in the field. The proportion of each non-forest class in relation to the total non-forest area in the reference region was estimated by sampling aerial photos. Five fixed-location points in each of 50 random photos covering the reference region and project area were analyzed, and the land-cover/land-use of each point described. See (Sup.Inf_Meth_05a-b) for a full list of the points and proportion estimation equations.

The fraction of each non-forest class in the reference region was, thus, estimated as follows: conventional coffee plantations 38%, fallows 22% and pastures 40%. The carbon stock of the single non-forest class, representing the post-deforestation class, was then estimated based on the area-weighted average carbon stock added by the higher boundary of the 90% confidence interval (Table G). This addition occurs to produce more conservative estimates, since the uncertainty in field measurements for these classes was higher than 10%.

Table G. Weighted-area average of post-deforestation (non-forest) classes

Area-weighted average total carbon stock in non-forest			
Parameter	**Pasture**	**Coffee**	**Fallow**

[41] Amézquita M. C., Van Putten B., Ibrahim M., Ramírez B. L., Giraldo H. Gómez M. E. 2006. Recovery of Degraded Pasture Areas and C-sequestration in Ecosystems

[42] Rojas, 2003. Secuestro de carbono y uso de agua en Sistemas Silvopastoriles con especies maderables nativas en el trópico seco de Costa Rica. Tesis de maestria. CATIE, Costa Rica.

[43] Ramos Veintimilla R. A. 2003. Fraccionamiento del carbono orgánico del suelo en tres tipos de uso de la tierra en fincas ganaderas de San Miguel de Barranca, Puntarenas-Costa Rica. Tesis de maestria. CATIE, Costa Rica.

Post-defor LC (ha in 100 ha)	40	38	22
Post-defor C stock (tCO2 ha-1)	25.29	68.67	180.17
90% C.I. est (tCO2)	2.04	9.97	58.37
C stock best est. (tCO2)	1,012	2,610	3,964
C stock upper 90% C.I. est (tCO2)	81	379	1,284
Total C stock best est (tCO2)	7,585		
Total C stock 90% C.I. est (tCO2)	1,744		
Area-weighted mean C stock best est (tCO_2 /ha)	**75.85**		
Area-weighted mean C stock upper 90% C.I. est (tCO_2/ha)	**17.44**		

In the baseline scenario, the carbon stocks and boundaries of the forest classes within the project area and leakage belt are assumed to remain constant. It is not expected that areas will lose carbon due to degradation, logging for timber, charcoal production or fuel wood collection. The project conservatively omits any increase in carbon stocks within the forest classes due to avoided deforestation. Likewise, degradation in the leakage belt is conservatively omitted and, therefore, a map sequence highlighting the polygons of degradation was not produced.

A complete description of the sampling design and field measurements are provided in Supportive Information (Sup.Inf_Meth_04a-d). A sample of field data sheets will be provided to the validator. The average carbon content in each forest and non-forest class as well as the 90% confidence intervals are reported in VM Table 14.

6.1.2 Calculation of baseline carbon stock changes

Method 01 was used to calculate the baseline carbon stock change. Carbon stock changes in the project area were estimated by subtracting the annual area of the final non-forest class multiplied by its average carbon stock from the annual deforested area per forest class multiplied by the respective average carbon stock (Equation 7).

Equation 7. Carbon stock changes in the project area

$$\Delta CBSLPA_t = \sum_{icl=1}^{Icl} ABSLPA_{icl,t} * Ctot_{icl,t} - \sum_{fcl=1}^{Fcl} ABSLPA_{fcl,t} * Ctot_{fcl,t}$$

Where:

$\Delta CBSLPA_t$	Total baseline carbon stock change within the project area at year t; tCO_{2-e}
$ABSLPAicl_t$	Area of initial forest class *icl* deforested at time t within the project area in the baseline case; ha
$Ctoticl_t$	Average carbon stock of all accounted carbon pools in the initial forest class *icl* at time t; tCO_{2-e}
$ABSLPAfcl_t$	Area of the final non-forest class *fcl* at time t within the project area in the baseline case; ha
$Ctotfcl_t$	Average carbon stock of all accounted carbon pools in non-forest class *fcl* at time t; tCO_{2-e}
Icl	1, 2, 3 … *Icl* initial (pre-deforestation) forest classes; dimensionless
Fcl	1, 2, 3 … *Fcl* final (post-deforestation) non-forest classes; dimensionless

t 1, 2, 3 … *T*, a year of the proposed crediting period; dimensionless

Results are reported in VM Table 14, 15.a, 15.b, and 15.c.

VM Table 14. Average carbon stock per hectare of all LU/LC classes present in the project area, leakage belt and leakage management area

LU/LC class		Average carbon stock per hectare + 90% CI					
		Cab_{cl}		Cbb_{cl}		$Ctot_{cl}$	
		average stock	+ 90% CI	*average stock*	+ 90% CI	*average stock*	+ 90% CI
ID_{cl}	Name	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
1	pre-montane forest	379.1	62.6	97.6	15.5	476.8	77.9
2	cloud forest	415.2	29.4	104.4	7.3	519.6	36.6
3	dwarf forest	104.7	34.0	27.1	9.7	131.8	43.7
4	non-forest	63.1	14.7	15.9	3.2	75.9	17.4

Where:

Cab_{cl} Average carbon stock per hectare in the above-ground biomass carbon pool of class cl; tCO_2-e ha^{-1}

Cbb_{cl} Average carbon stock per hectare in the below-ground biomass carbon pool of class cl; tCO_2-e ha^{-1}

Cdw_{cl} Average carbon stock per hectare in the dead wood biomass carbon pool of class cl; tCO_2-e ha^{-1}

Cl_{cl} Average carbon stocker hectare in the litter carbon pool of class cl; tCO_2-e ha^{-1}

$Csoc_{cl}$ Average carbon stock in the soil organic carbon pool of class cl; tCO_2-e ha^{-1}

