CORDILLERA AZUL NATIONAL PARK REDD PROJECT

Document Prepared By
Centro de Conservación, Investigación y Manejo de Áreas Naturales CIMA - Cordillera Azul
Lima, Peru
with technical assistance from TerraCarbon, LLC, Peoria, IL, USA

Project Title	Cordillera Azul National Park REDD+ Project
Project ID	985
Version	Version 2.0
Report ID	CIMA/TC 7-2016
Date of Issue	15 November, 2017
Project Location	Peru Departments: San Martín, Loreto, Huánuco and Ucayali
Project Proponent(s)	Centro de Conservación, Investigación y Manejo de Áreas Naturales-Cordillera Azul (CIMA-Cordillera Azul) Contact: Patricia I. Fernández-Dávila M. Email: pfernandezdavila@cima.org.pe Phone: (51 1) 241 2291 or 241 2295
Prepared By	CIMA with technical assistance from TerraCarbon David Shoch, TerraCarbon 5901 N. Sheridan Rd., Peoria, IL 61614 david.shoch@terracarbon.com 1-434-326-1144
Validation/Verification Body	**Asociación Española de Normalización y Certificación (AENOR INTERNACIONAL S.A.U)** Contact: Jose Magro Email: jmagro@aenor.com Phone: (34) 915 294 961

GHG Accounting/Crediting Period	The project crediting period is 20 years, extending from 8 August 2008 to 7 August 2028. The CCB and VCS have coincident crediting period.
Monitoring Period of this Report	August 8, 2015 to August 7, 2016
History of CCB Status	The project was validated under CCB Standards Second Edition on February 19, 2013 by SCS Global Services[1] and subsequently achieved three verification processes: (1) verified on March 21, 2014 by Rainforest Alliance[2], (2) verified January 04, 2016 by AENOR, and (3) verified on December 20, 2016 by AENOR[3].
Gold Level Criteria	The project reached the Gold Level of Exceptional Biodiversity Benefits – vulnerability and Irreplaceability - during validation, and has implemented protection and monitoring actions to maintain this status. The Park harboring and protecting a variety of Critically Endangered (CR) and Endangered (EN) species, like Amphibious (*Atelopus pulcher*), birds (*Heliangelus regalis*) and Mammals (*Pteronura brasiliensis*), and healthy populations of more than 13 vulnerable species. Also protects more than 91 species of big and medium size mammals, 617 species of birds, 59 species of reptiles, 71 species of amphibians, 176 species of fishes and more than 1,600 species of plants. In recent years, 9 new species for science have been described Those exceptional biodiversity benefits are based on the huge area of the park, intact montane forests and other vegetation types of high conservation priority, and the broad altitudinal gradient within the park that permits migration of species adapting to a changing climate. During the monitoring period, the PNCAZ qualified as one of the protected areas exhibiting the best conservation rate in Peru's national system of protected areas, and where are still finding new records and new species for science. Note: Exceptional Biodiversity Benefits are development in section 7.

[1] https://s3.amazonaws.com/CCBA/Projects/Cordillera_Azul_National_Park_REDD_project/CCB_CIMA_PNCAZ_Validation_Statement_022113.pdf
[2] https://s3.amazonaws.com/CCBA/Projects/Cordillera_Azul_National_Park_REDD_project/Verification/Verified/Updated/Cordillera+Azul+CCB+verif+statement+14+(1).pdf
[3] http://www.vcsprojectdatabase.org/#/project_details/985

Table of Contents

1 SUMMARY OF PROJECT BENEFITS

This section highlights some of this project's important benefits. Section 1.1 (Unique Project Benefits) should be aligned with a project's causal model and is specific to this project. Section 1.2 (Standardized Benefit Metrics) is the same quantifiable information for all CCB projects. This section does not replace the development of a project-specific causal model or the monitoring and reporting of all associated project-specific impacts (positive and negative) in Sections 2-5 of this document.

1.1 Unique Project Benefits

Outcome or Impact	Achievements during the Monitoring Period	Section Reference	Achievements during the Project Lifetime
1) (Obj.1) The PNCAZ remains undamaged its conservation targets and continues the recovery of degraded areas → 1.1 The PNCAZ's ecosystems remain intact.	Ensure the protection of Headwaters for 2 great Amazonian basins: • Huallaga • Ucayali With more than 45 microbasins,	• Sec. 5.1.1 • Sec. 7 • Appendix 1	Maintain the protection of the Headwaters of 2 great Amazonian basins: • Huallaga • Ucayali
2) (Obj.1) The PNCAZ remains undamaged its conservation targets and continues the recovery of degraded areas → 2.1. PNCAZ research priorities are known and attractive to scientists who are able to finance their own research.	3 New Species: • Bird: *Machaeropterus eckelberryi* • Frog: *Rhinella lilyrodriguezae* • Fish: *Trichomycterus sp. nov.* (under description)	• Sec. 5.1.1 • Sec. 7	New Described Species: • Fishes: 4 spp • Amphibia: 1 sp • Reptiles: 2 spp • Birds: 2 spp
3) (Obj.1) The PNCAZ remains undamaged its conservation targets and continues the recovery of degraded areas → 2.2. Research topics respond to identified priorities, and results and recommendations are taken into account in decision making for PNCAZ management.	Protection of Kakatiabo (Indigenous) People in Isolation, who live inside the park	• Sec. 2.5.2 • Sec. 4.1.1	Creation of an Indigenous Reserve Isolated Indigenous People, in the PNCAZ buffer zone

4) (Obj.5) PNCAZ conservation contributes to improving the quality of life of neighboring populations through the benefits generated, especially those located in the intervention areas established in the Master Plan → 5.3 Based on the results of the ZEE, local communities manage conservation areas according to their interests.	8 Conservation initiatives in the buffer zone communities: • Nuevo Jaén • Nuevo San Martín • Challual • Las Palma • Nuevo Trujillo • San Juan • Vista Alegre • Yamino	• Sec. 4.1.2	8 Conservation initiatives near communities and villages. A great conservation area in Boca-Pauya, Cushabatay basin (aprox. 81,000 ha)
5) (Obj5.) PNCAZ conservation contributes to improving the quality of life of neighboring populations through the benefits generated, especially those located in the intervention areas established in the Master Plan → 5.4 The local population and authorities are committed to sustainable land management and understand its link with PNCAZ's conservation	3 Blue Agreements (Conservation Agreements): • Shapaja • Maronilla • Nuevo Jaen Approximately 4,000 beneficiaries	• Sec. 4.3.3 • Appendix 1	8 Blue Agreements Approximately 10,500 beneficiaries

1.2 Standardized Benefit Metrics

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
GHG emission reductions & removals	Net estimated emission removals in the project area, measured against the without-project scenario	not applicable	---	---
	Net estimated emission reductions in the project area, measured against the without-project scenario	4,075,362.8 t CO2-e (4,074,606 t CO2-e)	Baseline tables, from PD Appendix 9 (3.2.4)	28,970,971.6 tCO2-e
Forest[4] cover	For REDD[5] projects: Number of hectares of reduced forest loss in the project area measured against the without-project scenario	9,532.4 ha (9,533.5[6]ha–1.1[7]ha)	Baseline tables, from PD Appendix 9	45,194.13 ha
	For ARR[8] projects: Number of hectares of forest cover increased in the project area measured against the without-project scenario	not applicable	---	---
Improved land management	Number of hectares of existing production forest land in which IFM[9] practices have occurred as a result of the project's activities, measured against the without-project scenario	not applicable	---	---

[4] Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)
[5] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)
[6] *Aunplanned,i,t* (ha): Deforested area according to baseline (Source: PD Appendix 9)
[7] *ADefPA,u,i,t* (ha): Project area change (Source: Monitoring Workbook 2016).
[8] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)
[9] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	Number of hectares of non-forest land in which improved land management has occurred as a result of the project's activities, measured against the without-project scenario	Goal achieved in 2015, 24 communities and villages (246,192ha)	4.1.2	246,192 ha under land use zoning
Training	Total number of community members who have improved skills and/or knowledge resulting from training provided as part of project activities	45 parkguards 3,801 head of the families	2.4.2 4.1.2	At least 1 training / yr
	Number of female community members who have improved skills and/or knowledge resulting from training provided as part of project activities of project activities	219 artisans	4.1.2	300 women
Employment	Total number of people employed in of project activities,[10] expressed as number of full time employees11	45 parkguards 49 CIMA staff 20 Communal parkguards	2.4.3	45 parkguards 49 CIMA staff >20 Communal parkguards
	Number of women employed in project activities, expressed as number of full time employees	18 women	2.4.3	15-20 women
Livelihoods	Total number of people with improved livelihoods[12] or income generated as a result of project activities	3,801 families from 39 villages and communities are supported to implement strategic plans (Quality of Life Plans and Action Plans)	4.1.2	> 4,000 families

[10] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.
[11] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])
[12] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	Number of women with improved livelihoods or income generated as a result of project activities	Mothers from 3,801 families	4.1.2	> 4,000 women
Health	Total number of people for whom health services were improved as a result of project activities, measured against the without-project scenario	not applicable	---	---
	Number of women for whom health services were improved as a result of project activities, measured against the without-project scenario	not applicable	---	---
Education	Total number of people for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	not applicable	---	---
	Number of women and girls for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	not applicable	---	---
Water	Total number of people who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	not applicable	---	---
	Number of women who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	not applicable	---	---

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
Well-being	Total number of community members whose well-being[13] was improved as a result of project activities	14,300 community members (men, women and child), from 21 villages and communities, who had been developed or updated their Quality of Life Plans as well as to continue the process of Implementing.	4.1.2	> 16,000 community members from 34 communities with Life Plans
	Number of women whose well-being was improved as a result of project activities	319 women	4.1.2	500 women
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation,[14] measured against the without-project scenario	1,3 millions of hectares conserved by the PNCAZ	2.1.7	Maintain the status of conservation of PNCAZ
	Number of globally Critically Endangered or Endangered species[15] benefiting from reduced threats as a result of project activities,[16] measured against the without-project scenario	10 Species IUCN (Critical, endangered and near threat) 120 species of importance for CITES I and II	7	Maintain number of species, or discover new species

[13] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Health, Education, Water, etc.), but could also include other benefits such as empowerment of community groups, strengthened legal rights to resources, conservation of access to areas of cultural significance, etc.
[14] Biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation.
[15] Per IUCN's Red List of Threatened Species
[16] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Description

2.1.1 Implementation Description

Primary Goal Prevent deforestation in the Cordillera Azul National Park by designing and implementing activities that fulfill the following secondary goals and objectives:

i. Improve park protection to deter human encroachment.
Obj 1. The PNCAZ remains undamaged its conservation targets and continues the recovery of degraded areas

Obj. 2. PNCAZ and its buffer zone have become a place of research of global importance which gathers researchers/scientists and contributes to the management of natural protected areas.

ii. Increase local capacity for sustainable land use and improve life quality for buffer zone communities.
Obj. 3. Tourism promoted in PNCAZ's buffer zone has expanded benefits for local people without causing negative impacts to the protected area.

Obj. 4. Land-use planning is promoted in the "intervention areas" of the PNCAZ's buffer zone with the support of Regional and Local Governments

Obj. 5. PNCAZ conservation contributes to improving the quality of life of neighboring populations through the benefits generated, especially those located in the intervention areas established in the Master Plan.

iii. Strengthen relationships between park and project administrators and local, regional and national government agencies to increase effectiveness of conservation, development and livelihood efforts.
Obj. 6. Administration fee and distribution of carbon revenues

All project activities support these goals and are designed to work together to simultaneously achieve net positive climate, social and biodiversity benefits as discussed throughout this document, and detailed in Appendix 1.

To reduce human induced risks, like leakage, CIMA implemented the project generating positive social impacts in buffer zone populations, improving several aspects of the quality of life: *natural, social, human, physical and economic capitals*; for example, improved participation in strategic planning processes for villages (Quality of Life Plans and Action Plans), land-use zoning used as a tool for managing territories and community conservation areas according to their interests, and developing sustainable economic activities (i.e. cacao, handicraft and tourism), all of which have contributed to an improved standard of living of local human populations in the buffer zone; thus, 91% of the communities recognizes the work of CIMA as beneficial to its community, and 95% identifies the Park as important in terms of natural resources and ecosystem services. CIMA uses tools like MUF to monitor those social aspects, uses, perceptions, and risks.

In the case of natural risks, is important to remark that the most important regional and local strategy that will favorably impact a changing global climate is to maintain the huge area of natural forest contained in the PNCAZ intact such that ecosystem services and animal and plant communities are protected and adapted gradually.

For the current monitoring period August 8, 2015 to August 7, 2016, no permanent anthropogenic deforestation (only limited natural landslide disturbance) nor forest degradation occurred in the project area and the net reduction was 4,074,606 tCO2-e (when deductions for risk buffer were also included, the available verified carbon units were 3, 667,145 tCO2-e).

Since November 2014, CIMA signed a Loan Agreement and Agency Agreement with Althelia Climate Fund (ACF), both are backed by the carbon credits that REDD+ PNCAZ Project has generated in 2008-2012 as well as those that generate until 2018.

2.1.2 Project Category and Activity Type

Project Scope 14: Agriculture, Forest and other Land Use (AFOLU);

Project Category: Reduction Emission from Deforestation and Degradation (REDD);

Type of Activity: Avoided Unplanned Deforestation (AUDD).

The project is not a grouped project.

2.1.3 Project Proponent(s)

Organization name	Centro de Conservación, Investigación y Manejo de Áreas Naturales – Cordillera Azul (CIMA-Cordillera Azul)
Contact person	Patricia I. Fernández-Dávila M.
Title	Executive Director
Address	Av. Benavides 1238, Miraflores, Lima 18, Peru
Telephone	+51 1 2411191
Email	pfernandezdavila@cima.org.pe

2.1.4 Other Entities Involved in the Project

Organization name	TerraCarbon LLC
Role in the project	Provide technical assistance in the application of REDD methodologies and development of portions of the project documentation
Contact person	David Shoch
Title	Director, Forestry and Technical Services
Address	5901 N. Sheridan Road, Peoria, IL 61614, U.S.A.
Telephone	434 326 1144
Email	david.shoch@terracarbon.com

2.1.5 Project Start Date (G3.4)

Unchanged from the description in the validated PD.

The PNCAZ REDD project began on **August 8, 2008** with the signing of the Total Management Contract between CIMA and the Peruvian Government (through SERNANP, previously INRENA when the contract was initially signed).

2.1.6 Project Crediting Period (G3.4)

Unchanged from the description in the validated PD.

The project crediting period is 20 years, extending from **August 8, 2008 – August 7, 2028**. This corresponds with the length of the management contract between CIMA and the Peruvian Government.

The project lifetime is likely greater than 100 years because the project area is a legally recognized national park and the government has shown a commitment to ensuring it continues to be privately managed and protected. CIMA has been able to renew its management agreement each renewal period to date since 2002. CIMA expects to be able to renew its management contract when the current one expires in 2028. Both CIMA and the government have agreed that a portion of the revenue obtained from the sale of carbon credits will be used to establish an endowment for the park's long-term protection as outlined in the PD section 4.5.3. This endowment will fund park protection activities managed by CIMA or any other future management contract holders.

It is necessary to emphasize that during the first two monitoring periods (2008-2012 and 2012-2014), the project sold a small amount of VCUs in the voluntary market; however, in November 2014 CIMA signed a Loan Agreement and Agency Agreement with Althelia Climate Fund[17] (ACF), both are supported by the carbon credits that PNCAZ REDD+ Project has generated in 2008-2012, 2012-2014, and 2014-2015, as well as those that will generate until 2018.

2.1.7 Project Location (G3.3)

Unchanged from the map in the validated PD.

The boundaries of the project area remain unchanged from the description in the validated PDD, and the boundaries of the project zone continue to be the park's buffer zone (Figure 1). Definitions of the project area, buffer zone of the park and the project zone are provided here to ensure clear understanding:

The **Project Area** is located within the boundaries of the Cordillera Azul National Park (PNCAZ); owned by the government of Peru. The limits of the park, as defined in the official Supreme Decree No. 031-2001-AG, lie between 06°29'13.3" – 08°54'07.5" South and 75°20'52.3" – 76°24'17.4" West. The park has an area of 1,353,190.85 hectares (ha) and an approximate perimeter of 974 km. within four Departments: San Martín, Ucayali, Huánuco and Loreto. A small amount of land within the park is privately owned, so the project area is 1,351,963.85 ha. The PNCAZ is managed by CIMA under a *Total Management Contract* with the Peru's Natural Protected Areas Service (SERNANP).

[17] https://althelia.com/ Althelia Climate Fund is investing in ecosystems conservation and sustainable agroforestry, applying best-in-class social, environmental and governance (ESG) criteria.

The **park's buffer zone** surrounds the park, so, local population with land within the buffer zone are most likely to be affected by the REDD project and are the focus of project activities. The park's buffer zone was provisionally delineated by the Peruvian government[18] on 13 December 2001, covering 2,061,259.79 ha. In June of 2007 INRENA passed a resolution[19] amplifying the buffer zone to more than 2.3 million hectares and making official the limits proposed in the Master Plan 2003-2008[20]. Formerly, in 2011, through the resolution[21] that approved the Master Plan 2011–2016 (SERNANP 2012), the buffer zone limits were adjusted once more, now to 2,303,414.75 ha. Finally, during the updating process of the Master Plan 2017-2022, the boundaries of the buffer zone, previously approved in 2011, were ratified.