Cwp_{cl} Average carbon stocker hectare accumulated in the harvested wood products carbon pool between project start and the year of deforestation (stock remaining in wood products after 100 years)of class cl; tCO_2-e ha^{-1}

VM Table 15.a. Baseline carbon stock change in pre-deforestation (forest) classes

Project year *t*	Carbon stock changes in initial (pre-deforestation) forest classes in the project area						Total carbon stock change in initial forest classes	
	ID_{icl} pre-montane		ID_{icl} = cloud		ID_{icl} = dwarf		annual	cumulative
	$ABSLPA_{icl,t}$	$Ctot_{icl,t}$	$ABSLPA_{icl,t}$	$Ctot_{icl,t}$	$ABSLPA_{icl,t}$	$Ctot_{icl,t}$	□$CBSLPAi_t$	□$CBSLPAi$
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2009	21	399	2,456	520	0	88	1,284,780	1,284,780
2010	9	399	2,359	520	0	88	1,229,353	2,514,133
2011	3	399	2,217	520	0	88	1,153,079	3,667,211
2012	1	399	2,154	520	0	88	1,119,680	4,786,892
2013	2	399	2,147	520	0	88	1,116,212	5,903,104
2014	2	399	1,964	520	0	88	1,021,238	6,924,341
2015	1	399	1,902	520	0	88	988,849	7,913,190
2016	1	399	1,917	520	0	88	996,173	8,909,363
2017	0	399	1,884	520	0	88	979,018	9,888,381

2018	0	399	1,801	520	0	88	936,035	10,824,417

VM Table 9.b. Baseline carbon stock change in post-deforestation (non-forest) classes

Project year *t*	Carbon stock changes in final (post-deforestation) non-forest classes in the project area		Total carbon stock change in final non-forest classes	
	ID_{fcl}	= 1	annual	cumulative
	$ABSLPA_{fcl,t}$	$Ctot_{fcl,t}$	$\Delta CBSLPAf_t$	$\Delta CBSLPAf$
	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2009	2,478	93	231,144	231,144
2010	2,368	93	220,917	452,062
2011	2,220	93	207,105	659,167
2012	2,155	93	201,060	860,227
2013	2,149	93	200,447	1,060,674
2014	1,966	93	183,402	1,244,076
2015	1,903	93	177,575	1,421,651
2016	1,917	93	178,877	1,600,528
2017	1,884	93	175,787	1,776,315
2018	1,802	93	168,104	1,944,419

VM Table 15.c. Total net baseline carbon stock change in the project area

Project year *t*	Total carbon stock change in initial forest classes		Total carbon stock change in final non-forest classes		Total baseline carbon stock change in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPAi_t$	$\Delta CBSLPAi$	$\Delta CBSLPAf_t$	$\Delta CBSLPAf$	$\Delta CBSLPA_t$	$\Delta CBSLPA$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	1,284,780	1,284,780	231,144	231,144	1,053,635	1,053,635
2010	1,229,353	2,514,133	220,917	452,062	1,008,436	2,062,071
2011	1,153,079	3,667,211	207,105	659,167	945,973	3,008,045
2012	1,119,680	4,786,892	201,060	860,227	918,620	3,926,665
2013	1,116,212	5,903,104	200,447	1,060,674	915,765	4,842,430
2014	1,021,238	6,924,341	183,402	1,244,076	837,835	5,680,265
2015	988,849	7,913,190	177,575	1,421,651	811,273	6,491,539
2016	996,173	8,909,363	178,877	1,600,528	817,296	7,308,835
2017	979,018	9,888,381	175,787	1,776,315	803,232	8,112,067
2018	936,035	10,824,417	168,104	1,944,419	767,931	8,879,998

6.2 Baseline non-CO_2 emissions from forest fires

Data on forest fires used as a tool for conversion of forest to non-forest during the historical period in the project area and reference region are unavailable with sufficient accuracy to provide acceptable estimates of non-CO_2 emissions. Thus, we conservatively omit the non-CO_2 emissions from forest fires in the baseline.

Step 7: Ex ante estimation of actual carbon stock changes and non-CO_2 emissions in the project area

7.1 Ex ante estimation of actual carbon stock change

7.1.1 Ex ante estimation of actual carbon stock changes due to planned activities

According to the methodology, the project proponent should account for changes in the carbon stocks in the project area due to planned project activities.

The reduction in carbon and non-CO_2 emissions inside the AMPF generated by the AMCI are based on assumed reductions in the deforestation rate that will occur throughout the project area. Project activities to achieve those reductions will not lead to any change in carbon stocks. Planned deforestation or degradation as a result of infrastructure implementation, timber logging, or charcoal production for example, are not being considered as part of the project's activities. However, an increase in patrolling activities using purchased additional auto-motor vehicles is planned, which might lead to an increase in GHG emissions – this change in stock is not considered significant by VM0015 and will conservatively be omitted.

7.1.2 Ex ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the project area

The actual emissions reductions generated by the AMCI will be determined through *ex-post* measurements of project results based on its monitoring plan. Here, under the assumption of project effectiveness and following the methodology requirements, the *ex-ante* carbon stock changes within the project area are estimated by multiplying the annual total baseline carbon stock change by the factor (1-EI), where (EI) is an Effectiveness Index ranging from 0 (no effectiveness) to 1 (maximum effectiveness).

The EI was estimated based on the implementation agenda of project activities. We also assume that as conservation agreements are implemented, and enforcement to reduce illegal activities is increased, a higher effectiveness rate will be achieved. We assume that in 2009, 2010 and 2011 the effectiveness rate will be 50%, i.e. the project will be able to halt in half the baseline emissions. Then EI will increase gradually until reaching 90% in 2018.

7.1.3 Ex ante estimated net actual carbon stock changes in the project area

The results of the previous step are summarized in VM Table 22.

VM Table 22. Ex ante estimated net carbon stock change in the project area under the project scenario

Project year *t*	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulatie	annual	cumulativ	annual	cumulative	annual	cumulative

	$\Delta CPAdPA_t$ tCO$_2$-e	$\Delta CPAdPA$ tCO$_2$-e	$\Delta CPAiPA_t$ tCO$_2$-e	$\Delta CPAiPA$ tCO$_2$-e	$\Delta CUDdPA_t$ tCO$_2$-e	$\Delta CUDdPA$ tCO$_2$-e	$\Delta CPSPA_t$ tCO$_2$-e	$\Delta CPSPA$ tCO$_2$-e
2009	0	0	0	0	526,818	526,818	(526,818)	(526,818)
2010	0	0	0	0	504,218	1,031,036	(504,218)	(1,031,036)
2011	0	0	0	0	472,987	1,504,022	(472,987)	(1,504,022)
2012	0	0	0	0	413,379	1,917,401	(413,379)	(1,917,401)
2013	0	0	0	0	412,094	2,329,496	(412,094)	(2,329,496)
2014	0	0	0	0	335,134	2,664,630	(335,134)	(2,664,630)
2015	0	0	0	0	283,946	2,948,575	(283,946)	(2,948,575)
2016	0	0	0	0	245,189	3,193,764	(245,189)	(3,193,764)
2017	0	0	0	0	160,646	3,354,411	(160,646)	(3,354,411)
2018	0	0	0	0	76,793	3,431,204	(76,793)	(3,431,204)

7.2 Ex ante estimation of actual non-CO_2 emissions from forest fires

Not applicable to the project.

7.3 Total ex ante estimations for the project area

The total ex-ante estimation of emissions for the project area are reported in Table 24.

VM Table 24. Total ex ante estimated actual net carbon stock changes and emissions of non-CO2 gasses in the project area

Project year *t*	Total *ex ante* carbon stock decrease due to planned activities		Total *ex ante* carbon stock increase due to planned activities		Total *ex ante* carbon stock decrease due to unavoided unplanned deforestation		Total *ex ante* net carbon stock change		Total *ex ante* estimated actual non-CO_2 emissions from forest fires in the project area	
	annual $\Delta CPAdPA_t$ tCO$_2$-e	cumulativ $\Delta CPAdPA$ tCO$_2$-e	annual $\Delta CPAiPA_t$ tCO$_2$-e	cumulat $\Delta CPAiPA$ tCO$_2$-e	annual $\Delta CUDdPA_t$ tCO$_2$-e	cumulative $\Delta CUDdPA$ tCO$_2$-e	annual $\Delta CPSPA_t$ tCO$_2$-e	cumulative $\Delta CPSPA$ tCO$_2$-e	annual $EBBPSPA_t$ tCO$_2$-e	cumulat $EBBPSPA$ tCO$_2$-e
2009	0	0	0	0	526,818	526,818	(526,818)	(526,818)	0	0
2010	0	0	0	0	504,218	1,031,036	(504,218)	(1,031,036)	0	0
2011	0	0	0	0	472,987	1,504,022	(472,987)	(1,504,022)	0	0
2012	0	0	0	0	413,379	1,917,401	(413,379)	(1,917,401)	0	0
2013	0	0	0	0	412,094	2,329,496	(412,094)	(2,329,496)	0	0
2014	0	0	0	0	335,134	2,664,630	(335,134)	(2,664,630)	0	0
2015	0	0	0	0	283,946	2,948,575	(283,946)	(2,948,575)	0	0
2016	0	0	0	0	245,189	3,193,764	(245,189)	(3,193,764)	0	0
2017	0	0	0	0	160,646	3,354,411	(160,646)	(3,354,411)	0	0

2018	0	0	0	0	76,793	3,431,204	(76,793)	(3,431,204)	0	0

Step 8: Ex ante estimation of leakage

8.1 Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures

8.1.1 Carbon stock changes due to activities implemented in leakage management areas

Leakage Management Areas (LMAs) are already deforested lands located mostly within the Recovery Zone of the AMPF and adjacent lands in the Buffer Zone (Figure 21). These areas are currently conventional coffee plantations or degraded lands that in the absence of the project, would remain coffee and gradually be converted to pasturelands, or simply be left as degraded lands. This information is supported by the analysis of drivers of deforestation (see Sup.Inf_Meth_01) and was also cross-validated with local experts. Forest lands are first converted to coffee plantations; after coffee yields decrease these areas enter a crop-fallow cycle and are ultimately converted to pastureland. They remain pastureland until becoming completely degraded. Therefore, the baseline for these areas is non-forest remaining non-forest and thus the carbon stock change is assumed to be zero.

Leakage prevention activities in these areas in the project scenario include the introduction of sustainable coffee practices, through the use of agroforestry techniques and organic fertilizers, while some reforestation with native species will also take place in degraded lands. Carbon stocks in LMAs in the project scenario are thus expected to increase compared to the baseline. However, we conservatively assume that they will remain non-forest land, and the carbon stock in LMAs will consequently remain unchanged through the life of the project.

Similarly, emissions from the application of organic fertilizers in LMAs was estimated and considered to be insignificant. The fertilization of coffee plantations will include a mixture of guano (bird waste), chemical elements (copper, sulfate, etc) and bokashi composting. Guano originates from sea birds and has high levels of nitrogen and phosphorus. Nitrogen can reach 16% of the dry weight[44] according to the literature. Bokashi composting uses anaerobic decomposition and a combination of litter and coffee residual organic waste. According to pilot studies, the GHG emissions from bokashi fermentation would be negligible[45].