The **Project Zone** is a combination of the project area and the buffer zone. Because no human communities or villages exist within the project area, communities within the buffer zone represent all human communities within the project zone.

[18] Resolución Jefatural Nº 314-2001-INRENA
[19] Resolución Jefatural Nº 144-2007-INRENA
[20] Resolución Jefatural Nº 245-2004-INRENA
[21] Resolución Presidencial Nº 064-2011-SERNANP

Map of the PNCAZ project area (shaded in green) and its buffer zone (shaded in grey). The project zone consists of the entire shaded area (project area and buffer zone). The inset shows the park's location in central Peru.

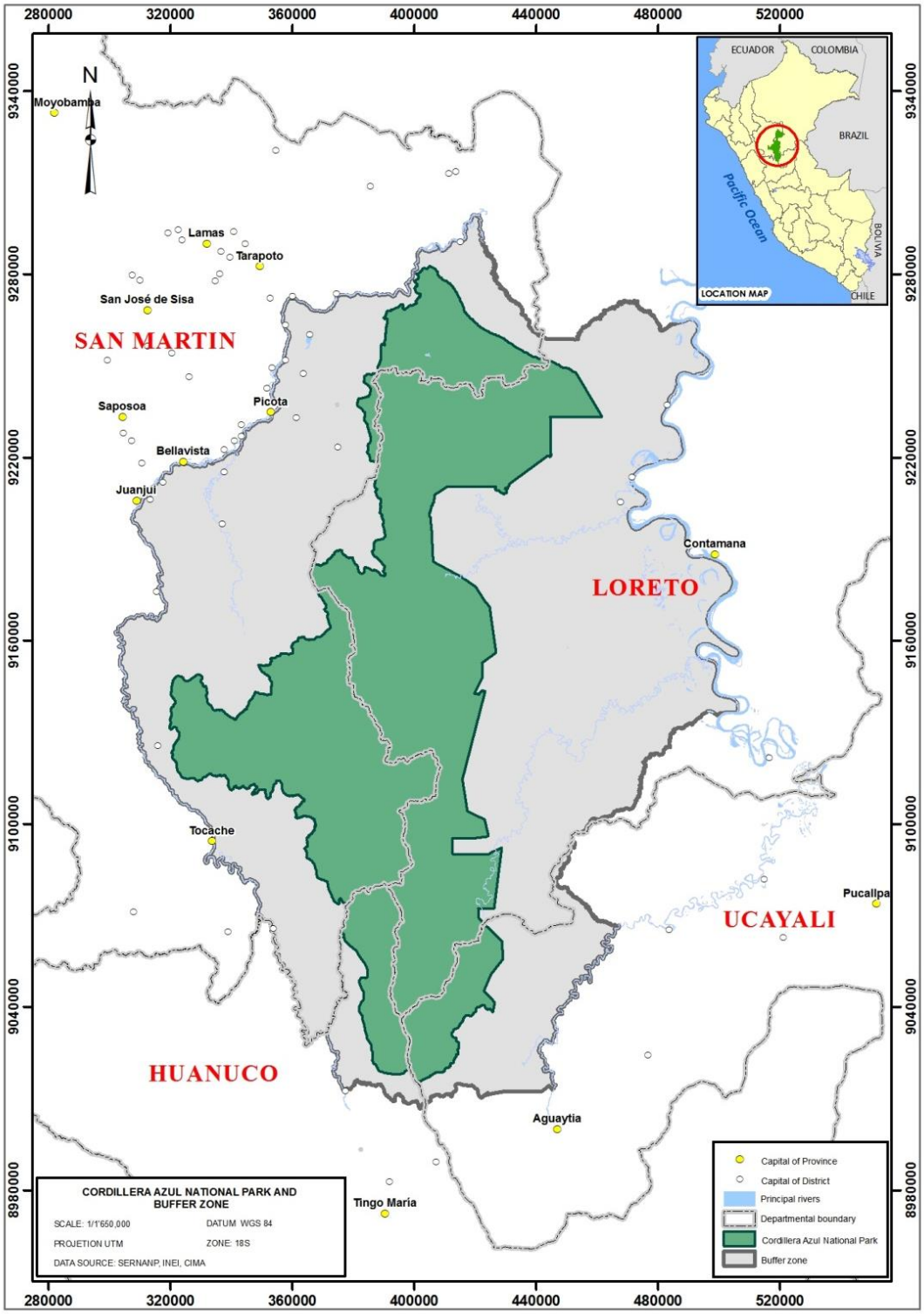


Figure 1: Project Map and Location

2.1.8 Title and Reference of Methodology

The methodology used to quantify the avoided emissions is the framework and component modules of the modular REDD methodology VM0007 REDD Methodology Modules Version 1.3 approved 20 November 2012.

This project uses the following modules and tools:

- VM0007 REDD Methodology Module, REDD Methodology Framework (REDD-MF), version 1.3
- CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools", version 1.0;
- CP-D "VMD0002 Estimation of carbon stocks in the dead-wood pool", version 1.0;
- BL-UP "VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation", version 3.1;
- LK-ASU "VMD0010 Estimation of emissions from activity shifting for avoided unplanned deforestation", version 1.0;
- E-BB "VMD0013 Estimation of greenhouse gas emissions from biomass burning", version 1.0;
- M-MON "VMD0015 Methods for monitoring of greenhouse gas emissions and removals" version 2.1;
- X -STR "VMD0016 Methods for stratification of the project area" version 1.0;
- X-UNC "VMD0017 Estimation of uncertainty for REDD project activities" version 2.0;
- T-ADD "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", version 3.0;
- T-BAR "Tool for AFOLU non-permanence risk analysis and buffer determination", version 3.1;
- T-SIG CDM "Tool for testing significance of GHG emissions in A/R CDM project activities", version 1.0.

2.1.9 Other Programs (CL1.5)

Not applicable to this project.

2.1.10 Sustainable Development

The PNCAZ REDD Project is recognized as an early initiative by Regulation of the Law on Remuneration Mechanisms for Ecosystem Services (Mecanismo de Retribución de Servicios Ecosistémicos – MRSE) approved in July 21, 2016; also understand the need to integrate them into the country reduction report, considering their positive impacts on reducing emissions from the USCUSS sector through eligible activities. In the other way, the National Forest and Climate Change Strategy (Estrategia Nacional De Bosques y Cambo Climático – ENBCC) approved by MINAM, recognizes the currently trends towards increased deforestation in Loreto and Ucayali, while San Martin. The MRSE promotes and regulates the establishment of voluntary agreements that reward the efforts of various public and private actors in the maintenance and enhancement of ecosystem services, including forest ecosystems under threat.

2.2 Project Implementation Status

2.2.1 Implementation Schedule (G3.4)

To best understand the implementation of the PNCAZ REDD project between August 8, 2014 and August 7, 2015, and the status of project activities, outcomes and impacts, a brief chronological history of CIMA's legal obligations for the management of the PNCAZ is provided here:

Date	Milestone(s) in the project's development and implementation
August 8, 2008	CIMA signed a contract with the Peruvian government for Total Management of the PNCAZ, a state-owned Natural Protected Area (ANP).
September 9-11, 2013	On the recommendation of the Monitoring Committee of the PNCAZ Management Contract, a Five-Year Planning Workshop for the Total Operations Management Agreement for PNCAZ was held in Lima to review (a) the results of the five-year period 2008-2013 and (b) the proposed 2014-2018 five-year plan.
November 6, 2013	CIMA and SERNANP signed a contract addendum which modifies Annex C: "Expected Results 2008-2013" of this Service Agreement.
November 29, 2013	The executant of the Administration Contract sent to SERNANP the proposed Five-Year Work Plan and Budget for the period between January 2014 and December 2018.
March 10, 2014	The Five-Year Work Plan and Budget received approval by the Management Department for Protected Natural Areas (DGANP- SERNANP)
November 12, 2014	CIMA and Althelia Climate Fund (GCF), with the authorization of SERNANP, signed a contract for financing the operations of PNCAZ and its buffer zone, compromising 8 million VCUs.
November 12, 2015	Blue Agreements (*Acuerdos Azules*) or Communal Conservation Agreements signed between CIMA and 3 local villages: Nuevo Jaén, Santa Rosa de Shapaja (San Martín) and Maronilla (Huánuco). to renew the commitment for 7 years in favor of the conservation of the Park, the sustainable use of the natural resources and the improvement of the quality of life of the populations in the scope of the protected natural area[22].
December 2015	Through 2015, 17 plans Quality of Life Plans were well established.
December 2016	Until August 2016 a total of 19 villages have developed their Quality of Life Plans as well as to continue the process of Implementing. Two new QLP has been development until the end of the evaluating period, and two more until the end of the year 2016. It is expected to reach 21 Quality of Life Plans 2016 and 34 in 2018.

Such changes and adjustments are common in the management of Natural Protected Areas in Peru and national context. They do not change the importance of conservation areas and their contribution to improving the quality of life for local people. Table1 indicates the status and impacts of the REDD project activities, organized by relevance to project objectives, that

[22] http://www.cima.org.pe/es/noticias/poblaciones-firman-acuerdos-en-favor-de-la-conservacion-del-parque-nacional-cordillera-azul

http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/acuerdos-azules-el-compromiso-de-las-comunidades-nativas-138967

were implemented during the time frame of this PIR. These activities were proposed by CIMA by submitting to SERNANP their annual work plans 2015 and 2016, worked together with the Head of the PNCAZ.

2.2.2 Methodology Deviations

While it was not a deviation from the methodology, adjustments were made to monitoring plan. So, in accordance with the PIR 2008-2012 (section 2.2) a new classification technique used to overcome sensor errors had been done. This procedure was already justified and explained in the PIR 2008-2012, section 5 (Appendix 1).

2.2.3 Minor Changes to Project Description (*Rules* 3.5.6)

No Minor Changes to project description were applied

2.2.4 Project Description Deviations (*Rules* 3.5.7 – 3.5.10)

No deviations to the project description were applied

2.2.5 Risks to the Project (G3.5)

The predominant likely **natural risk** is the changing climate that will affect biodiversity and community and probably climate benefits as well during the project lifetime. The effect of climate change and regional mitigating activities for this global phenomenon are described here:

- Climate change: results in changes in the geographic distribution of some plant and animal species, especially those with very restricted ranges or specialization to a particular habitat. Climate change affects species distributions and would cause species extinctions. As well, an increased frequency and intensity of extreme climate events (*e.g.,* floods, droughts, wind storms, fires) is predicted that will affect human well-being and the provision of nature's services.

  Mitigation strategy: Understanding the relevance of possible climate impacts, CIMA has developed the *Proyecto Red Regional de Observación del Clima para el Monitoreo de Cambio Climático y sus Impactos sobre los Ecosistemas de Ucayali – Red Climática Ucayali*, developed a first approximation of climate changes, which show a decrease in the number of living areas in the region, from twelve to nine due to changes in biotemperature and rainfall in the department[23]. Thanks to this study, it is evident that in the protected natural areas (ANP) of the Ucayali region, there is a trend towards the conversion of some areas of tropical humid forests to dry forests, mainly in the Cordillera Azul National Park and the Sierra National Park of the Divisor, in a period of approximately 30 years (CIMA 2017).

  In the case of PNCAZ is important to remark that the most important regional and local strategy that will favorably impact a changing global climate is to maintain the huge area of natural forest contained in the PNCAZ intact such that ecosystem services and animal and plant communities are protected. It is also very important to conserve the forests in the buffer zone; to achieve this

[23] According to the findings of the *Ucayali Climatic Network,* in the last 30 years, rainfall has decreased in Alto Purús National Park, Alto Purús Reserve, Cordillera Azul National Park and Sierra del Divisor National Park. Aditionally, the temperature rise from 24°C to 26°C, has led to a decrease in the number of Holdridge life zones in Ucayali, leading to transition zones, which is a possible indicator of climate change.

is essential to continue the sensitization processes and the land use planning for sustainability, which is the emphasis of CIMA's work.

Avoiding fragmentation of diverse natural forests is the most effective measure to avoid species extinctions, preserve the altitudinal corridors within the park that allow vertical migration of species as temperatures rise and allowing the adaptation of the communities to the new conditions.

CIMA identified the following **human-induced risks** and has worked - and will continue to work actively - to mitigate these potential risks as detailed below:

- Natural resource concessions in the buffer zone: The Peruvian government has granted timber, mining and oil concessions in the buffer zone. Not all of these concessions are active but the concession owners do have the right to use the land. While these concessions are not inside the park, they pose a risk to the park. Threats to the park may result from illegal operations in or misuse of the concessions, resulting in potential deforestation or pollution within the park and displacement of immigrants who move closer to or into the park, increasing pressure in the project area.

  Mitigation strategy: CIMA has continued building relationships and working closely with local, regional and national governments and other strategic institutions (i.e. ACCA) to monitor concessionaries activities (i.e. main and secondary road extension t forest extraction, forest degradation and deforestation), inside and outside the concessions, and the integrity of the forest cover. All the CIMA's processes incorporate information about land use rights rather than disregarding them even if abandoned (i.e. forest and conservation concessions), in order to recognize and safeguard previous rights acquired and to avoid conflict and strengthen land use rights in the buffer zone. Additionally, CIMA has raised awareness of laws and regulations in communities to encourage members to monitor and report illegal activities to the proper authorities. CIMA has worked on strengthening forest control by supporting regular vigilance by the community (*rondas campesinas*) and park guard patrols (official and communal parkguards) in the buffer zone.

- Lack of land tenure in the buffer zone: As discussed several times in the PD, most people living in the buffer zone do not own their land. This results in immigrants having only weak ties to a specific location and no motivation to remain there as erosion and soil depletion occurs. Instead, they move on to a new location. This advancing agricultural frontier presents one of the most severe threats to the park as waves of immigrants advance their deforestation and erosion-provoking practices closer to and eventually into the park.

  Mitigation strategy: CIMA has worked to train local community members in sustainable land-use practices, land-tenure processes; to ensure constant communication with as many communities as possible, and to strengthen and improve the quality of life in the communities. CIMA's process of land use zoning incorporates the border definitions of communities in order to strengthen rights of land use in the buffer zone; all of these land use zoning processes have been a key element for land use planning and recognition of the towns and communities.

- Illegal activities in the buffer zone: Illegal activities in the buffer zone place additional deforestation pressure on the park by increasing deforestation in the buffer zone and pushing immigrants closer to and eventually into the park.

  Mitigation strategy: CIMA has raised awareness of laws and regulations in the communities (Figure 2) to enable communities to also monitor and report illegal activities to the proper authorities. Because many illegal activities are driven by a need for additional resources, CIMA

has worked to train local communities in sustainable land-use practices; to facilitate land-tenure processes (i.e. categorizing and recognizing of towns or conservation initiatives); to ensure constant communication with as many communities as possible, and to strengthen and improve the quality of life in the communities (as mentioned above).

Figure 2: CIMA 2016. Banner #7 Environmental Education

- Increased tensions between communities that CIMA worked with initially and those that will be worked with in the future: There is a possibility that communities not located in the intervention areas will become jealous of the communities that have received priority. On the one hand, this would indicate a major success in that this situation would arise only if CIMA's activities are perceived as having value and improving the quality of life for buffer zone communities. On the other hand, increased tensions might be a negative issue and may pose a risk to the project if raids or land grabs occurred as a result. For example, some communities may become jealous of others who have been formally granted land tenure.

  Mitigation strategy: CIMA has worked to ensure constant communication with as many communities as possible to identify and address concerns as quickly as possible and to institute a strong, proactive communication program and complaint-resolution process. CIMA will never be able to work with all communities simultaneously but these measures will assist communities in understanding the priority-setting process and to voice concerns. Since 2015, CIMA has worked in a method for the prioritization of its work in the communities and scope of action, in order to have a selection of sites as objective as possible, to respond to management priorities PNCAZ and its area buffer.

  The design of the project, including the government's commitment discussed above and the project activities--emphasizing land tenure and sustainable land-use practices in the surrounding areas, and the creation of an endowment to ensure continued funding for park management activities well after the project's end--serve to ensure the project's benefits last beyond the project's lifetime. The project area is a national park so it will continue to have a SERNANP-approved Master Plan beyond the project lifetime, which will outline activities and indicators that must be monitored and reported upon. CIMA has worked diligently to ensure that community indicators are included in the Plan Maestro for PNCAZ and this provides a means

for community impacts (both positive and negative) to be monitored beyond the lifetime of the project.

2.2.6 Enhancement of High Conservation Values (G3.6)

Unchanged from the description in the validated PDD.

The project protects a vast expanse of intact montane forest with native species, and the use of natural resources in the project is solely for traditional use and subsistence, i.e., hunting, fishing, or medicinal; also considering the park zoning. As described previously in Section 1.10.5 Biodiversity from the PDD, all species in the park are native and many are endemic and/or threatened. No invasive, non-native, or genetically modified species will be used or introduced into the park as part of this project.