The project expects to use up to 200 tons of fertilizer per year (Table H) with a final composition of 32% guano, 10% smaller elements (potassium sulfate, potassium, zinc and copper) and phosphoric rock, and 58% bokashi per farmer. The application of this fertilizer will begin in 2011, although the emission of CO_{2e} will take several years. To be conservative, we assumed that all emissions will be released in the first

[44] *Encyclopædia Britannica. Encyclopædia Britannica Online*. Encyclopædia Britannica, 2011. Web. 19 Jul. 2011. <http://www.britannica.com/EBchecked/topic/247789/guano>.

[45] Lawrence Green. A Pilot study comparing GHG emissions associated with organic waste treated with and without bokashi fermentation, 2009. http://www.bokashicycle.com/Pilot%20GHG%20Bokashi%20Fermentation%20Study%20Results.pdf

year after its application. The total expected CO_{2e} emissions from this activity are 0,41 tCO_{2e} in the baseline period, therefore the emissions from this source are not significant, and have been omitted.

Table H. Estimation of CO_2 emission from the use of fertilizer

Proj year y	Total amount of fertilizer (t)	Total amount of guano (t)	N in guano (tN)	N_2O in guano (tN_2O)	CO_2e in guano (tCO_2)	Total Amount of bokashi (t)	C in bokashi (tC)	CH_4 in bokashi $(t)CH_4$	CO_2e in bokashi (tCO2)	CO_2e emission per year (tCO2)	Cumulative CO_2e emission (t CO2)
2011	122	39	6	10	0	30	0	0	0	0.03	0.03
2012	196	63	10	16	0	49	0	0	0	0.05	0.08
2013	271	86	14	22	0	68	0	0	0	0.07	0.15
2014	200	64	10	16	0	50	0	0	0	0.05	0.20
2015	200	64	10	16	0	50	0	0	0	0.05	0.26
2016	200	64	10	16	0	50	0	0	0	0.05	0.31
2017	200	64	10	16	0	50	0	0	0	0.05	0.36
2018	200	64	10	16	0	50	0	0	0	0.05	0.41

The leakage prevention activities are not associated with other VCS or UNFCCC registered project activities. In addition, the consumption of fossil fuels, as a result of the project activity, is considered always insignificant by the methodology and not considered in this project. The estimated net carbon stock change and non-CO_2 emissions in LMAs are illustrated in VM Table 25.c while a map is provided in Figure 21.

VM Table 25.c. Ex ante estimated net carbon stock change and non-CO2 emissions in leakage management areas*

Project year *t*	Total carbon stock change and non-CO2 emissions in leakage management areas in the baseline case		Total carbon stock changes and non-CO2 emissions in leakage management areas in the project case		Net carbon stock change due to leakage prevention measures	
	annual	cumulative	annual	cumulative	annual	cumulative
	DCBSLLKt	*DCBSLLK*	*DCPSLKt*	*DCPSLK*	*DCLPMLKt*	*DCLPMLK*
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
2012	0	0	0	0	0	0
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0

* estimates are made based on a projection of 835 Conservation Agreements implemented during the project's lifetime and an average of 3ha managed per farmer

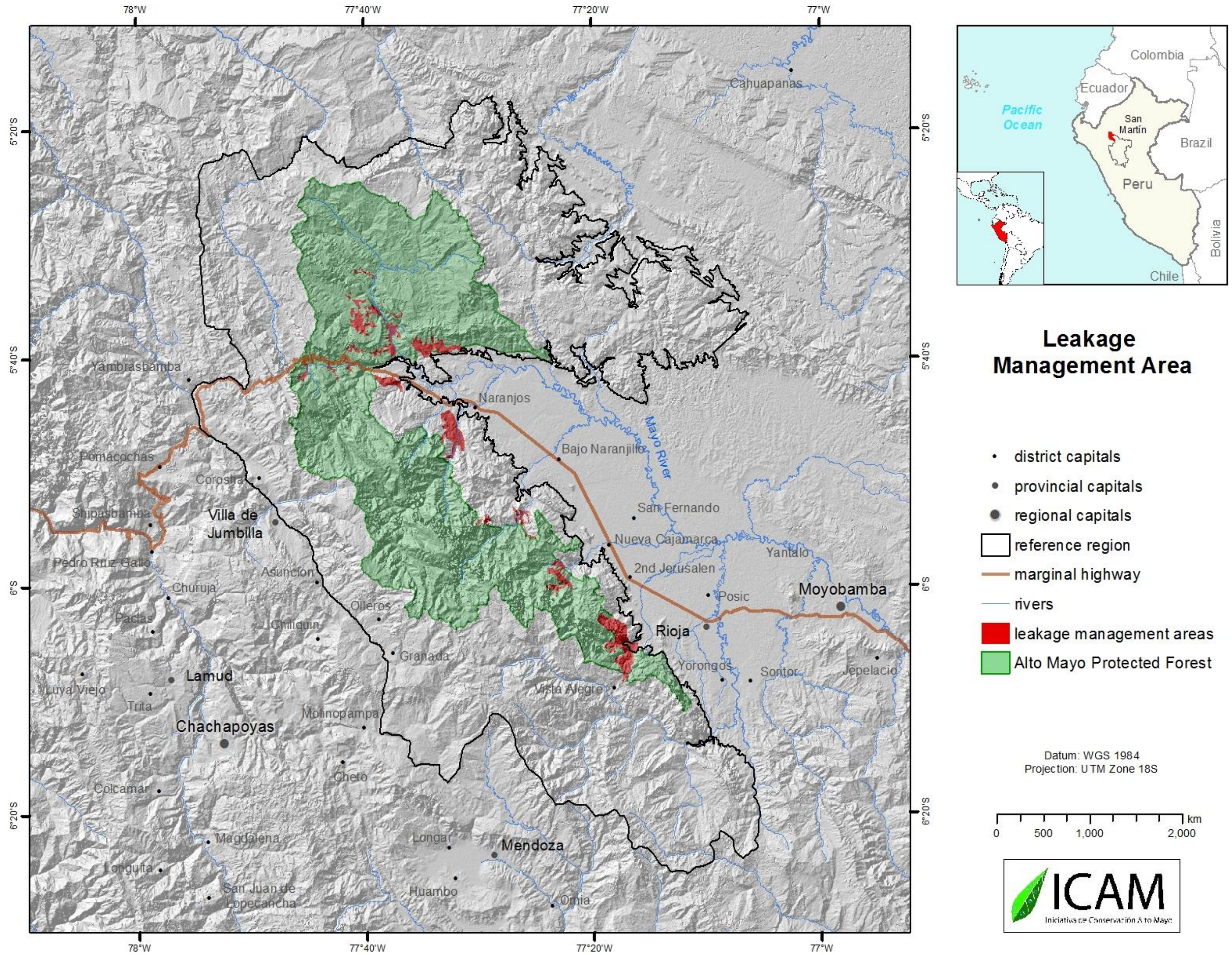

Figure 21. Map of Leakage Management Areas

8.1.2 Ex ante estimation of CH_4 and N_2O emissions from grazing animals

Project activities associated with leakage prevention do not include any livestock management, therefore emissions as result of grazing are not considered.

8.1.3 Total ex ante estimated carbon stock changes and increases in GHG emissions due to leakage prevention measures

There are no significant increases in GHG emissions due to leakage prevention measures.

8.2 Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage

The ex-ante estimation of decrease in carbon stocks under the baseline scenario within the leakage belt follows the same method used to estimate the carbon stock decrease in the project area (step 6.1.2). We used activity data for classes (**Method 01**) to estimate the ex ante baseline carbon stock changes within the leakage belt. (VM Table 29.a, 29.b, and 29.c)

VM Table 29.a. Baseline carbon stock change in pre-deforestation (forest) classes

Project year *t*	Carbon stock changes in initial (pre-deforestation) forest classes in the leakage belt						Total carbon stock change in initial forest classes	
	ID_{icl}	pre-montane	ID_{icl}	= cloud	ID_{icl}	= dwarf	annual	cumulative
	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$\Delta CBSLLKi_t$	$\Delta CBSLLKi$
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2009	0	399	1,111	520	-	132	577,395	577,395
2010	0	399	1,088	520	-	132	565,423	1,142,818
2011	0	399	1,082	520	0	132	562,442	1,705,261
2012	0	399	1,203	520	1	132	625,364	2,330,625
2013	0	399	1,290	520	6	132	671,204	3,001,829
2014	0	399	1,281	520	11	132	667,145	3,668,974
2015	0	399	1,491	520	27	132	778,157	4,447,131
2016	0	399	1,596	520	41	132	834,922	5,282,053
2017	0	399	1,715	520	58	132	898,541	6,180,594
2018	0	399	1,700	520	63	132	891,536	7,072,130

VM Table 29.b. Baseline carbon stock change in post-deforestation (non-forest) classes

Project year *t*	Carbon stock changes in final (post-deforestation) non-forest classes on the leakage belt		Total carbon stock change in final non-forest classes	
	ID_{fcl}	= 1	annual	cumulative
	$ABSLLK_{fcl,t}$	$Ctot_{fcl,t}$	$\Delta CBSLLKf_t$	$\Delta CBSLLKf$
	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2009	1,318	93	122,957	122,957
2010	1,332	93	124,241	247,198
2011	1,348	93	125,719	372,917
2012	1,371	93	127,894	500,811
2013	1,332	93	124,241	625,052
2014	1,514	93	141,261	766,313
2015	1,574	93	146,878	913,191
2016	1,487	93	138,708	1,051,900
2017	1,490	93	138,960	1,190,860
2018	1,516	93	141,387	1,332,247

VM Table 109.c. Total net baseline carbon stock change in the leakage belt

Project year *t*	Total carbon stock change in initial forest classes		Total carbon stock change in final non-forest classes		Total baseline carbon stock change	
	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLLKi_t$	$\Delta CBSLLKi$	$\Delta CBSLLKf_t$	$\Delta CBSLLKf$	$\Delta CBSLLK_t$	$\Delta CBSLLK$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	577,395	577,395	122,957	122,957	454,438	454,438
2010	565,423	1,142,818	124,241	247,198	441,182	895,620
2011	562,442	1,705,261	125,719	372,917	436,723	1,332,344
2012	625,364	2,330,625	127,894	500,811	497,471	1,829,814
2013	671,204	3,001,829	124,241	625,052	546,963	2,376,777
2014	667,145	3,668,974	141,261	766,313	525,884	2,902,661
2015	778,157	4,447,131	146,878	913,191	631,279	3,533,940
2016	834,922	5,282,053	138,708	1,051,900	696,213	4,230,153
2017	898,541	6,180,594	138,960	1,190,860	759,581	4,989,734
2018	891,536	7,072,130	141,387	1,332,247	750,150	5,739,884

Similar to the estimation of the *ex-ante* carbon stock change in the project area, the *ex-ante* estimation of carbon stock changes and GHG emissions in the leakage belt is based on the assumed effectiveness of the leakage prevention activities. Following the methodology, a Displacement Leakage Factor (DLF) is used as a proxy for this effectiveness and is estimated as a percentage of baseline carbon stock changes within the project area that are displaced within the leakage belt.

In order to increase the effectiveness of the project, the agent groups of deforestation have been engaged and involved in the project activities. We assumed that 5% of the deforestation within the project area in the baseline case will be displaced to the leakage belt in the first 3 years of the project and will decrease annually until reaching 0% in 2018 (VM Table 32). GHG emissions due to displaced forest fires are not considered since they are excluded from the project accounting.