Park guard patrol routes are used not only for control, but also to collect the monitoring data and these routes encompass large areas both in the park and in the buffer zone, resulting in monitoring of the entire project zone. Additionally, records of researchers show good populations of birds and large mammals (Alvarez et al. 2014), as well as amphibians endangered and sensitive to diseases such as those believed to occur by changes in weather conditions (Hörnes 2016). More details are described in the section 5.1.2.

2.2.7 Benefit Permanence (G3.7)

Unchanged from the description in the validated PDD.

The project crediting period is twenty years long extending from August 8, 2008 – August 8, 2028, because this is the length of the management contract between CIMA and the Peruvian government. However, the project lifetime is likely greater than 100 years because the *project area* is a legally recognized national park and the government has shown a commitment to ensuring it continues to be privately managed and protected.

The PNCAZ REDD project has been recognized by the MINAM as a REDD early initiative. The Peruvian government, through SERNANP and MINAM, also proposes that the protected areas with REDD projects should harmonize their project´s baselines with the forest emission reference levels built by MINAM for the national level, since 2019 onwards.

2.3 Stakeholder Engagement

2.3.1 Community Consultation (G3.8)

Unchanged from the description in the validated PDD.

Two groups of stakeholders were identified for the project: (1) Primary stakeholders are those with direct involvement in the project area, with is the Peruvian government through SERNANP and MINAM. (2) Secondary stakeholders are those in the buffer zone, who may be affected by some project activities but do not reside or have rights in the project area.

SERNANP and MINAM participate to the discussions, work groups, presentations, and conferences related to the PNCAZ´s REDD Project. The PNCAZ Master Plan, with was approved by SERNANP in 2017, considers the REDD Project as a financial mechanism implemented y CIMA. CIMA and SERNANP maintain a close working relationship coordination for the project implementation and any improvements that may be made over time, as new information obtained. CIMA coordinates very closely with the PNCAZ Head, in fact CIMA's Tarapoto offices are located within PNCAZ's Headquarters allowing for continuous communication.

For the population in the PNCAZ´s buffer zone, monthly visits of CIMA's technical field staff to communities provide an opportunity to present information and receive comments. CIMA works extensively with these communities to determine how the project can have the most positive impact on their lives. The desire for a participatory approach to park management is included as one of the three primary goals of the project and supporting activities have been defined. The strategies and specific tools used by CIMA for park and project management are publicly available on CIMA's web page (http://cima.org.pe); those have been explained to local populations during training and consciousness-raising sessions as well as distributed in print to local leaders, institutions, authorities and other stakeholders

2.3.2 Public Comment Period Publicity (G3.9)

Communications on CIMA web page to publicize the CCBA public comment period for present verification are submitted to the respective local and regional stakeholders, or any interested person or institution at national or international level.

2.3.3 Distribution of Project Information (G3.9)

Communications by letters to authorities and during communal assemblies, to publicize the CCBA public comment period for present verification. CIMA submit customized letters to the respective local and regional authorities, as well as indigenous grassroots organizations (Federaciones indígenas), SERNANP and MINAM, among others.

2.3.4 Conflicts and Grievances (G3.10)

Unchanged from the description in the validated PDD.

Any comment from the buffer zone communities - even in case of conflicts or grievances - goes directly to park guards or to the CIMA technical team, given their frequent interaction with the communities. However, some comments or conflict are sent to the CIMA field offices or directly to the Head of PNCAZ; so, parkguards forward questions they cannot answer and concerns or complaints voiced by residents to the field offices. Most items are easily resolved by the field offices, but when necessary are forwarded to the Program Director or local law enforcement authorities as appropriate.

Concerns and comments are handled in a consistent manner. Depending on the issue, conference calls, in-person meetings, interviews with the commenter or CIMA personnel, and other means are used to obtain additional information as necessary, and appropriate actions are then taken. Some complaints have resulted in expanded training, new communications to buffer zone communities, and even firing of an employee. There is no formal written procedure for this process but it is applied consistently and builds on CIMA's close relationship with the buffer zone communities. CIMA's Executive Director is ultimately responsible for the resolution of all issues but questions, complaints, and comments may be addressed by several individuals within the organization, depending on the topic.

To date, all issues have been satisfactorily resolved through this process.

2.4 Management Capacity and Best Practices

2.4.1 Required Technical Skills and Expertise (G4.2)

The project proponent is the Centro de Conservación, Investigación y Manejo de Áreas Naturales-Cordillera Azul (CIMA-Cordillera Azul). CIMA was created to provide institutional, technical and financial support to the Peruvian government for the administration and management of the PNCAZ.

CIMA's success in its initial pre-project pilot efforts led the Peruvian government to sign a 20-year management contract with the non-governmental organization for full management of the park, ranging from field activities to strategic planning. CIMA's headquarters in Lima oversees the activities of all field offices and coordinates directly with the relevant offices of the national government. Although CIMA has had the PNCAZ management contract since 2008, all park guards in Peru are part of the national park system overseen by SERNANP. CIMA has been providing funding for park guards and control infrastructure and activities, working closely with SERNANP to design annual work plans as well as monitoring all park guard operations. In coordination with SERNANP, CIMA has also been responsible to design and implement the park management strategies outlined in the Master Plan.

The governance structure for the PNCAZ REDD project is illustrated by the organizational diagram (Figure 3). The Cordillera Azul Program, led by the Program Director, consists of three areas led by the PNCAZ Director: (1) Protection, led by the Head of the PNCAZ, (2) Territorial Zoning and (3) Extension, which is the most active area of work in the buffer zone; these latter two areas were combined in 2013 as a result of the evolution of CIMA's Model for Activity Implementation in the buffer zone. Ecological and Economic Land-Use Zoning (ZEE) was part of the physical diagnostic phase prior to community strategic planning.

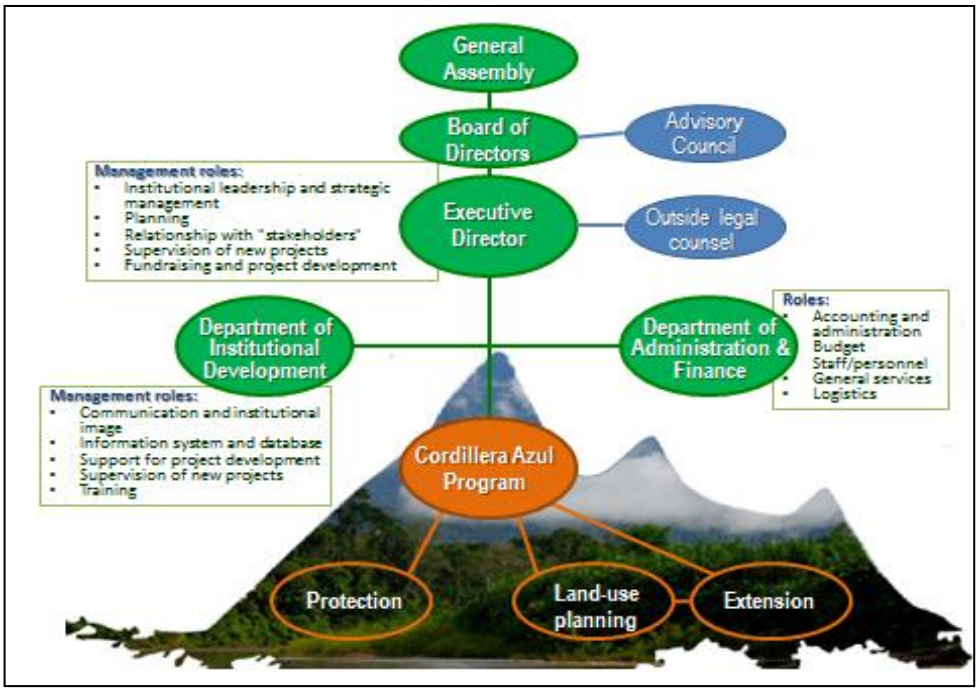


Figure 3. The governance structure and organization of the PNCAZ REDD Project

There has been no change in key personnel since the last verification period; therefore, CIMA's management team, and their advisors, has extensive experience in a variety of fields and key technical skills required by the project including finance, administration, law, anthropology,

communication, education, biology, forestry, agronomy, mapping and GIS. The personnel directly responsible for the project has been maintained, a brief summary of their responsibilities is listed below:

Executive Director - Patricia I. Fernández-Dávila

- Reviews project progress through quarterly and annual reports and internal meetings covering the budget, programs, and communications;
- Ensures the resources needed for the project are obtained either through hiring or training of CIMA employees or through collaborations with, or retention of, outside organizations;
- Represents CIMA in high-level discussions and contracting with SERNANP, other governmental agencies, media, stakeholders and supporting organizations or contractors;
- Ensures CIMA operates in accordance with all applicable regulations.

Director of Finance and Administration – Jorge Aliaga

- Oversees all aspects of project finances;
- Ensures revenue distribution is in accordance with the agreed upon revenue-sharing plan;
- Monitors the annual project budget;
- Oversees accounting and financial audits;
- Oversees benefits and contracts for CIMA personnel ensuring compliance with national regulations and CIMA policies.

Program Director – Rubén Paitán

- Oversees the implementation of the 20-year park management contract;
- Oversees strategy and project activity development and implementation;
- Oversees programmatic activities of all regional offices and interfaces with local and regional partners;
- Tracks project progress through personal involvement and review of quarterly and annual reports and internal meetings covering the budget, programs, and communications;
- Represents CIMA in discussions regarding the project with SERNANP, other governmental agencies, media, stakeholders and supporting organizations or contractors;
- Ensures coordination and communication among regional offices and with Lima office;
- Provides local contact for SERNANP's Park Director;
- Ensures coordination of park guard activities, including scheduling, acquisition of supplies and safety procedures;
- Implements activities supporting the park management contract;
- Ensures that project field activities operate in accordance with all applicable regulations.

Director of Institutional Development – Tatiana Pequeño

- Oversees collection, mapping, analysis and storage of project data including project monitoring;
- Manages programs supporting the REDD project reviewing the schedule, budget and effectiveness of the programs;
- Coordinates training for park guards and CIMA personnel as needed, including the development of training tools and programs, obtaining funds for training, and securing qualified trainers;
- Works with the GIS group responsible for interpreting satellite imagery, mapping information, conducting analyses and providing reports;
- Represents CIMA in technical discussions regarding the project with SERNANP, other governmental agencies, media, stakeholders and supporting organizations or contractors;
- Participates in the Mesa REDD network and the National Climate Change Commission's REDD Technical Group;
- Develops monitoring or status reports for funding institutions, government and internal uses.

Additionally, CIMA has been collaborating with a wide range of institutions that bring a complementary set of skills to implement management activities in PNCAZ and the buffer zone. CIMA works with these diverse institutions through a variety of relationships, including some collaborative agreements and contracts. The range of CIMA collaborators includes:

- **Academic institutions**: local, national and international universities and museums, such as Universidad Nacional Agraria La Molina (UNALM), Universidad Peruana Cayetano Heredia (UPCH) and the Museo de Historia Natural (MUSM) of the Universidad Nacional Mayor de San Marcos (UNMSM), Pontificia Universidad Católica del Perú (PUCP); and international universities, like University of Bonn (Germane), University of Duke, University of Texas (USA), Universidad de Cambridge (UK) and through the Alianza Andes Tropicales (AAT) with 16 other academic institutions and non-governmental organizations in Latin America.
- **Schools and training centers**: Administrative educational units (Unidades de Gestión Educativa Locales-UGEL), elementary and high schools and technical institutes.
- **Community-based organizations**: Indigenous federations, parents and teachers association (APAFA), local vigilance groups (*rondas campesinas*) and community committees (*I.e.* associations, cooperatives, mother clubs and other interest groups).
- **Authorities and different government organizations** at the national, regional and local levels (including institutions that review and approve CIMA's initiatives such as master plans for the park and zoning efforts for the buffer zone); Provincial and District Municipalities; and the Regional Governments of Loreto, Huánuco, Ucayali and San Martín.

TerraCarbon (Peoria, Illinois, USA) has provided essential support CIMA in the measurement and monitoring of forest carbon The TerraCarbon team of forestry and modelling experts quantified the amount of avoided deforestation by measuring the park's carbon stock and properly documenting the process. TerraCarbon also provided advanced training to CIMA's information management and GIS team so that CIMA can be a full participant in the methodologies used in the project proposal and complete future monitoring and project

documentation activities. In addition, Terra Carbon trained PNCAZ park guards on the prism methodology used to measure carbon stocks (Shoch *et al.* 2009). This technical knowledge enabled park guards to participate in the initial carbon stock assessment, validation and verification processes in 2012 and 2013, and will allow them to engage in future monitoring as needed. The trained park guards can now train others in measuring carbon stock with prisms, thus build capacity in Peru for accurate REDD data collection and monitoring. TerraCarbon also provided expertise in developing the revised VCS baseline module used for this project and assisting in the double validation process. TerraCarbon will continue to support CIMA in the future.

2.4.2 Worker Training (G4.3)

Unchanged from the description in the validated PDD.

Constant training for PNCAZ staff (parkguards and CIMA team); during the period 2 training Courses for Parkguards and CIMA technicians was development:

- Training for the Implementation of the ***Environmental Education Information Guide*** (March 2016), participation of 45 parkguards, and CIMA technician staff from Tarapoto (10 field technician and 01 support professional) and Tocache (03 field technician and 01 support professional). The Guide is implemented in the priority populations identified that are based in critical areas of the PNCAZ ZA. Complementary material was delivered.
- Training for the ***Monitoring of Fauna by Parkguards*** (March 2016), where all the 45 rangers participated. This training was given at the request of the PNCAZ Headquarters in order to standardize in a simple and practical way the general knowledge about fauna and the practices of data collection by the park rangers. The basis for this presentation is the Monitoring Guide for wildlife (Fine Filter Conservation Objects - OCFF) prepared by CIMA with information from the park rangers themselves and pertinent recommendations. Details on the application of this monitoring methods are detailed in section 5.1.1.

2.4.3 Community Employment Opportunities (G4.4)

Unchanged from the description in the validated PDD.

CIMA employs almost 100 people including professional staff, technicians and park guards located in five offices and 21 guard posts and centers (Table 1). Staff turnover is relatively low; CIMA has technicians and parkguards who have spent more than 13 years in the institution. However, when new staff is needed, open calls are made particularly in the area where the personnel is required.

Table 1. PNCAZ Project staff. by offices in Lima, Tarapoto, Tocache, Contamana and Aguaytia.

Headquarters		PNCA Project Staff	
		Total	women
CIMA staff	Lima	11	7
	Tarapoto field office	23	4
	Tocache field office	6	3
	Contamana field office	6	2

	Aguaytía field office	3	1
	Total CIMA staff	**49**	**17**
SERNANP	Parkguards (PNCAZ boundaries)	**45**	**1**

Park management activities are led from field offices in Tarapoto, Tocache, Contamana and Aguaytia. Decentralizing project activities into the field offices allows CIMA to hire individuals from the different regions that surround the project area, promoting greater knowledge of, and better interactions with, local and regional communities and governments. Decentralization also allows CIM A to tailor programs and communications to reflect the needs of the communities and reduce travel times and cost.

2.4.4 Relevant Laws and Regulations Related to Worker's Rights (G4.5)

For this period, the following labor laws and regulations continue in force:

- **Ley N°30222**, promulgated in July 2014, and amending the **Ley N°29783** ***Ley de Seguridad y Salud en el trabajo***, promulgated in August 2011. About security responsibilities of the employer.
- **Decreto Supremo N° 007-2012-TR**, which it sets the Minimum remuneration increased for worker.
- **Reglamento de Ley N°29783** approved by DS Nº 005-2012-TR and modified by **Ley N°30222**.

According to the statement in law presented above, CIMA applies principles of risk prevention and has a system of risk prevention, implemented through adequate training and provision to the field staff with necessary equipment to conduct their activities safely.

2.4.5 Occupational Safety Assessment (G4.6)

Unchanged from the description in the validated PDD.

Since 20013, CIMA has a *Safety and Health Management System at Work*, within the framework of Law No. 29783. This document, already mentioned as support in the previous Verification, states that the protection of the physical integrity and occupational health of its workers is the main concern of CIMA. Thus, in matters of Health and Safety at Work, it is committed to:

- Safety and occupational health are an essential and integrated part of all processes, aimed at the prevention of damage and the deterioration of health.
- Oriented to reduce the greatest possible number of risks through the establishment of adequate control systems.
- Ensure compliance with legal regulations on occupational safety and health
- Disseminate and promote the objectives of occupational safety and health in workers, obtaining their commitment to its implementation, review and permanent updating.
- Guarantee consultation and participation of workers.
- Create awareness about the right to security, and the duties that arise from it.

2.4.6 Financial Health of Implementing Organization(s) (G4.7)

Unchanged from the description in the validated PDD.

CIMA's financial plan since 2010 - as part of the Master Plan 2011-2016 – has included different strategies to achieve financial sustainability and ensure sufficient funds for the management of the PNCAZ; although the master plan has already been updated, this document was in force in the 2015 - 2016 verification period. The financial plan has been used successfully to manage the project and reach objectives. Operating costs and "pre-carbon credit" project funding have both been in line with projections and funding has remained stable.

In November 2014, CIMA signed an agreement with Althelia Climate Fund (ACF) that ensures funding based on the guarantee of the carbon credits generated by PNCAZ's REDD project. Table 2 lists CIMA's funding sources for the period 2012-2016, all of which have contributed to finance the PNCAZ REDD project management prior to the sale of carbon credits.

Table 2. Funding sources for the PNCAZ REDD project between August 2014-August 2017

Funding source	Time period	Project name and objectives
USAID (through The Nature Conservancy)	May 2012 - Sep 2014. Extension: Jan. 2015.	"Net Zero Deforestation: Demonstration projects in the Andean-Amazonia" Objectives: • Contribute to an improved standard of living of residents of Shamboyacu, Picota Province, by developing capacities and providing tools for improved agricultural and forest management practices and to restore degraded forest areas; • Ensure ecosystem services, such as water provision and forest biomass, into the future.
Blue Moon Fund	Jan 2013 - Jun 2014 Extension: Dec. 2014	"Creating and strengthening integrated territorial management skills of the Kakataibo and Shipibo Communities in Ucayali, Peru" Objectives: • Territorial delimitation; • Land-use management; • Conflict resolution.
USAID	Apr 2013 - Mar 2014 Extension: Dec. 2014 (with additional funding)	"Conservation program for the Cordillera Azul" Objectives: • Protect the PNCAZ and its biodiversity; • Strengthen local capacity for sustainable use and improved standard of living; • Incorporate planning and monitoring for optimum administration of the PNCAZ and its buffer zone and develop monitoring for REDD; • Financial sustainability of the PNCAZ.
Althelia Climate Fund	Nov 2014 – Nov. 2018	"Proyecto REDD+ del PNCAZ" • Protect the PNCAZ and its biodiversity; • Strengthen local capacity for sustainable use and improved standard of living; • Financial sustainability of the PNCAZ.
Blue Moon Fund / New Venture Fund	Jun 2015 – Mayo 2016 Extension: Sep. 2016	"PNCAZ's expanding, supporting sustainability and improving management of its buffer zone" • PNCAZ's expansion on Cushabatay sector; • Promote conservation initiatives on buffer zone; • Support verification for financial sustainability.
Fondo de Las Americas - Fondam	Dec. 2015 – Ago. 2017	"*Red Regional de Observación del Clima* for the Monitoring of Climate Change and its Impacts on the Ecosystems of Ucayali" • Establish and operate a regional cooperation platform for monitoring the climate and monitoring the impact of climate change on the ecosystems of the Protected Areas of Ucayali

Internal financial responsibility

CIMA places great emphasis on the efficient and responsible use of financial and other resources. Budgets are carefully monitored and reviewed, whether at the organization or project level. The Director of Finance and Administration monitors spending against approved budgets using a series of spreadsheets, regularly meets with project managers, and provides reports to the Executive Director. Spreadsheet data and other information support the identification of spending trends and suggestions for improvements throughout the organization. Administrative procedures that are in place guide employees on financial matters, including procedures on managing funds, expenses, cash advances and reimbursements.

Yearly financial audits of CIMA have been carried out by an accredited auditor. If there were any negative findings, CIMA corrected identified issues and implemented measures to prevent any inaccuracy from occurring again. This procedure has been successful to date. CIMA's 2015 financial audit received a favorable report, while the financial audit for the 2016 period is still in progress. A current financial spreadsheet will be provided to the verification body for review.

2.5 Legal Status and Property Rights

2.5.1 National and Local Laws (G5.1)

Relevant national and local laws and regulations and international treaties and agreements are unchanged from the list provided in the validated PD (Dec 20, 2012), with the exception of:

- Ley Forestal y de Fauna Silvestre (Ley N° 29763), enacted in 2011. Regulates the management of forest ecosystem services, recognizing its importance, the need for conservation and responsible and sustainable management of forest ecosystems, to counteract the negative effects of climate change.

  Including its respective regulations, enacted in September 2015 (afterward the verification period):

  - Reglamento para la Gestión Forestal, (D.S. Nº 018-2015-MINAGRI).
  - Reglamento para la Gestión de Fauna Silvestre (D.S. Nº 019-2015-MINAGRI).
  - Reglamento para la Gestión e las Plantaciones Forestales y los Sistemas Agroforestales (D.S. Nº 020-2015-MINAGRI).
  - Reglamento para la Gestión Forestal y de Fauna Silvestre en Comunidades Nativas y Comunidades Campesinas (D.S. Nº 021-2015-MINAGRI).

- Ley de Mecanismos de Retribución por Servicios Ecosistémicos, from June 2014. It provides relevant definitions and the different types of mechanisms that can be applied. It also presents the National Register of Compensation Mechanisms for Ecosystem Services (*Registro Único de Mecanismos de Retribución por Servicios Ecosistémicos*).

The Regulation for this law was under discussion through the end of 2015, and finally approved in July 2016. It promotes and regulates the establishment of voluntary agreements that reward the efforts of various public and private actors in the maintenance and enhancement of ecosystem services, including forest ecosystems under threat

- Resolución N° 26-2014-SERNANP, published on Marh 2014[24]. Establishes procedures for the marketing of carbon credits from REDD projects in protected areas.

  http://cdn.inventarte.net.s3.amazonaws.com/cop20/wp-content/uploads/2015/07/Segundo-Webinar_SERNANP.pdf

CIMA is committed to meeting or exceeding any regulation, standard, treaty or international agreement that may cover its activities. The only regulation that affects the project area is the regulation establishing the national park and appropriate uses (Supreme Decree No. 031-2001-AG). The project exists to enforce these regulations and is therefore in compliance with them. CIMA continues to monitor new or changing regulations to identify any that may affect the project area.

Within the PNCAZ, CIMA has authorization over management of the park and the role of the park guards is to alert appropriate authorities in the case of an illegal activity. CIMA does not have the authority to enforce any regulations outside the park. Many laws exist that govern activities of organizations and communities in the buffer zone but the enforcement of these laws by the proper authorities is rare.

More details about Legal Regulations are in the PD (section 1.11 Compliance with Laws, Statutes, Property Rights and Other Regulatory Frameworks).

2.5.2 Free, Prior and Informed Consent (G5.3)

Unchanged from description in the validated PD.

There is a possibility that an uncontacted group of Kakataibo[25] resides in or near the park (FENACOCA/IBC 2005, CIMA 2011) though there has never been an event of meeting with an uncontacted indigenous person in all the years that CIMA and SERNANP have been working in the PNCAZ and its buffer zone. This possibility led CIMA to the development of the intangible zone that permits no entry or use by anyone other than the Kakataibo in isolation.

CIMA also worked extensively with Kakataibo tribal leaders and the Peruvian government to identify the greatest possible range of these people when defining this intangible zone[26]. Park guards, communal park guards and extension team personnel all received training regarding how to respect the rights of these people to remain uncontacted and the best ways to react if contact accidentally happens in the buffer zone.

Records of *Indigenous People in Isolation and Initial Contact* (Pueblos Indígenas en Situación de Aislamiento y en Situación de Contacto Inicial - PIACI) enable to register preventively as *Reservas Indígenas* (formerly *Reservas Territoriales*, which must be adequate) in order to be assessment by the Multisectoral Commission created by Law Nº 28736, *'Ley para la Protección de Pueblos Indígenas u Originarios en Situación de Aislamiento y en Situación de Contacto Inicial'*. In this regard, should be mentioned that the records are subject to constant updates according to official information that is generated. Also, in accordance with the Directiva Nº 001-2013-VMI / MC " *Normas, Pautas y Procedimientos para el Registro de los Pueblos Indígenas en Situación de Aislamiento y en Situación de Contacto Inicial y el Registro de Reservas Indígenas* ", approved by RVM No. 008-2013-VMI / MC, already has the Memorandum Nº 189-2013-VMI / MC which gives "favorable qualification for the recognition of indigenous people

[24] http://legislacionanp.org.pe/wp-content/uploads/2014/03/SERNANP-norma2.pdf
[25] http://www.cultura.gob.pe/es/interculturalidad/dpiaci/registro/piaci
[26] http://www.cultura.gob.pe/sites/default/files/paginternas/tablaarchivos/2014/03/07-solicitudderesservaindigenacacataibosurycacataibonorte.pdf

Kakataibo in situation of isolation, and the categorization of Indigenous Reserve Kakataibo Sur and Indigenous Reserve Kakataibo Norte"[27]; however requires more information to define the geographic scope. CIMA has been supporting efforts to have more information about these peoples in isolation, without disturbing in any way your current lifestyle.

PIACI are characterized by their immunological, social and cultural vulnerability; thus, it is necessary for the State to adopt and implement specific protection policies for these populations, with the creation of intangible indigenous reserves, for the exclusive use of these populations and the traditional use (for subsistence) of native communities around these reserves. To date, the Kakataibo North (corresponding to the PNCAZ buffer zone) and South Indigenous Reserve proposal has completed the first stage of the categorization process. On August 9, 2017, the Kakataibo people in isolation obtained their recognition of existence (Supreme Decree Nº 0 -2017-MC). Now, requires the second stage of categorization, which will end in the delimitation of the perimeter and area of the indigenous reserve. Indigenous reserves acquire such status by supreme decree, based on an Additional Categorization Study (EAC).

It should be noted that any attempts to locate these people in voluntary isolation, to ask them for permission to develop a REDD project, would directly violate their right to remain uncontacted under Peruvian laws and the international agreements signed by Peru (see PD Section 3.1.2). In this context, CIMA and SERNANP (parkguards) activities in this region are designed specifically to allow the uncontacted peoples to conduct their lives as they wish, with zero interference from outsiders.

More information in the section CM1.1.

2.5.3 Property Rights Protection (G5.4)

Unchanged from description in the validated PD

Titled land inside the PNCAZ

In late 2000, when CIMA's predecessor organization APECO and The Field Museum were preparing the documents necessary to establish Cordillera Azul National Park, they partnered with Conservational International (CI). CI retained a law firm in Peru to research land ownership and claims in the area so that boundaries for the park could be designed to avoid any private properties inside. Due to an oversight, ownership claims filed in the district of Loreto were not investigated. As a result, the park was established with some private parcels acquired prior to the park's formation, 1,227 ha, inside the park boundaries. CIMA reached agreements with all 21 landowners to limit land-clearing activities in the park.

Although there are no permanent residences in the park, the privately-held parcels are not included in the project area and CIMA will not claim any avoided deforestation credits for these areas.

2.5.4 Identification of Illegal Activity (G5.5)

Unchanged from description in the validated PD

One illegal cattle ranch is within the project area. When the project began in 2008, only one area inside the park continued to be incompatible with conservation: an estimated 220 ha cattle

[27] http://www.cultura.gob.pe/sites/default/files/paginternas/tablaarchivos/2014/03/12-pueblocacataibo.pdf

ranch on the southwest corner of the park that had not been detected when the park was established. Once it was detected, the cattle rancher was asked to leave the park since he did not own the land. In his response, the rancher offered not to expand his operations and to help keep watch for illegal uses of land within the park since he was there prior to its establishment. SERNANP and CIMA agreed to this and allowed the rancher to remain under these terms. Just prior to the start of the project, monitoring demonstrated that the cattle rancher had expanded his operations in violation of his agreement. This resulted in legal proceedings that are ongoing (Section 2.2.3 of the PD).

3 CLIMATE

3.1 Monitoring GHG Emission Reductions and Removals

3.1.1 Data and Parameters Available at Validation

Data / Parameter	$\Delta C_{BSL,PA,unplanned}$
Data unit	t CO_2-e
Description	Net CO_2 emissions in the baseline from unplanned deforestation in the project area
Source of data	Derived in Section 3.1 of PD
Value applied:	4,075,362.78 t CO_2-e (2016)
Justification of choice of data or description of measurement methods and procedures applied	Derived and justified in Section 3 of PD in which baseline is set
Purpose of the data	Calculation of baseline emissions
Comments	The value corresponds to the existence of carbon above and below ground

Data / Parameter	$\Delta C_{BSL,LK,unplanned}$
Data unit	t CO_2-e
Description	Net CO_2 emissions in the baseline from unplanned deforestation in the leakage belt
Source of data	Derived in Section 3.1 and 3.2 of PD
Value applied:	18,451,176.86 t CO_2-e (2016)
Justification of choice of data or description of measurement methods and procedures applied	Derived and justified in Section 3 of PD in which baseline is set
Purpose of the data	Calculation of baseline emissions
Comments	The value corresponds to the existence of carbon above and below ground

Data / Parameter	C_{OLB}
Data unit	t CO_2-e ha^{-1}
Description	Area-weighted average aboveground tree carbon stock for forests available for unplanned deforestation outside the Leakage Belt
Source of data	2010 FAO FRA Peru Country Report
Value applied:	376.3 t CO_2-e ha^{-1}

Justification of choice of data or description of measurement methods and procedures applied	Derived above in Section 3.3 of the Project Description
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	C_{LB}
Data unit	t CO_2-e ha^{-1}
Description	Area weighted average aboveground tree carbon stock for forests available for unplanned deforestation inside the Leakage Belt
Source of data	Stocks were derived by first delineating three high order forest classes from Natureserve (Josse et al. 2007; and Ferreira et al. 2007), *humedales-vegetacion inundable* and *tierra firme* (corresponding roughly with aguajal/alluvial forest and hill/mountain forest, respectively, from the project area) and anthropogenic forest. For each of the three classes, spatially-explicit aboveground biomass data were obtained from Saatchi et al. 2009, from which an area-weighted mean live aboveground tree carbon stock was estimated.
Value applied:	358.8 t CO_2-e ha-1
Justification of choice of data or description of measurement methods and procedures applied	Derived above in Section 3 of the Project Description
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	*CF*
Data unit	t C t $d.m.^{-1}$
Description	Carbon fraction of dry matter in t C t^{-1} d.m.
Source of data	Default value of from IPCC 2006GL
Value applied:	0.47 t C t^{-1} d.m
Justification of choice of data or description of measurement methods and procedures applied	As permitted by methodology VM0007 module CP-AB "Values from the literature (e.g. IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3) shall be used if available, otherwise default value of 0.47 t C t^{-1} d.m. can be used"
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	*D:RAD*
Data unit	Dimensionless

Description	Ratio of DBH to plot radius, specific to prism Basal Area Factor (BAF) employed in point sampling
Source of data	Avery, T.E. and H.E. Burkhart. 1994. Forest Measurements. Fourth Edition. McGraw Hill, Boston, Massachusetts, USA. 408 pp.
Value applied:	

	BAF gauge				
ft^2/acre	5	10	15	20	40
m^2/ha	1.15	2.29	3.44	4.59	9.18
ratio dbh/plot radius	1:46.7	1:33	1:26.9	1:23.3	1:16.5

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	$f_j(X,Y)$
Data unit	t d.m. tree^{-1}
Description	Allometric equation for species *j* linking measured tree variable(s) to aboveground biomass of living trees, expressed as t d.m. tree^{-1}
Source of data	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, B., Puig, H., Riera, B. and T. Yamakura. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145:87-99. Freitas Alvarado, L., Otarola Acevedo, E., del Castillo Torres, D., Linares Bensimon, C., Martinez Davila, P. and G.A. Malca Salas. 2006. Servicios ambientales de almacenamiento y secuestro de carbono del ecosistema aguajal en la Reserva Nacional Pacaya Samiria, Loreto, Perú. Instituto de Investigaciones de la Amazonía Peruana. Documento Técnico Nº 29. Iquitos, Perú.
Value applied:	Detailed in PNCAZ 2009 forest inventory report
Justification of choice of data or description of measurement methods and procedures applied	Both equations validated in PNCAZ 2009 forest inventory report
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	*R*
Data unit	t root d.m. t $^{-1}$ shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per unit area (not on a per stem basis).