VM Table 32. Ex ante estimated leakage due to activity displacement

Project year *t*	Total *ex ante estimated* decrease in carbon stocks due to displaced deforestation		Total *ex ante estimated* increase in GHG emissions due to displaced forest fires	
	annual	cumulative	annual	cumulative
	$\Delta CADLK_t$	$\Delta CADLK$	$EADLK_t$	$EADLK$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	(52,682)	(52,682)	0	0
2010	(50,422)	(103,104)	0	0
2011	(47,299)	(150,402)	0	0
2012	(36,745)	(187,147)	0	0
2013	(36,631)	(223,778)	0	0
2014	(25,135)	(248,913)	0	0
2015	(24,338)	(273,251)	0	0
2016	(16,346)	(289,597)	0	0
2017	(8,032)	(297,629)	0	0
2018	0	(297,629)	0	0

8.3 Ex ante estimation of total leakage

The total ex-ante leakage estimation is reported in VM Table 33.

VM Table 33. Ex ante estimated total leakage

Project year *t*	Total *ex ante* decrease in carbon stocks due to displaced deforestation		Carbon stock decrease or non-CO2 emissions due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CADLK_t$	$\Delta CADLK$	$\Delta CLPMLKt$	$\Delta CLPMLK$	ΔCLK_t	ΔCLK	ELK_t	ELK
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	(52,682)	(52,682)	0	0	(52,682)	(52,682)	0	0
2010	(50,422)	(103,104)	0	0	(50,422)	(103,104)	0	0
2011	(47,299)	(150,402)	0	0	(47,299)	(150,402)	0	0
2012	(36,745)	(187,147)	0	0	(36,745)	(187,147)	0	0
2013	(36,631)	(223,778)	0	0	(36,631)	(223,778)	0	0
2014	(25,135)	(248,913)	0	0	(25,135)	(248,913)	0	0
2015	(24,338)	(273,251)	0	0	(24,338)	(273,251)	0	0
2016	(16,346)	(289,597)	0	0	(16,346)	(289,597)	0	0
2017	(8,032)	(297,629)	0	0	(8,032)	(297,629)	0	0
2018	0	(297,629)	0	0	0	(297,629)	0	0

Step 9: Ex ante total net anthropogenic GHG emission reductions

9.1 Significance assessment

Only the carbon stored in the above and below ground biomass pools were considered by the project. While the above-ground pool is mandatory, the below-ground pool is optional but recommended by the methodology, since it represents between 15% to 30% of the carbon stored in above-ground biomass, and is therefore a significant pool. Root-to-shoot ratios and data to estimate the carbon stocks in the below-ground biomass pool were sourced from regional literature following IPCC (2006) guidance.

Harvested wood products were excluded as significant timber removal is not associated with the baseline scenario.

9.2 Calculation of ex-ante estimation of total net GHG emissions reductions and Calculation of ex-ante Verified Carbon Units (VCUs)

The ex-ante estimation of total net GHG emissions reductions and the calculation of ex-ante Verified Carbon Units (VCUs) to be generated through the proposed AUD project activity are summarized in Table 34. Ex-ante buffer credits are calculated based on a 10% risk factor estimated through the VCS non-permanence risk tool.

VM Table 34. Ex-ante estimated net anthropogenic GHG emission reductions (DREDDt) and Voluntary Carbon Units (VCUt)

Project year *t*	Baseline carbon stock changes		*Ex ante* project carbon stock changes		*Ex ante* leakage carbon stock changes		*Ex ante* net anthropogenic GHG emission reductions		*Ex ante* VCUs tradable		*Ex ante* buffer credits*	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPA_t$	$\Delta CBSLPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	ΔCLK_t	ΔCLK	$\Delta REDD_t$	$\Delta REDD$	VCU_t	VCU	VBC_t	VBC
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2009	1,053,635	1,053,635	(526,818)	(526,818)	(52,682)	(52,682)	474,136	474,136	421,454	421,454	52,682	52,682
2010	1,008,436	2,062,071	(504,218)	(1,031,036)	(50,422)	(103,104)	453,796	927,932	403,374	824,829	50,422	103,104
2011	945,973	3,008,045	(472,987)	(1,504,022)	(47,299)	(150,402)	425,688	1,353,620	378,389	1,203,218	47,299	150,402
2012	918,620	3,926,665	(413,379)	(1,917,401)	(36,745)	(187,147)	468,496	1,822,116	417,972	1,621,190	50,524	200,926
2013	915,765	4,842,430	(412,094)	(2,329,496)	(36,631)	(223,778)	467,040	2,289,157	416,673	2,037,863	50,367	251,293
2014	837,835	5,680,265	(335,134)	(2,664,630)	(25,135)	(248,913)	477,566	2,766,723	427,296	2,465,159	50,270	301,564
2015	811,273	6,491,539	(283,946)	(2,948,575)	(24,338)	(273,251)	502,990	3,269,712	450,257	2,915,416	52,733	354,296
2016	817,296	7,308,835	(245,189)	(3,193,764)	(16,346)	(289,597)	555,762	3,825,474	498,551	3,413,967	57,211	411,507
2017	803,232	8,112,067	(160,646)	(3,354,411)	(8,032)	(297,629)	634,553	4,460,027	570,294	3,984,261	64,259	475,766
2018	767,931	8,879,998	(76,793)	(3,431,204)	0	(297,629)	691,138	5,151,165	622,024	4,606,285	69,114	544,879

* Ex-ante buffer credits are calculated based on a 10% Risk Factor (RF) estimated through the VCS non-permanence risk tool.

Part 3 – Methodology for monitoring and re-validation of the baseline

Task 1: Monitoring of carbon stock changes and GHG emissions for periodical verifications

1.1 Monitoring of actual carbon stock changes and GHG emissions within the project area

1.1.1 Monitoring of project implementation

Monitoring of the AMCI project implementation is conducted through different components that together form an integrated monitoring system. These include: (1) conservation agreements' social and biodiversity benefits and performance; (2) carbon fluxes from land use and land cover changes; and (3) the AMPF management plan per se or master plan and its effectiveness in mitigating threats towards the conservation objectives of the PA. For further details please refer to section 4.3 of the AMCI PD.