Source of data	Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world's upland forests. Oecologia 111, 1-11. Freitas Alvarado, L., Otarola Acevedo, E., del Castillo Torres, D., Linares Bensimon, C., Martinez Davila, P. and G.A. Malca Salas. 2006. Servicios ambientales de almacenamiento y secuestro de carbono del ecosistema aguajal en la Reserva Nacional Pacaya Samiria, Loreto, Perú. Instituto de Investigaciones de la Amazonía Peruana. Documento Técnico Nº 29. Iquitos, Perú.
Value applied:	Detailed in PNCAZ 2009 forest inventory report
Justification of choice of data or description of measurement methods and procedures applied	Note that rather than using a constant root to shoot ratio to estimate belowground biomass, belowground biomass was estimated using an allometric equation, where the relationship varies continuously with aboveground biomass. The equation is derived from 151 observations from a global dataset of upland forests. For *Mauritia flexuosa* root biomass (lowland palm swamps) a fixed root: total biomass ratio of 0.276 derived from in-country empirical data was used.
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	D_{DWdc}
Data unit	t d.m. m^{-3}
Description	Mean wood density of dead wood in the density class (dc) – sound (1), intermediate (2), and rotten (3); t d.m. m^{-3}
Source of data	Measured from dead wood samples, 30 from each decomposition class, collected in the project area. Density of dead wood was determined through sampling and laboratory analysis as follows. Discs were collected in the field and decomposition class and green volume determined as per standard protocols (Appendix 2). Discs were then transferred to a laboratory (Laboratorio de Análisis de Suelos del Instituto Nacional de Investigación Agraria, INIA) in Tarapoto and oven-dried at 80°C, conducting continuous weight measurements until reaching constant weight. The resulting dry weight was recorded and used to calculate dead wood density as oven-dry weight (g) / green volume (cm^3) for each sample.
Value applied:	Detailed in PNCAZ 2009 forest inventory report
Justification of choice of data or description of measurement methods and procedures applied	Measurements follow procedures as outlined in methodology VM0007 module CP-D
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	*Regional Forest Cover / Non-Forest Cover Benchmark Map*
Data unit	ha
Description	Map showing the location of forest land within the reference region at the beginning of the crediting period

Source of data	Classified satellite imagery
Value applied:	3,271,261 ha (at beginning of first baseline period)
Justification of choice of data or description of measurement methods and procedures applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions
Comments	Updated every 10 years at baseline revision

Data / Parameter	*Project Forest Cover Benchmark Map*
Data unit	ha
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data	Classified satellite imagery
Value applied:	1,348,258.6 ha (at beginning of 2016 monitoring period)
Justification of choice of data or description of measurement methods and procedures applied	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of baseline emissions
Comments	Updated at each monitoring/verification event

Data / Parameter	*Leakage Belt Forest Cover Benchmark Map*
Data unit	ha
Description	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period. Only applicable where leakage is to be monitored in a leakage belt
Source of data	Classified satellite imagery
Value applied:	1,819,720.6 ha (at beginning of 2016 monitoring period)
Justification of choice of data or description of measurement methods and procedures applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of leakage
Comments	Updated at each monitoring/verification event

Data / Parameter	$COMF_i$
Data unit	dimensionless
Description	Combustion factor for stratum *i* (vegetation type)

Source of data	Default values in Table 2.6 of IPCC 2006 (Annex 2)
Value applied:	Not applied, $A_{burn,i,t}$ = 0 for 2016 monitoring period
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

Data / Parameter	G_{gi}
Data unit	g kg^{-1} dry matter burnt
Description	Emission factor for stratum *i* for gas *g*,
Source of data	Defaults in Volume 4, Chapter 2, of the IPCC 2006 Inventory Guidelines in table 2.5 (Annex 2: emission factors for various types of burning for CH_4 and N_2O).
Value applied:	Not applied, $A_{burn,i,t}$ = 0 for 2016 monitoring period
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data	Calculation of project emissions
Comments	

3.1.2 Data and Parameters Monitored

Details on data and parameters monitored are provided below. Note that:

- Where a parameter is calculated from a methodology equation (i.e. not raw data), the methodology module and equation number is specified and "Description of measurement methods and procedures to be applied" and "QA/QC procedures to be applied" are left blank.
- To avoid repetition and maintain an economical use of space in the summary tables, "Description of measurement methods and procedures to be applied" and "QA/QC procedures to be applied" for monitored (not calculated) parameters reference detailed accounts of procedures provided in the monitoring plan description below.

Data / Parameter	$\Delta C_{P,Def,i,t}$
Data unit	t CO_2-e
Description	Net carbon stock change as a result of deforestation in the project case in the project area in stratum *i* at time *t*
Source of data	Calculated
Description of measurement methods and procedures to be applied	

Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	588.5 t CO_2-e (2016, all strata)
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	Equation 3, VMD0015
Comments	

Data / Parameter	$\Delta C_{P,DefLB,i,t}$
Data unit	t CO_2-e
Description	Net carbon stock change as a result of deforestation in the project case in the leakage belt in stratum *i* at time *t*
Source of data	Calculated
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	6,227,947.4 t CO_2-e (2016, all strata)
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage
Calculation method	Equation 4, VMD0015
Comments	

Data / Parameter	$\Delta C_{P,DistPA,i,t}$
Data unit	t CO_2-e
Description	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum *i* at time *t*
Source of data	Calculated
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	168.0 t CO_2-e (2016, all strata)
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions

Calculation method	Equation 20, VMD0015
Comments	

Data / Parameter	$A_{DefPA,u,i,t}$
Data unit	Ha
Description	Area of recorded deforestation in the project area stratum *i* converted to land use *u* at time *t*
Source of data	Monitored at each monitoring/verification event through analysis of classified satellite imagery
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description. Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to 3 pixels by 3 pixels Landsat resolution (90m by 90m), providing closest conformance possible to 0.5 ha Peru DNA forest definition with Landsat.
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	1.1 ha (2016, all strata, all land uses)
Monitoring equipment	Image processing, classification and assessment work was conducted using IDRISI, TerrSet, Eastman, J.R., 2014. I (Worcester, MA: Clark University). Some steps in accuracy assessment were conducted using: Arc GIS 10.0 ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$A_{DefLB,u,i,t}$
Data unit	ha
Description	Area of recorded deforestation in the leakage belt stratum *i* converted to land use *u* at time *t*
Source of data	Monitored at each monitoring/verification event through analysis of classified satellite imagery
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description. Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to3 pixels by 3pixels Landsat resolution (90m by 90m), providing closest conformance possible to 0.5 ha Peru DNA forest definition with Landsat.
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	14,200.7 ha (2016, all strata, all land uses)

Monitoring equipment	Image processing, classification and assessment work was conducted using IDRISI, Selva edition, Eastman, J.R., 2012. IDRISI Selva (Worcester, MA: Clark University). Some steps in accuracy assessment were conducted using: Arc GIS 10.0 ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of leakage
Calculation method	
Comments	

Data / Parameter	$A_{DistPA,q,i,t}$
Data unit	ha
Description	Area impacted by natural disturbance in post-natural disturbance stratum *q* in stratum *i,* at time *t*
Source of data	Monitored at each monitoring/verification event through analysis of classified satellite imagery
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description. Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to3 pixels by 3 pixels Landsat resolution (90m by 90m), providing closest conformance possible to 0.5 ha Peru DNA forest definition with Landsat.
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	0.4 ha (2016, all strata, all land uses)
Monitoring equipment	Image processing, classification and assessment work was conducted using IDRISI, Selva edition, Eastman, J.R., 2012. IDRISI Selva (Worcester, MA: Clark University). Some steps in accuracy assessment were conducted using: Arc GIS 10.0 ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	Accounts only area of overlap with cumulative baseline deforestation in the project area through 2016

Data / Parameter	$C_{BSL,i}$
Data unit	t CO_2-e ha^{-1}
Description	Carbon stock in all pools in the baseline case in stratum *i*

Source of data	Estimated from forest carbon inventory. For strata identified in the leakage belt from vegetation maps from NatureServe (Josse et al. 2007), but not represented in the project area inventory, stock estimates specific to each stratum will be obtained from peer-reviewed values from Peru.
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description
Frequency of monitoring/recording	Every ≤ 10 years. First re-measurement in 2018.
Value monitored:	Detailed in PNCAZ 2009 forest inventory report
Monitoring equipment	Detailed in PNCAZ 2009 forest inventory report
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$C_{P,post,u,i}$
Data unit	t CO_2-e ha^{-1}
Description	Carbon stock in all pools in post-deforestation land use *u* in stratum *i*
Source of data	Post deforestation carbon stocks are set as the historical area-weighted average carbon stock for pasture and cultivation land uses, derived from historical land use survey data and stocks estimates from regional studies in PD Section 3.
Description of measurement methods and procedures to be applied	None
Frequency of monitoring/recording	Every ≤ 10 years. Value to be re-assessed in 2018.
Value monitored:	41.3 t CO_2-e ha^{-1}
Monitoring equipment	none
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$C_{P,Dist,q,i}$
Data unit	t CO_2-e ha^{-1}
Description	Carbon stock in pools in post-natural disturbance strata *q* in stratum *i*
Source of data	Conservatively assumed to be zero post disturbance

Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Not monitored and conservatively assumed to be zero post disturbance.
Value monitored:	0 t CO_2-e ha^{-1}
Monitoring equipment	none
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$A_{DegW,i,t}$
Data unit	ha
Description	Area potentially impacted by degradation processes in stratum *i*
Source of data	Delineated based on survey results indicating general area of project potentially accessed and typical depth of penetration of illegal harvest activities from points of access
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording	Repeated each time the PRA indicates a potential for degradation. PRA conducted every $\leq$ 2 years
Value monitored:	Not estimated. PRA did not indicate potential for degradation.
Monitoring equipment	
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$C_{DegW,i,t}$
Data unit	t CO_2-e
Description	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* at time *t*
Source of data	Estimated from diameter measurements of cut stumps in sample plots

Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value monitored:	Not estimated for 2016 monitoring period
Monitoring equipment	
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	AP_i
Data unit	Ha
Description	Total area of degradation sample plots in stratum *i*
Source of data	Calculated as 3% of $A_{DegW,i,t}$
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value monitored:	Sampling not carried out for 2016
Monitoring equipment	
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$\Delta C_{P,DegW,i,t}$
Data unit	t CO_2-e
Description	Net carbon stock changes as a result of degradation in stratum *i* in the project area at time *t*
Source of data	Calculated
Description of measurement methods and procedures to be applied	

Frequency of monitoring/recording	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value monitored:	Sampling not carried out for 2016
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	Equation 8, VMD0015
Comments	

Data / Parameter	$PROP_{IMM}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by immigrating population
Source of data	Calculated based on results of 2015 survey of communities within 2 km of the PNCAZ boundary.
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description. Questions will be structured as: how long have you lived here and where did you come from prior? Immigrants are defined as someone who has lived in the area less than 5 years and came from an area outside the leakage belt. As there are sensitivities to assessing responsibility for deforestation in an interview context, the proportion of baseline deforestation caused by immigrating population will be assumed to be equal to the proportion of immigrants in the surrounding population.
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	19.7%
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage emissions
Calculation method	
Comments	

Data / Parameter	*MANFOR*
Data unit	Ha
Description	Total area of forests under active management nationally
Source of data	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied	

Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage emissions
Calculation method	
Comments	May be conservatively set to zero

Data / Parameter	*PROTFOR*
Data unit	Ha
Description	Total area of fully protected forests nationally
Source of data	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	0
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage emissions
Calculation method	
Comments	May be conservatively set to zero A demonstration is required that areas will be protected against deforestation. Such a demonstration shall include either: 1. Designation as a UNESCO World Heritage Site, or 2. Management by an international NGO, or 3. Evidence that the government has immediately acted to evict any and all illegal squatters

Data / Parameter	*TOTFOR*
Data unit	ha
Description	Total available national forest area
Source of data	Official data, peer reviewed publications and other verifiable sources, including Peru FAO FRA reports, e.g. FAO. 2015. Global Forest Resources Assessment 2015, Peru Country Report. Forestry Department, Food and Agriculture Organization of the United Nations, Rome.
Description of measurement methods and procedures to be applied	

Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	73,973,000 ha
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage emissions
Calculation method	
Comments	

Data / Parameter	$PROP_{RES}$
Data unit	Proportion
Description	Estimated proportion of baseline deforestation caused by population that has been resident for ≥5 years
Source of data	Calculated based on results of 2015 survey of communities within 2 km of the PNCAZ boundary.
Description of measurement methods and procedures to be applied	Equals 1 - $PROP_{IMM}$ Detailed procedures provided under monitoring plan description below.
Frequency of monitoring/recording	Every ≤ 5 years
Value monitored:	80.3%
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage emissions
Calculation method	
Comments	

Data / Parameter	*N*
Data unit	Dimensionless
Description	Number of samples (i.e. clusters of 5 variable radius plots)
Source of data	Detailed in PNCAZ 2009 forest inventory report
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Every ≤ 10 years
Value monitored:	64 clusters of 5 variable radius plots
Monitoring equipment	N/A
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	Detailed in PNCAZ 2009 forest inventory report

Comments	

Data / Parameter	*DBH*
Data unit	cm
Description	Diameter at breast height of a tree in cm
Source of data	Measured in the field
Description of measurement methods and procedures to be applied	Detailed in PNCAZ 2009 forest inventory report
Frequency of monitoring/recording	Every ≤ 10 years
Value monitored:	Detailed in PNCAZ inventory analysis database and field data sheets
Monitoring equipment	Detailed in PNCAZ 2009 forest inventory report
QA/QC procedures to be applied	Detailed in PNCAZ 2009 forest inventory report and in description of monitoring plan below
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$Dia_{n,i,t}$
Data unit	cm
Description	Diameter of piece *n* of dead wood along the transect in stratum *i*, at time *t* in *cm*
Source of data	Measured in the field
Description of measurement methods and procedures to be applied	Detailed in PNCAZ 2009 forest inventory report
Frequency of monitoring/recording	Every ≤ 10 years
Value monitored:	Detailed in PNCAZ inventory analysis database and field data sheets
Monitoring equipment	Detailed in PNCAZ 2009 forest inventory report
QA/QC procedures to be applied	Detailed in PNCAZ 2009 forest inventory report and in description of monitoring plan below
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	*BDia*
Data unit	cm

Description	Basal diameter of standing dead tree in cm
Source of data	Measured in the field
Description of measurement methods and procedures to be applied	Detailed in PNCAZ 2009 forest inventory report
Frequency of monitoring/recording	Every ≤ 10 years
Value monitored:	Detailed in PNCAZ inventory analysis database and field data sheets
Monitoring equipment	Detailed in PNCAZ 2009 forest inventory report
QA/QC procedures to be applied	Detailed in PNCAZ 2009 forest inventory report and in description of monitoring plan below
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	TD_{SDW}
Data unit	cm
Description	Top diameter of standing dead tree in cm
Source of data	
Description of measurement methods and procedures to be applied	Not measured
Frequency of monitoring/recording	
Value monitored:	
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	Standing dead wood volume calculations assume volume of a paraboloid, i.e. volume = cross sectional area * height * ½ (no need for top diameter)

Data / Parameter	H_{SDW}
Data unit	m
Description	Height of standing dead tree in m
Source of data	Measured in the field
Description of measurement methods and procedures to be applied	Detailed in PNCAZ 2009 forest inventory report

Frequency of monitoring/recording	Every ≤ 10 years
Value monitored:	Detailed in PNCAZ inventory analysis database and field data sheets
Monitoring equipment	Detailed in PNCAZ 2009 forest inventory report
QA/QC procedures to be applied	Detailed in PNCAZ 2009 forest inventory report and in description of monitoring plan below
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	*Project Forest Cover Monitoring Map*
Data unit	ha
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period (= updated *Project Forest Cover Benchmark Map).*
Source of data	Classified satellite imagery
Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording	Updated at each monitoring/verification event every ≤ 5 years
Value monitored:	1,348,179.7 ha (at end of monitoring period)
Monitoring equipment	Image processing, classification and assessment work was conducted using IDRISI, TerrSet edition, Eastman, J.R., 2014. (Worcester, MA: Clark University). Some steps in accuracy assessment were conducted using: Arc GIS 10.0 ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	*Leakage Belt Forest Cover Monitoring Map*
Data unit	ha
Description	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period (= updated *Leakage Belt Forest Cover Benchmark Map).*
Source of data	Classified satellite imagery

Description of measurement methods and procedures to be applied	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording	Updated at each monitoring/verification event every ≤ 5 years
Value monitored:	1,805,519.9 ha (at end of monitoring period)
Monitoring equipment	Image processing, classification and assessment work was conducted using IDRISI, TerrSet edition, Eastman, J.R., 2014. (Worcester, MA: Clark University). Some steps in accuracy assessment were conducted using: Arc GIS 10.0 ESRI 2011. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.
QA/QC procedures to be applied	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

Data / Parameter	$A_{burn,i,t}$
Data unit	ha
Description	Area burnt in stratum *i* at time *t*
Source of data	GPS coordinates and/or Remote Sensing data
Description of measurement methods and procedures to be applied	Remote sensing analysis detailed below under monitoring plan description
Frequency of monitoring/recording	Areas burnt shall be monitored at least every five years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored:	0 ha (2016, all strata)
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of project emissions
Calculation method	
Comments	

3.1.3 Monitoring Plan

3.1.3.1 Revision of the baseline

The baseline as outlined here in the Project Description is valid for 10 years, through August 7, 2018. The baseline will be revised every 10 years from the project start date.

3.1.3.2 Monitoring of actual carbon stock changes and greenhouse gas emissions

For accounting purposes the project conservatively assumes stable stocks and no biomass monitoring is conducted in areas potentially undergoing carbon stock enhancement, as permitted in the methodology monitoring module VMD0015, hence ΔCP,Enh,i,t is set to 0.

Monitoring of actual emissions in the project area focuses on:

- Emissions due to deforestation and natural disturbance;
- Emissions due to biomass burning;
- Emissions due to illegal degradation.

Procedures and responsibilities for monitoring each of the above sources of emissions are detailed below.

3.1.3.3 Emissions due to deforestation and natural disturbance

Forest cover change due to deforestation and natural disturbance is monitored through periodic assessment of classified satellite imagery covering the project area. Emissions ($\Delta C_{P,Def,i,t}$ and $\Delta C_{P,DistPA,i,t}$ for deforestation and natural disturbance, respectively) are estimated by multiplying area of forest loss detected ($A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$, for deforestation and natural disturbance, respectively) by average forest carbon stock per unit area (conservatively assuming $\Delta C_{P,Dist,q,i,t}$ and $\Delta C_{pools,Def,u,i,t} = C_{BSL,i}$). Stock estimates from the initial field inventory completed in 2009, are valid for 10 years (per VM0007), minimally through 2018. Post 2018, forest carbon stock estimates will be updated for any strata where deforestation or natural disturbance is detected.

Monitoring changes in forest cover

The project boundary, as set in the PD, will serve as the initial "forest cover benchmark map" against which changes in forest cover will assessed over the interval of the first monitoring period; the entire project area has been demonstrated to meet the forest definition at the beginning of the crediting period. For subsequent monitoring periods, change in forest cover will be assessed against the preceding classified forest cover map marking the beginning of the monitoring interval.

Data collection and analysis to determine forest cover change at each monitoring event will follow the procedures detailed below. The resulting classified image is compared with the preceding classified image (forest cover benchmark map marking the start of the monitoring interval) to detect forest cover change over the monitoring interval, and subsequently becomes the updated forest cover benchmark map for the next monitoring interval. Thus, the forest benchmark map is updated at each monitoring event. All changes in forest cover detected for the monitoring interval will be annualized (to produce estimates of ha for each year) by dividing the area by the number of years in the period.

For each monitoring/verification date, satellite imagery for that year will be acquired and interpreted to produce a classified forest cover map in which forest and non-forest are distinguished. A Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to 3 pixels by 3 pixels Landsat resolution (90m x 90m) will be used throughout the duration of the project crediting period. The general work flow for monitoring forest cover change is shown in Figure 4.

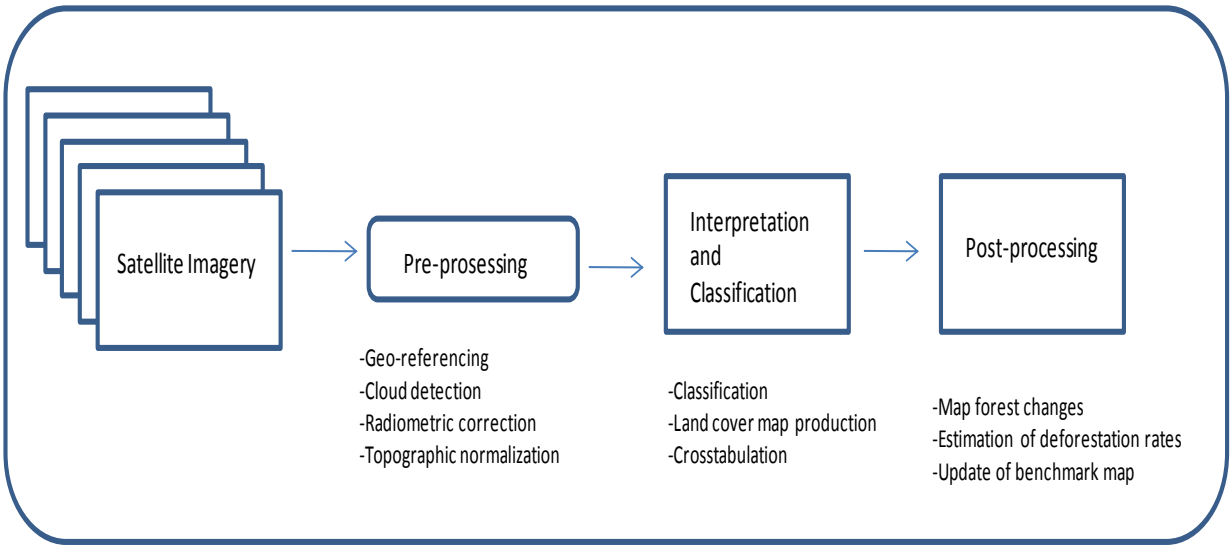


Figure 4. General workflow for monitoring forest cover change in the project area and leakage belt

The forest cover benchmark map for the project in August 2015 (Figure 5) establishes the extent and location of forest and non-forest at the beginning of the crediting period and the first verification interval.

Figure 5: Forest cover benchmark map for project area, August 2015

Data collection and analysis to determine forest cover change at each monitoring event will follow the procedures detailed below. The resulting classified image is compared with the preceding forest cover benchmark map to detect forest cover change for the monitoring period, and becomes the updated forest cover benchmark map for the subsequent monitoring period. Thus, the forest benchmark map is updated at each monitoring event.

Data acquisition

To estimate the change of forest cover within the project area, the benchmark map generated at the previous monitoring event (or at project start August 2008 for the first monitoring event) will be compared with a newly-generated classified forest cover map for the monitoring date. The new forest cover map for the project area will comply with the following requirements.

Base satellite imagery will cover both the project area and leakage belt (i.e. monitoring of project area and leakage belt will use the same data source) and will be from a single year, though it may include a mosaic of scenes over several months. Landsat imagery has been used in historical analysis, and will likely be used in the future, but with the failure of Landsat 5 in 2011, and the sensor error with Landsat 7, a final determination of the which sensor will be used will hinge on the continuity of the Landsat program. Landsat 8 was launched successfully in 2013 and continues to collect data along with Landsat 7. In the case that both of these sensors fail before their replacement, other medium resolution remotely sense data will be used that can calibrate to acceptable levels with the previous imagery.

Imagery will be 90% cloud free. This typically can be achieved by mosaicking multiple scenes from the same year together. In the case that imagery alone cannot achieve 90% classified area, where possible, clouded areas will be classified on the basis of other data sources (e.g. ground surveys in the year of interest, radar, over-flights or classified imagery from a year subsequent to the monitored year).

Per module M-MON, "If the areas with 10% cloud cover in either date in question do not overlap exactly, then the rate [will] come from areas that were cloud free in both dates in question.... estimated in % per year. Then, a maximum possible forest cover map [will] be made for the most recent time period [i.e. monitoring date]. The historical rate in % [will] be multiplied by the maximum forest cover area at the start of the period for estimating the total area of deforestation during the [monitoring] period."

The following cartographic data has also been collected to aid in geo-referencing and delineation of project area and leakage belt (all projected in UTM WGS 84 Zone 18 S):

- Carta Nacional 1:1 000,000 IGN (Hojas 13L, 14K, 14L, 19M, 15J, 15K, 15L, 15M, 16J, 16K, 16L, 16M, 17J, 17K, 17L, 17M, 18K, 18L, 18M)
- Rivers and roads - CIMA Cordillera Azul.
- Project area
- Leakage belt area

Pre-processing

As stated above Landsat moderate resolution imagery will be used preferentially. Landsat imagery is 30m multispectral data that is composed of 7 -11 bands. Some of these bands are not used in image classification since they are designed for collection of other data (i.e thermal bands or aerosols) The other 6 bands will be included in image analysis.

Collected imagery will be prepared for processing and analysis to ensure that the imagery displays and overlays accurately. The following pre-processing tasks will be conducted and are detailed below: geo-referencing, cloud and shadow removal. Each scene will be pre-processed and classified separately, eliminating need for radiometric corrections or topographic normalization where scenes must be puzzled together.

The majority of Landsat imagery from USGS is obtained from EROS (Earth Resource Observation Systems) with multiple pre-processing steps completed. These processing steps are summarized below and more detail information can be found from NASA[28].

The 1G product available to users is both radiometrically and geometrically corrected. The correction algorithms employed model the spacecraft and sensor using data generated by onboard computers during imaging events and ground control points and a digital elevation model are also used to improve the overall geometric fidelity. The geometric correction process utilizes both ground control points (GCP) and digital elevation models (DEM) to attain absolute geodetic accuracy. The WGS84 ellipsoid is employed as the Earth model for the Universal Transverse Mercator (UTM) coordinate transformation. Associated with the UTM projection is a unique set of projection parameters that flow from the USGS General Cartographic Transformation Package. The end result is a geometrically rectified product free from distortions related to the sensor (*e.g.,* jitter, view angle effects), satellite (e.g. altitude deviations from nominal), and Earth (*e.g.,* rotation, curvature, relief).

When landsat data is imported in the image processing software, it is converted from raw digital numbers to reflectance values. For this conversion a dark-object subtraction method is applies using the module in Idrisi, For Landsat data reflectance rescaling coefficients and the solar elevation angle parameter which are found in the metadata are applied, and a haze digital number is automatically determined. The results are ground reflectance images which are used in all further image processing steps

When using Level 1G processed imagery, pre-processing success must be confirmed, but frequently few extra pre-processing steps are necessary. The potential additional steps are detailed below.

Radiometric correction

Since change detection is conducted after classification, the only time additional radiometric correction is required is if severe atmospheric distortions are present in the only available imagery, or extreme topographic relief makes cloud shadows problematic. In these cases a haze reduction algorithm using a dark object subtraction may be used or a topographic normalization using a digital elevation model may be used.

Geo-referencing

For this procedure the August 2008 benchmark map will be used as a reference image from which all subsequent images will be geo-referenced. At least seven well distributed ground control points (GCP) will be identified for the geo-referencing procedure. Each GCP will be known and recognizable in the source image and the reference image. A resampling operation using the nearest neighbor interpolation method and a linear polynomial function will be used to ensure minimal distortion. The average geo-location error will not exceed one pixel. In the case that multiple images are mosaicked, a final image may be geo-referenced to ensure accurate location. In the case that imagery is obtained with geo-rectification conducted by the image producer or provider, secondary geo-referencing is not necessary.

Cloud and shadow detection and removal

Detection of clouds and shadows will be accomplished through visual inspection or combining automated cloud identification techniques and visual inspection. An unsupervised clustering technique and a post classification assessment will be used to identify all areas affected by

[28] http://landsathandbook.gsfc.nasa.gov/level/

clouds and cloud shadow. Other imagery from with 12 months of the image date may be used to fill in these cloud areas.

Interpretation and classification

In this step, the scenes are interpreted by applying a classification algorithm to identify forest and non-forest categories. A two-step approach to classification will be used. In the first step, an unsupervised clustering algorithm technique will be used to classify each scene. Visual interpretation of clusters by an image analyst with knowledge of the land cover and/or with the assistance of high resolution imagery will be conducted to identify and then group all clusters into forest, non-forest, fire or fire scars, cloud and cloud-shadow and water classes. In the case of mixed classed, a second stage clustering may be employed on just the areas of confusion to see if clear classes may be identified. If clear categorization has been obtained (tested through the accuracy assessment) then step 2 can be skipped. If the classification accuracy using the unsupervised technique is not sufficient, or if the analyst prefers the use of supervised techniques, then a maximum likelihood algorithm will be used for supervised classification using samples of known areas selected for training areas (AOI, Areas of Interest) for a minimum of the following classes: "non-forest," "forest," “fire scars,” “water”. A final land use map with 2 categories (forest and non-forest) will be created to assess forest loss against the previous benchmark map. In the case of fire evidence, as can be detected through the distinct spectral signature of burn scars, typically for >18 months, or naturally shaped (as opposed to more typically geometrically shaped anthropogenic disturbance) patches of re-growth, or from field reports of fires that have been investigated and substantiated through remote sensing evidence, these areas will be maintained as a separate category to calculate parameter $A_{burn,i,t}$; and for estimation of biomass burning emissions using the module E-BB, calculated emissions from biomass burning will be incorporated in project accounting only where they are not determined to be insignificant applying T-SIG. As mentioned above, each scene will be classified separately.

The following guidelines will be taken into consideration for the imagery classification process:

Each scene will be classified separately using a hard classification method. The geospatial analyst performing the classification will take into consideration the variety of features in the scene and reference training sites representing a range of categories (from within forest and non-forest) sufficient to facilitate the identification of forested locations from locations with no forest. Special attention will be given to grasslands or herbaceous wetlands, and especially old fallows and shade crops like coffee (which can be confused with forest) to avoid classification errors. Where necessary, corrections to the supervised classification will be made from visual interpretation of imagery. Once the classified map is produced, categories will be merged into two categories for change assessment: forest and non-forest.

Following classification, classified scenes will then be joined to produce a final map that will be compared against the benchmark map.

Post classification

To ensure that the minimum forest definition is met, the final classification will be filtered using a 3 x 3 mode filter. This will increase the MMU to 90m x 90 m to most closely meet the national forest definition. It will also improve any “speckle” in the classification due to small error.

Change detection

Post-classification change detection techniques will be implemented for identifying forest cover change.

Basic cross-tabulation techniques will be used to identify changes from forest to non-forest. Area data from the two maps (benchmark map at beginning of monitoring interval and newly-generated map for current monitoring year) will be cross-tabulated to identify locations that change from forest to non-forest during the monitoring period, which represent deforestation in the actual with-project case.

The project area has many extreme topographic features- Including very steep slopes, and areas at high elevation that have minimal tree cover. These areas were removed from the spatial modeling due to their inaccessibility, and will also be removed from the change detection analysis since any land cover change in these areas is due to non-anthropogenic sources. GIS files that delineate these masked areas are archived so that each analysis will maintain the same masks.

Quality Assurance/Quality Control

To ensure consistency and quality results, spatial analysts carrying out the imagery processing, interpretation, and change detection procedures will strictly adhere to the steps detailed above. All data sources and analytical procedures will be documented and archived (detailed under data archiving below).

Accuracy of the classification will be assessed by comparing the classification with ground truth points or samples of high resolution imagery (*e.g.,* SPOT or Rapideye imagery). Any data collected from ground-truth points will be recorded (including GPS coordinates, identified land-use class, and supporting photographic evidence) and archived. Any sample points of high resolution imagery used to assess classification accuracy will also be archived. Samples used to assess classification accuracy should be well-distributed throughout the project area (as far as is possible considering availability of high resolution imagery and/or logistics of acquiring ground truth data), with a minimum sampling intensity of 50 points each for the forest and non-forest classes.

Results of the accuracy assessment will be presented and analyzed in a matrix in the format elaborated in the example below (Table 3), such that the following errors are presented:

- Overall classification accuracy;
- Error of omission of each land-use category (forest and non-forest);
- Error of commission of each land-use category (forest and non-forest).

Table 3: Example accuracy assessment results

Land-use class as determined from ground-truth points	Classification		Total	Accuracy (%) *User's accuracy (# correct/ row total)*	Error of Commission (%)
	Forest	Non-forest			
Forest (100)	95	5	100	95.0	5.0
Non-forest (100)	9	91	100	91.0	9.0
Total	104	96	200		
Accuracy (%) *Producer's accuracy (# correct/ column total)*	91.3	94.8			
Error of Omission (%)	8.7	5.2			

The classification will only be used in the forest cover change detection step if the overall classification accuracy, calculated as the total number of correct samples/ the total number of samples, is equal to or exceeds 90%.

Data Archiving

All data sources and processing, classification and change detection procedures will be documented and stored in a dedicated long-term electronic archive maintained by CIMA at its main office in Lima as described in Section 3.3.8.

Information related to monitoring deforestation maintained in the archive will include:

- Base (raw) imagery used (specifying type, source, resolution, imagery date, acquisition date);
- Any cartographic data used to geo-reference the image (source, base data);
- Data used for training classification;
- Definition of land cover classes assessed;
- Documentation of software type and procedures applied (including all pre-processing steps and corrections, spectral bands used in final classifications, and classification methodologies and algorithms applied);
- Classified images;
- Data used in accuracy assessment, ground-truth points (including GPS coordinates, identified land-use class, and supporting photographic evidence) and/or sample points of high resolution imagery;
- Accuracy assessment matrix with minimally the following errors presented: overall classification accuracy, error of omission of each land-use category (forest and non-forest), and error of commission of each land-use category (forest and non-forest).

Data archived will be maintained through at least two years beyond the end of the project crediting period, through July 2030. Given the extended time frame and the pace of production of updated versions of software and new hardware for storing data, electronic files will be updated periodically or converted to a format accessible to future software applications, as needed.

Updating forest carbon stock estimates

Forest carbon stock estimates used to calculate emissions from deforestation and natural disturbance will use estimates derived from field measurements less than or equal to 10 years old. In the event that any deforestation is discovered in the project area, forest carbon stock estimates older than 10 years will be updated for any strata where deforestation is detected. Initial above- and belowground biomass and dead wood stock estimates from the 2009 inventory are valid and treated as constant through 2018, after which they will be re-estimated from new field measurements.

To re-assess forest carbon stocks, twenty (20) point samples (four clusters of five points) will be randomly located in each forest strata and measured (following field protocols in Appendix 8) in 2018. Biomass will be estimated applying the allometric equations of Chave et al. 2005 and otherwise maintain consistency with analytical procedures applied in the original 2009 inventory. For each strata, where the re-measured estimate of total forest biomass carbon (live and dead) is within the 90% confidence interval of the 2009 estimate, the 2009 stock estimate

will continue to be used in the next 10 year baseline period. If the re-measured estimate is outside (i.e., greater than or less than) the 90% confidence interval of the 2009 estimate, then the 2018 stock estimate will be used in the next 10 year baseline period.