Quarterly reports will be available describing the progress of the activities listed in the management plans. CI-Peru will keep a copy of all spatial and tabular data, maps, reports and any relevant documentation, securely backed-up. This information will be available to verifiers for inspection. CI-Peru will also be responsible for monitoring project activities to be implemented by local partners. See section 4.3 of the AMCI VCS PC for a detailed description of the AMCI data management plan.

1.1.2 Monitoring of land-use and land-cover change within the project area

As of the date of validation no regional, national or jurisdictional monitoring system of land-use and land-cover change was in place. Therefore, the project proponent will be responsible for developing the land-use and land-cover change component of the monitoring plan for the project area and leakage belt. The analysis will cover the monitoring of forest land converted to non-forest. The land cover and change maps will be produced following the technical steps described below and detailed in Sup.Inf_Meth_03a-c, including quality assurance procedures. Accuracy assessment as described in steps 2.4 and 2.5 of Part 2 of the Methodological Annex will be performed. The minimum accepted accuracy of the final classification will be 80%.

The project proponent will complete the following technical steps (described in detail in Sup.Inf_Meth_03a):

1. Acquire appropriate Landsat images with minimal cloud cover from multiple sources including the United States Geographical Survey (USGS), the Global Land Survey (GLS), and the Brazilian National Institute for Space Research (INPE). Multiple images will be used in the verification to fill areas obscured by clouds;

2. Atmospherically correct images;

3. Orthorectify images to within one pixel using a single base image (generally a GeoCover image, or similar image, used to generate the forest benchmark map);

4. In areas where no-data values exist in the base image (due to clouds, cloud shadows, SLC-off artifacts), composited images will be generated using the base image and multiple gap-filling images. A cloud, cloud shadow, and SLC-off mask for the base image will first be generated and gap-filling scenes identified to fill the mask of the base image. Temporal and gap extent criteria will be used to select the gap-filling scenes; scenes with similar acquisition dates will be given preference, as well as minimal cloud, cloud shadow, and SLC-off gap artifacts.

5. Classify images in two-date image stacks using decision tree analysis (a combination of ERDAS and See5, or similar). Only areas which were forested in the baseline period will be classified, as they are the only class subject to deforestation.
    a. Map classes include: 1=forest, 2=non-forest, 4=water, and 5=cloud
    b. Collect training data to represent both change and non-change areas
    c. Include numerous sub-classes in the training data for each land-cover and change class, to incorporate the full range of spectral variability within the image
6. Filter classifications using a three step process:
    a. Neighborhood majority filter 3x3, corners unchecked
    b. Clump, 4 way
    c. 1-hectare eliminate
7. To produce multi-date classifications the new classification will be merged with the existing classification. In the updated map product each digit in the final classification represents the land-cover at the corresponding time period.

To ensure a high quality analysis, the project proponent will closely follow the methods, rules and procedures specified in Conservation International's standard change detection methodology (See Sup.Inf_Meth_03b).

The project proponent will continue to use, primarily, Landsat images, as this source is expected to keep providing continued coverage, at low or no-cost, due to the Landsat Data Continuity Mission (LDCM). However, in the cases were Landsat imagery is not available or cannot provide adequate coverage, other types of imagery will be used. When incorporating other types of imagery it is important to consider spectral resolution, spatial resolution, continuity, seasonality, and context. Context refers to the types of activity in the area, such as in an area that is not likely to experience deforestation due to a lack of accessibility. Regardless of the data used, all the images will be co-registered to the baseline image. CI's standard methodology for co-registering images will be applied (See Sup.Inf_Meth_03c).

Imagery with acquisition dates as close as possible to the reporting period date will be used. For the 2011 monitoring period, the new images will be combined with those from 2006 to conduct a multi-temporal analysis of change; this is similar to the approach used in the historical analysis. The forest benchmark map and source imagery used for the historical analysis will also be consulted to ensure maximum consistency in image interpretation. This will include using the image-display stretches used during the historical analysis, in order to minimize the risk of inconsistent interpretation. All data used to create the updated map and the resulting classification will be stored and backed-up along other GIS data.

The final product will be validated with high resolution imagery (i.e. 5 meter spatial resolution or less) and/or field-collected ground-truth data. The minimum accuracy for each land-cover class will be 80%. In addition, accuracy assessments of the decision tree generation will be conducted using a stratified sampling method with 50% of the training done to test how well the model fits the training data. Analyst interpretation will still be necessary to determine the best land-cover product and adjust the model using multiple iterations.

1.1.3 Monitoring of carbon stock changes and non-CO_2 emissions from forest fires

Monitoring of carbon stock changes

Within the project area:

The ex-ante estimated average carbon stocks per land-use and land-change class is not expected to change during the fixed baseline period. There are no areas subject to significant carbon stock decrease due to controlled deforestation and planned harvest activities (e.g. planned logging, fuel-wood collection and charcoal production activities) in the project scenario. Similarly, no areas subject to significant unplanned carbon stock decrease e.g. due to uncontrolled forest fires or other catastrophic events were identified. Although protection of forest land by the project will likely lead to an increase in carbon stocks, monitoring of increases in carbon stocks are conservatively omitted because the project does not intend to claim credits for this category. Therefore, carbon stocks will not be monitored within the project area.

Within leakage management areas:

No areas will be subject to planned and significant carbon stock decrease in the project scenario in the LMAs according to the ex-ante assessment. On the contrary, carbon stocks are expected to increase in LMAs but are conservatively omitted from project accounting. Therefore, carbon stocks will not be monitored within LMAs.

Within the leakage belt:

Carbon stocks will not be monitored within the leakage belt as this is optional.

Monitoring of non-CO2 emissions form forest fires

Emissions from forest fires were estimated as insignificant and are, therefore, conservatively omitted in the monitoring phase.

1.1.4 Monitoring of impacts of natural disturbances and other catastrophic events

Natural disasters that might affect the carbon stocks (i.e. hurricanes, volcanic eruptions, flooding, severe droughts, earthquakes) in the AMPF are uncommon and do not represent a significant risk for the project area as assessed in the Non-Permanence Risk Report. However, the project proponent will use medium-resolution satellite images to monitor catastrophic events, applying the methodology described in Sup.Inf_Meth_03 and though field visits for ground-truthing.

CI will consider a second tier of monitoring that comprises the rapid monitoring of deforestation hotspot areas. This will be based on readily available near real-time decision support tools. Two such tools, developed by Conservation International, are the Fire Alert System (FAS) and the Illegal Logging and Encroachment Monitoring System. FAS uses MODIS active fire data to generate daily email alerts of active fire locations. This system can be customized by the user, such as the project manager, to track and respond to fire and associated deforestation activity captured in specific areas of interest. The Illegal Logging and Encroachment Monitoring System uses visual interpretation of high resolution imagery – such as Landsat, ASTER, and ALOS AVNIR– to quickly generate alerts highlighting areas of forest encroachment and illegal logging, whenever cloud-free data become available within target areas of interest.

1.1.5 Total ex post estimated actual net carbon stock changes and GHG emissions in the project area

Relevant tables will be updated using the new measurements of changes in carbon stocks and GHG emissions in each monitoring period. The results will be summarized in the VM Table 24: Total ex-post estimated actual net changes in carbon stocks and emissions of GHG in the project area.

1.2 Monitoring of leakage

1.2.1 Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities

The major leakage prevention activity to be implemented is the capacity building and technical assistance for coffee producers to implement sustainable coffee production techniques. No planned deforestation or degradation is expected to occur as part of leakage prevention activities, and no changes in carbon stocks are expected to occur according to the ex-ante analysis. Local coffee producers will use organic fertilizer to improve their production as part of the project therefore some increase in GHG emissions is expected, however GHG emissions from this activity are not considered significant according to the ex-ante assessment and therefore will not be monitored.

1.2.2 Monitoring of carbon stock decrease and increases in GHG emissions due to activity displacement leakage

Deforestation in the leakage belt will be monitored using the same methodology described in the Sup.Inf_Meth_03. Any deforestation above the baseline in the leakage belt will be discounted from the carbon emissions avoided to due to project activities. If emissions in the leakage belt are higher than the baseline due to activities not attributed to the project, the project proponent will collect robust evidence to justify that the deforestation is not linked to project activities.

Emissions from forest fires are not included in the baseline therefore increases in GHG emissions will not be monitored in the leakage belt.

1.2.3 Total ex post estimated leakage

The results of all ex-post estimations of leakage through monitoring will be summarized using the same table format used in the ex-ante assessment and will be reported in VM Table 32: Total ex-post estimated leakage.

1.3 Ex post net anthropogenic GHG emission reductions

The calculation of ex-post net anthropogenic emission reductions will be estimated similarly to the ex-ante calculation using the equation below:

Equation 8. Ex-post emission reduction

$$\Delta REDD_t = (\Delta CBSLPA_t) - (\Delta CPSPA_t) - (\Delta CLK_t + ELK_t)$$

Where:

$\Delta REDD_t$	*Ex-post* estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t*; tCO_2e
$\Delta CBSLPA_t$	Sum of baseline carbon stock changes in the project area at year *t*; tCO_2e
$\Delta CPSPA_t$	Sum of *ex post* estimated actual carbon stock changes in the project area at year *t*; tCO_2e
ΔCLK_t	Sum of *ex post* estimated leakage net carbon stock changes at year *t*; tCO_2e
ELK_t	Sum of *ex post* estimated leakage emissions at year *t*; tCO_2e
t	1, 2, 3 … *T,* a year of the proposed crediting period; dimensionless

Task 2: Revisiting the baseline projections for future fixed baseline period

The baseline proposed for the AMPF will be revised in 2018. If by this date no regional, national or jurisdictional baseline has been developed, the project proponent will revisit and update the baseline.

2.1 Update information on agents, drivers and underlying causes of deforestation

Information on drivers and agents of deforestation in the reference region will be collected periodically. Prior to 2018, a workshop will be organized with local representatives, experts and stakeholders to validate the information collected and discuss strategies to mitigate the drivers of deforestation. The approach used in this public consultation will be based on the *Open Standards for the Practice of Conservation* and will follow the steps described in Sup.Inf_Meth_01. The results of this workshop will be also used to identify the variables to be used in the deforestation modeling.

2.2 Adjustment of the land-use and land-cover change component of the baseline

2.2.1 Adjustment of the annual areas of baseline deforestation

As more information becomes available on land-use and land-cover change and the causes of deforestation, the annual rates of deforestation will be re-estimated. If conclusive information on historical deforestation is available to project deforestation rates for the next baseline period, approach ”b” (time function) or “c” (modeling) will be used. The methods used will follow steps 3 and 4 of part 02 of the VCS VM0015 methodology. If an applicable sub-national or national baseline becomes available during the fixed baseline period, it will be used for the subsequent period.

2.2.2 Adjustment of the location of the projected baseline deforestation

Using the adjusted annual deforestation rate, the location will be spatially distributed using the Land Change Modeler (LCM) tool in IDRISI, or other similar spatially explicit modeling software. Any improved spatial and/or tabular data will be reassessed and used in the modeling. New factor maps and a risk map will be produced for the project and leakage belt, and the accuracy of the modeling will be assessed using the equation described in section 4.2 of part 02 of this document.

The leakage belt will be revised and its boundary delineated based on a mobility analysis, unless the agents and drivers of deforestation have changed substantially and another method for defining the boundary of the leakage is more suitable.

2.3 Adjustment of the carbon component of the baseline

The project will use the carbon stock measurements for the entire project crediting period, unless more accurate data is available and covering all the carbon pools considered by the project.