3.1.3.4 Quality Assurance /Quality Control and Data Archiving Procedures

The following steps will be taken to control for errors in field sampling and measurements and data analysis:

1. Field crews with prior training in forest inventory will carry out all field data collection and adhere to field measurement protocols outlined in PD Appendix 8. Pilot sample plots shall be measured before the initiation of formal measurements to train and appraise field crews and identify and correct any errors in field measurements. Field crew leaders will be responsible for ensuring that field protocols are followed to ensure accurate and consistent measurement. During the course of implementation, field crews were periodically apprised of measurement errors to assess progress. To ensure accurate measurements, the height of diameter at breast height (1.3 m) will be periodically re-assessed by personnel during the course of the inventory. Field crews will have fine scale forest strata maps for use in the field to precisely interpret strata/forest boundaries and identify potential areas of plot overlap.
2. Calibration of prisms will be confirmed prior to formal field measurements. All borderline trees will be measured and assessed against prism plot radius factor, which is standardized as distance to the center of the tree: diameter at breast height.
3. An opportunistic sample of plots will be re-measured to assess measurement errors. Re-measurement for this purpose will be done by a different field crew. Measurement error will be assessed as 1/2 of the mean (absolute) percent difference between re-measured plot level biomass estimates (a valid assumption where teams are equally experienced and there are no systematic errors in measurement, which will also be appraised from the re-measurement results). Target measurement error is < 5%.
4. Field measurement data will be recorded on standard field data sheets (PD Appendix 8) and transferred to electronic media (“entrada de datos PNCAZ inventario.xls”) following each return from the field. Original data sheets will be permanently archived at the CIMA office in Tarapoto and Lima, and the electronic database of all field measurements will be housed in the dedicated long-term electronic archive maintained on the CIMA server at its main office in Lima. The electronic database will also archive GIS coverage detailing forest and strata boundaries and plot locations.
5. Checks will be run for unusual (high or low) values to identify and correct any errors in recorded field data or transcription. Personnel involved in data analysis will consult with personnel involved in measurement to clarify any ambiguities in recorded field data.
6. For laboratory analysis of dead wood specific gravity, all balances for measuring dry weights will be calibrated against known weights prior to use. All calibration results will be documented and archived along with sample analysis results. 10% of samples will be re-analyzed/re-weighed to produce an error estimate

3.1.3.5 Emissions due to illegal degradation

Emissions due to illegal logging will be tracked by conducting MUF surveys in communities with access to the project area at least every three years. If necessary to make the assessment

more frequently, then *ad hoc* surveys may be made to gather information on specific parameters.

Communities surveyed will include, but not necessarily be limited to those listed in Table 4.

Table 4: Communities to be surveyed

Reference region (District)	Population center
Huimbayoc	Pongo Isla
Huimbayoc	Pucallpa
Chazuta	Ricardo Palma
Chazuta	Callanayacu
Shamboyacu	Porvenir
Pampa Hermosa	Tahiti
Pampa Hermosa	Playa Hermosa
Alto Biavo	Los Cedros
Bajo Biavo	Selva Andina
Alto Biavo	Challual
Alto Biavo	Juanita
Padre Abad	Yamino
Contamana	La Cumbre

Surveys will produce information on wood consumers (fuel wood and wood for construction and charcoal production) in the surroundings areas, as well as general indications on the areas where wood is sourced from and maximum depth of penetration of harvest activities from access points.

In the event that any potential of illegal logging occurring in the project area is detected from the surveys (*i.e.* ≥10% of those interviewed/surveyed believe that degradation may be occurring within the project boundary), temporary sample plots will be allocated and measured in the area of the project indicated by the surveys as a potential source area for illegally-harvested wood. The potential degradation area within the project area ($A_{DegW,i}$) will be delineated based on survey results, incorporating general area information and maximum depth of penetration. Rectangular plots 10 meters by 1 kilometer (1 ha area) will be randomly or systematically allocated in the area, sufficient to produce a 1% sample of the area, and any recently-cut stumps or other indications of illegal harvest will be noted and recorded. Diameter at breast height or diameter at height of cut, whichever is lower, of cut stumps will be measured.

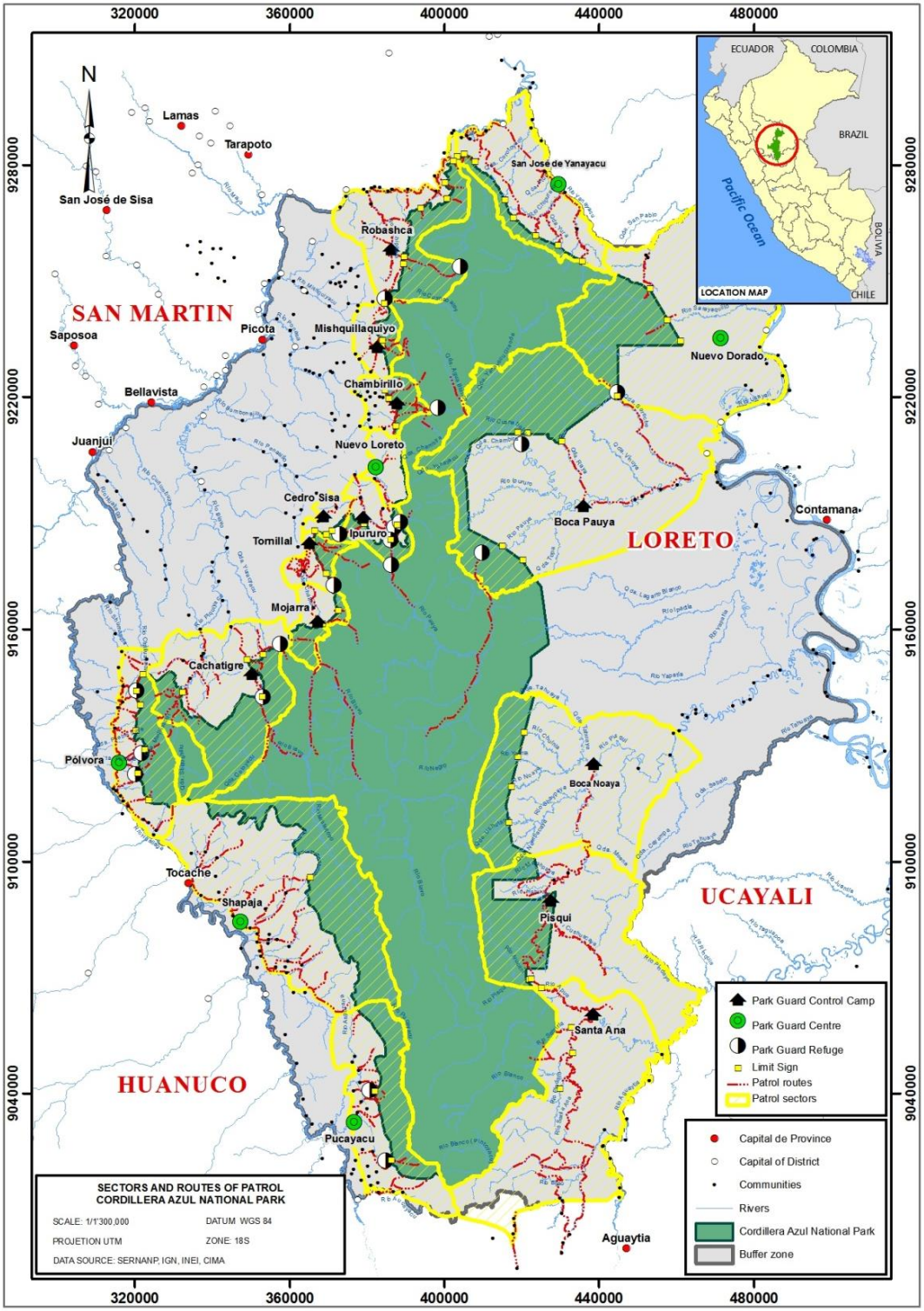
In the event that the sample plot assessment indicated that illegal logging is occurring in the area, supplemental plots will be allocated to achieve a 3% sample of the area. Biomass will be estimated from measured diameters (conservatively assuming that diameters of stumps cut below breast height are equivalent to diameter at breast height) applying the allometric equation of Chave et al. 2005 and otherwise maintain consistency with analytical procedures applied in the original 2009 PNCAZ inventory. Emissions due to illegal logging ($\Delta C_{P,DegW,i,t}$) are estimated by multiplying area ($A_{DegW,i}$) by average biomass carbon of trees cut and removed per unit area ($C_{DegW,i,t}$ / AP_i).

The more intensive 3% sample will be carried out once every 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area to produce an estimate of emissions resulting from illegal logging ($ÄC_{P,DegW,i}$). Estimates of emissions will be annualized (to produce estimates in t CO_2-e per year) by dividing the emission for the monitoring interval by the number of years in the interval.

The same quality assurance/quality control and archiving procedures as detailed above for updating estimates of forest carbon stocks will be adhered to in the field surveys of potential degradation areas.

Within the project area and area bordering the park (PNCAZ buffer zone), routine patrols will be carried out throughout the year by park guards. Patrols will identify, and resolve where possible, any illegal wood harvest taking place in the PNCAZ and project area. There are 18 control posts and park guard centers on or near the border of the project area, from which guards will be routinely fielded on patrol routes totaling 2,041 km distance (544.6 km within PNCAZ). The total area to be routinely patrolled is located closest to communities with potential access to the park (i.e. highest potential pressure area for illegal harvest) and totals 1,779,984.7 ha (507,364.2 ha within PNCAZ). The density of patrol trails in the monitored area within PNCAZ is 1 km per 10 km^2. The location of patrol areas and park control posts are shown in Figure 6.

Figure 6. Location of patrol areas and park control posts

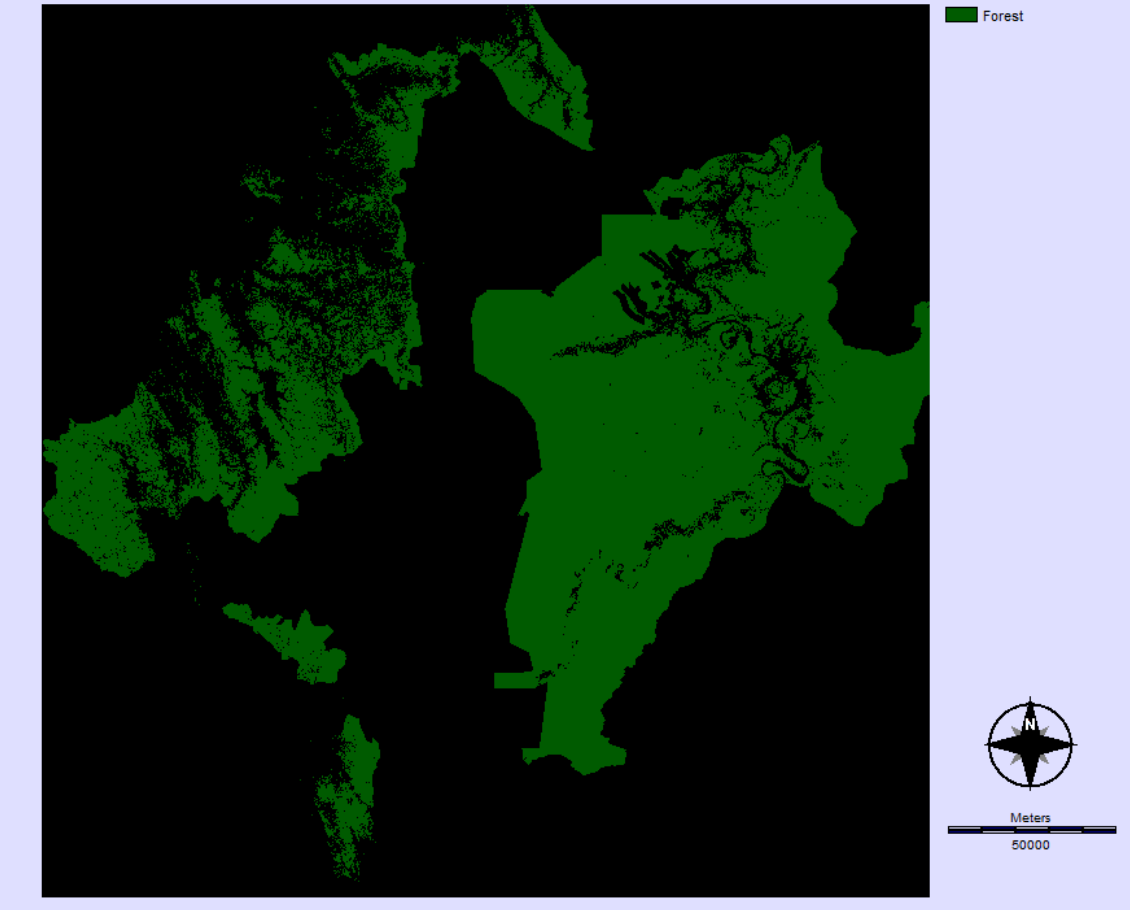


3.1.3.6 Monitoring of leakage carbon stock changes

Activity-shifting leakage in the leakage belt will be monitored by tracking forest cover change in the leakage belt (ADefLB,u,i,t), using classified satellite imagery produced following the same procedures outlined above in Section 3.3.3, referencing the 2015 forest cover benchmark map for the leakage belt (Figure 7). All changes in forest cover detected for the monitoring interval will be annualized (to produce estimates of ha for each year) by dividing the area by the number of years in the period.

Note that the leakage belt includes private inholdings and ineligible areas (without forest >10 years old) within PNCAZ as well as planned deforestation areas for oil palm production in the northeast. The area of forest in the leakage belt at the beginning of the 2016 monitoring period is 1,819,721 ha.

Figure 7. Benchmark map of forest cover in 2015 in the leakage belt



shape: lb_2015_benchmarkmap

Parameter, $\Delta C_{pools,Def,u,i,t}$, is derived from estimates of $C_{BSL,i}$ (forest carbon stock in all pools in the baseline case in stratum *i*) from PNCAZ forest inventory measurements, or for strata identified in the leakage belt but not represented in the PNCAZ inventory from peer-reviewed regional literature sources, as for initial estimates derived in PD Section 3. Parameter, $C_{P,post,u,i}$ (carbon stock in all pools in post-deforestation land use *u* in stratum) is assigned as the historical area-weighted average carbon stock for the converted (non-forest) baseline land-use(s), the initial estimate derived in PD Section 3. Stock estimates will be re-assessed every $\leq$10 years.

Monitored parameters will be entered into the table format (Table 5, following page) to complete calculations of activity shifting leakage occurring in the leakage belt in the with-project case ($\Delta C_{LK\text{-}ASU\text{-}LB}$).

Activity shifting leakage outside the leakage belt (Table 6, following page) will be tracked by monitoring deforestation in the project area ($A_{DefPA,i,t}$) and leakage belt ($A_{DefLB,i,t}$).

The value for the first verification period was 32.5%. For the 2014-2015 and current (2015-2016) verification periods, we updated the value of PROPImm referencing new data collected in January/February 2015, the new value is derived in Section 3.2.3, see Table 23, and is 19.7%. Subsequently, the parameter, $PROP_{IMM}$, will be derived from the results of surveys conducted among neighboring communities every $\leq$5 years. The same communities identified above for assessing potential for illegal degradation in the project area will be surveyed to determine for each interviewee how long the person has lived there and where did they come from prior to moving to the area. As there are sensitivities to assessing responsibility for deforestation in an interview context, the proportion of baseline deforestation caused by immigrating population will be assumed to be equal to the proportion of immigrants in the surrounding population. Immigrants are defined as someone who has lived in the area less than 5 years and came from an area outside the leakage belt.

3.1.3.7 Estimation of ex-post net carbon stock changes and greenhouse gas emissions.

Estimates of GHG credits eligible for issuance as VCUs will be calculated entering data into the table format (Table 7, following page), where:

Estimated GHG emission reduction credits =

- Baseline emissions, fixed for 10 years at validation *minus*
- Project emissions *minus*
- Leakage *minus*
- Non-permanence Risk Buffer withholding (calculated as a percent of net change in carbon stocks prior to deduction of leakage).

Table 5: Calculation format for area subject to activity shifting leakage in the leakage belt

Equation	Derived in PD Sections 3.1 and 3.3		Derived from forest inventory estimates	M-MON 4	LK-ASU 1
Year	$\Delta C_{BSL,LK,unplanned}$ t CO_2	$A_{DefLB,u,i,t}$ ha	$\Delta C_{pools,Def,u,i,t}$ t CO_2/ha	$\Delta C_{P,DefLB,i,t}$ t CO_2	$\Delta C_{LK\text{-}ASU\text{-}LB}$ t CO_2
2009	6,910,840.7				
2010	7,497,174.1				
2011	9,658,074.5				
Etc…	Etc...				

Table 6: Calculation format for area subject to activity shifting leakage outside the leakage belt

Equation		Derived in PD Section 3.1	LK-ASU 7			LK-ASU 8	LK-ASU 9	Derived in PD in Section 3.3	LK-ASU 11
Year	$PROP_{IMM}$	$A_{BSL,PA,unplanned,t}$ ha	$A_{LK\text{-}IMM,t}$ ha	$A_{DefPA,i,t}$ ha	$A_{DefLB,i,t}$ ha	$A_{LK\text{-}ACT\text{-}IMM,t}$ ha	$A_{LK\text{-}OLB,t}$ ha	$PROP_{CS}$	$\Delta C_{LK\text{-}ASU,OLB}$ t CO_2
2009	32.5%	4,256.82						1.049	
2010	32.5%	5,420.34						1.049	
2011	32.5%	3,216.33						1.049	
Etc…	Etc...	Etc.						Etc.	

Table 7: Calculation format for estimates of GHG credits eligible for issuance as VCUs

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO2e)	Risk buffer (%)	Deductions for AFOLU pooled buffer account	Estimated net GHG emission reductions or removals (tCO_2e)
2009	1,834,510.1					
2010	1,960,580.9					
2011	1,337,026.1					
Etc…						

3.1.3.8 Organization and Responsibilities

For all aspects of project monitoring, CIMA will ensure that data collection, processing, analysis, management and archiving are conducted in accordance with the monitoring plan.

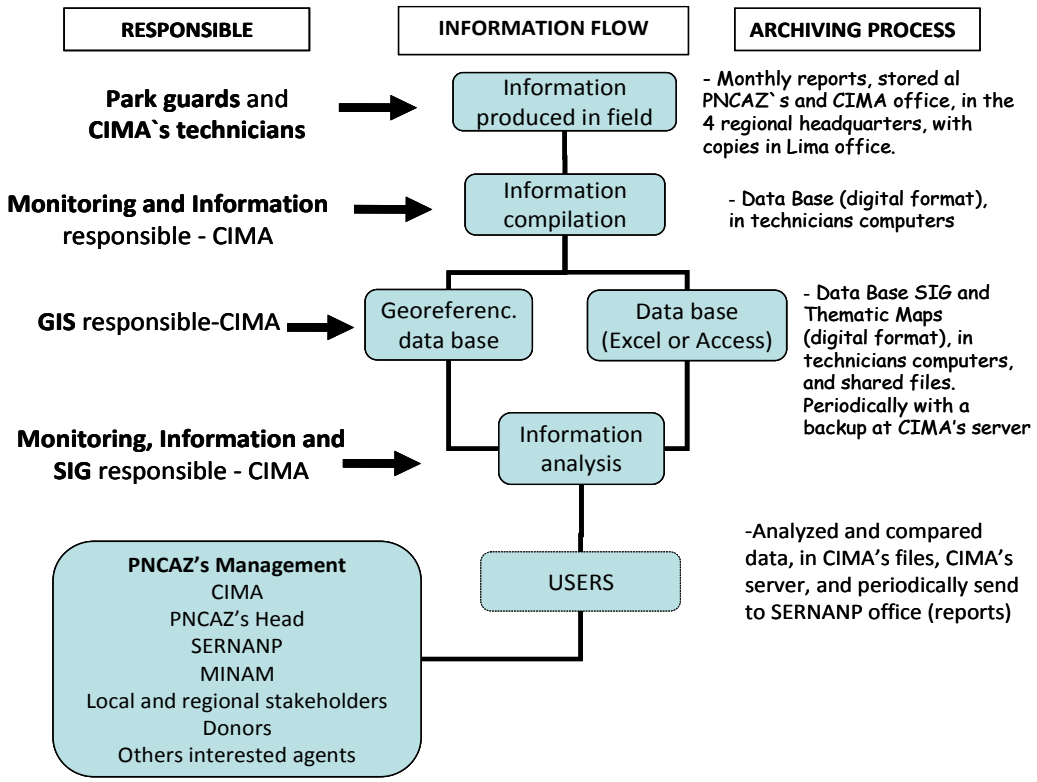
Remote sensing image analysis is conducted by CIMA's GIS team periodically according to the procedures discussed in PD Appendix 4.

Field data is the result of CIMA technicians' trips and the park guards routine and special patrols as part of their planning activities. Technicians and park guards are the key personnel in the generation of information – threats, social and environmental aspects of PNCAZ and buffer zone – and are trained to ensure that they are aware of the importance of the data they are generating. They are the first link in the chain of information flow (Figure 8).

This data is recorded in the monthly reports of the technicians and park guards at the offices of the Head of PNCAZ and CIMA, and copies of the park guards' reports are send to CIMA office in Lima headquarters. This information is analyzed by the CIMA Information and Data Specialists to provide quarterly and annual technical reports to SERNANP (or donors) about the progress in PNCAZ's management activities, to report results and impacts of management to SERNANP, and for review by CIMA Management as appropriate. This critical information is systematized and analyzed annually by the technical staff of CIMA.

Hard copies of all of the data is stored in Lima or Tarapoto. The most important information and data is converted to electronic format and placed on the server for sharing between the Lima and Tarapoto offices. This server is periodically backed up.

Figure 8: Data flow in CIMA



3.1.4 Dissemination of Monitoring Plan and Results (CL3.2)

The results of the PNCAZ's deforestation analysis have been reported according to the monitoring procedures for PNCAZ's management, in the corresponding quarterly and annual reports to SERNANP, under the framework of the Administration Agreement which CIMA performs.

Specific monitoring results about avoided deforestation by PNCAZ REDD Project, obtained by Terra Carbon for the 2015-2016 period, have been reported during the second quarter of 2017 to SERNANP, once they were finalized.

This information has also been shared with the chairmanship of the PNCAZ's Management Committee, the Engineer David Morales Flores from the Cooperativa Agraria Cacaotera - ACOPAGRO, in San Martin.

The information has also disseminated in different meetings in the framework of the REDD board of the San Martin region.

Once the verified information is obtained, the dissemination of the final results of the monitoring of actual changes in carbon stocks and GHG emissions will proceed in the CIMA website, bouncing the news on the website SERNANP as it has been made on previous periods.

- http://cop20.minam.gob.pe/24314/presentaciones-del-webinar-negocios-de-carbono-y-conservacion-de-areas-naturales-protegidas/ (Estudio de caso: Parque Nacional Cordillera Azulin: Presentaciones del webinar "Negocios de carbono y conservación de Áreas Naturales Protegidas")
- http://www.iai.int/?p=8421
- http://www.iai.int/wp-content/uploads/2015/08/CIMA-IAI-2015.pdf (Experiencia del Proyecto REDD+, in: Regional Training Workshop on tools for climate-smart conservation: vulnerability assessments, ecosystem services and structured adaptation planning toward conservation goals. IAI, Quito, Ecuador)
- https://portals.iucn.org/library/sites/library/files/documents/2016-030.pdf (Arguedas, S.; Vides, R. y Castaño, L. (Eds). 2015. Lecciones aprendidas y buenas prácticas para la gestión de áreas protegidas amazónicas. UICN-Fundación Gordon y Betty Moore. Quito, Ecuador. 264 pp.)
- http://cima.org.pe/files/images/publicaciones/pdf/CIMA-2013-Experiencia-REDD-PNCAZ.pdf (Experiencia del Proyecto REDD+ PNCAZ - CIMA)
- http://cima.org.pe/files/images/publicaciones/pdf/UICN-2014-Enfoque-Ecosistemico-en-Cordillera-Azul-pag-41.pdf (Planificación y gestión de Áreas Protegidas en América del Sur: avances en la aplicación del enfoque ecosistémico – UICN, página 41)
- http://www.bosques.gob.pe/archivo/libro_carbono.pdf (Estimación de los contenidos de carbono de la biomasa aérea en los bosques de Perú)
- http://theforestsdialogue.org/publication/country-report-considerations-redd-benefit-sharing-peru (Country Report: Considerations for REDD+ benefit sharing in Peru – The Forest Dialogue)

- http://pdf.usaid.gov/pdf_docs/PA00JJSR.pdf (Plan Regional de Fortalecimiento de Capacidades en Cambio Climático y REDD+ para la Región San Martin – TNC/USAID/GORESAM)
- http://www.cima.org.pe/es/noticias/parque-nacional-cordillera-azul-logra-acuerdo-historico (Noticia PNCAZ y acuerdo de CIMA-Althelia Cimate Fund).
- https://althelia.com/wp-content/uploads/2017/07/Althelia_impact-report_2017.pdf (Althelia Impact Report)
- http://www.fondoamericas.org.pe/iniciativa-del-fondam-sernanp-y-senamhi-que-permitira-generar-medidas-de-adaptacion-al-cambio-climatico-en-cuatro-areas-naturales-protegidas/

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Baseline emissions for the project activities for project year 2016 is shown in Table 8 below (derived from Section 3.1 of the VCS PD). Recall that the monitoring report uses the convention that the project year is the year at the end of the interval, *i.e.* project year 2016 is 8 August 2015 to 7 August 2016.

Table 8. Calculation of baseline emissions

Year	$C_{TOT\ PA}$	$C_{TOT\ LB}$
2016	4,075,362.8	18,451,176.9

3.2.2 Project Emissions

Project emissions from deforestation are calculated as the total area deforested multiplied by the emission per unit area.

Table 9. Parameters used to calculate *ΔCP,DefPA,i,t*

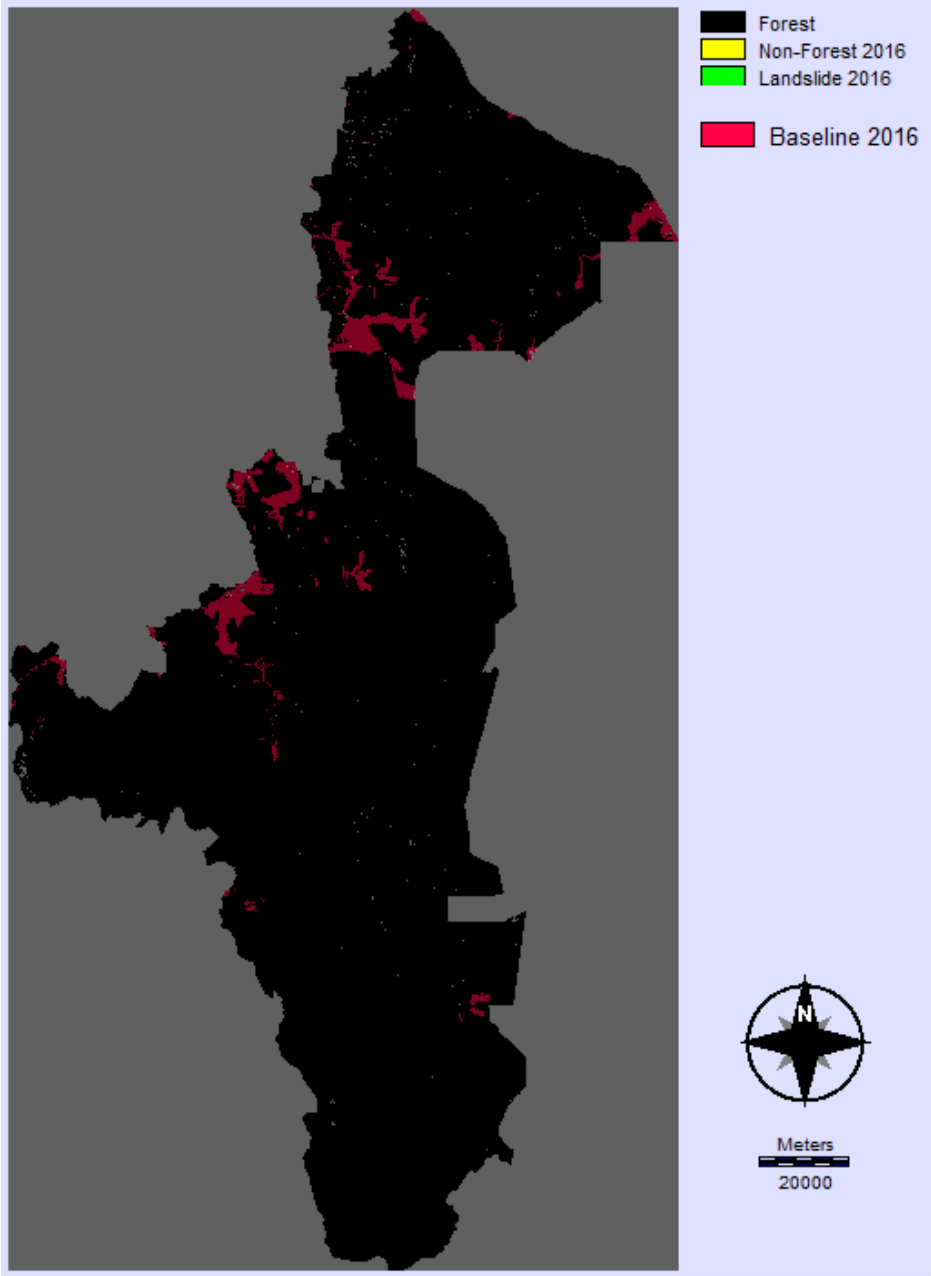
ADefPA,u,i,t (ha)	Area of recorded deforestation in the project area stratum *i* converted to land use *u* at time *t*; ha	Calculated in imagery analysis
ΔCpools,Def,u,i,t	Net carbon stock changes in all pools in the project case in land use *u* in stratum *i* at time *t*; t CO_2-e ha^{-1}	Calculated below

Landslides have occurred in the project area and have been delineated in the image classification from other deforestation. This determination was based on distinguishing deforestation that occurred on very steep slopes in areas of known susceptibility to landslides based on previous landslide events and expert knowledge.

Table 10: Components of *ADefPA,u,i,t (ha)*

	ADefPA,u,i,t (ha)				
	Alluvial	Collinsos (Hill forest)	Montanosos	Humedales (Aguajal)	*TOTAL*
2016	*0*	*0.4*	*0.6*	*0.0*	*1.1*

Figure 9. Project land cover change and baseline projections 2016



Calculation of emission per unit area is equal to the difference between the stocks before and after deforestation. There are no indications of any commercial wood products recovery associated with the forest clearance process.

Table 11. Parameters used to calculate $\Delta C_{pools,Def,u,i,t}$

Parameter	Description	Calculation	Value
CBSL,i	Carbon stock in all pools in the baseline case in stratum	Calculated in forest inventory (PD section 3)	Varies by stratum
CP,post,u,I	Carbon stock in all pools in post-deforestation land use u in stratum i; t CO_2-e ha-1	Historical area-weighted average carbon stock for the converted (non-forest) baseline, cultivation and pasture (derived in PDD section 3)	41.3

Table 12. Components of $\Delta CP,DefPA,i,t$

Year	ΔCP,DefPA,i,t (tCO2)				Total
	Alluvial	Collinsos (Hill forest)	Montanosos	Humedales (Aguajal)	$\Delta CP,DefPA,i,t$
2016	0.0	191.4	397.1	0.0	588.5

Monitoring areas undergoing natural disturbance

Per module M-MON, "For unplanned deforestation the sum of $A_{DistPA,q,i,t}$ shall be equal to the area of overlap between the delineated area of the disturbance and the summed area of unplanned deforestation in the project area ($A_{BSL,PA,unplanned,t}$), summed to the year in which the disturbance occurred." Thus emissions from natural disturbance that are accounted for are only those taking place in the area of projected deforestation in the baseline. Because the baseline incorporates topographic features (elevation) in the spatial modeling, which assign higher probabilities of deforestation in lower elevation and more level areas suitable for settlement and agriculture, risk of landslides (that tend to occur on higher elevation, steeper sites less suitable for settlement and agriculture) that produce reversals in project accounting is expected to be low.

Some landslides have occurred in the project area during the monitoring period and have been delineated in the image classification (Figure 9) There was very little overlap between these areas and the summed area of unplanned deforestation in the project area ($A_{BSL,PA,unplanned,t}$). These areas of natural disturbance area are included in project accounting.

Table 13. Components of *ADistPA,q,i,t (ha)*

Year	*ADistPA,q,i,t (ha)*				
	Alluvial	Collinsos (Hill forest)	Montanosos	Humedales (Aguajal)	*TOTAL*
2016	0.0	0.4	0.0	0.0	0.4

Shape: PA_2016_allclasses_pncaz

Table 14. Parameters used to calculate ΔCP,Dist,q,i,t

Parameter	Description	Value
CBSL,i	Carbon stock in all pools in the baseline case in stratum t CO_2-e ha-1	Calculated in forest inventory (PD annex)
CP,Dist,q,i	Carbon stock in all pools in post-natural disturbance strata *q,* in stratum i; t CO_2-e ha-1	Conservatively assumed to be 0
CDist, WP,q,i	Carbon stock sequestered in wood products from harvests following natural disturbance in post-natual disturbance stratum *q,* in stratum i; t CO_2-e ha-1	0

Table 15. Components of ΔCP,Dist,q,i,t

Stratum	CBSL,i	CP,Dist,q,i	CDist, WP,q,i	ΔCP,Dist,q,i,t
Alluvial	295.2	0.0	0.0	295.2
Colinosos (Hill forest)	466.8	0.0	0.0	466.8
Montanosos	671.7	0.0	0.0	671.7
Humedales (Aguajal)	372.9	0.0	0.0	372.9

Table 16. Components of *ΔCP,DistPA,i,t*

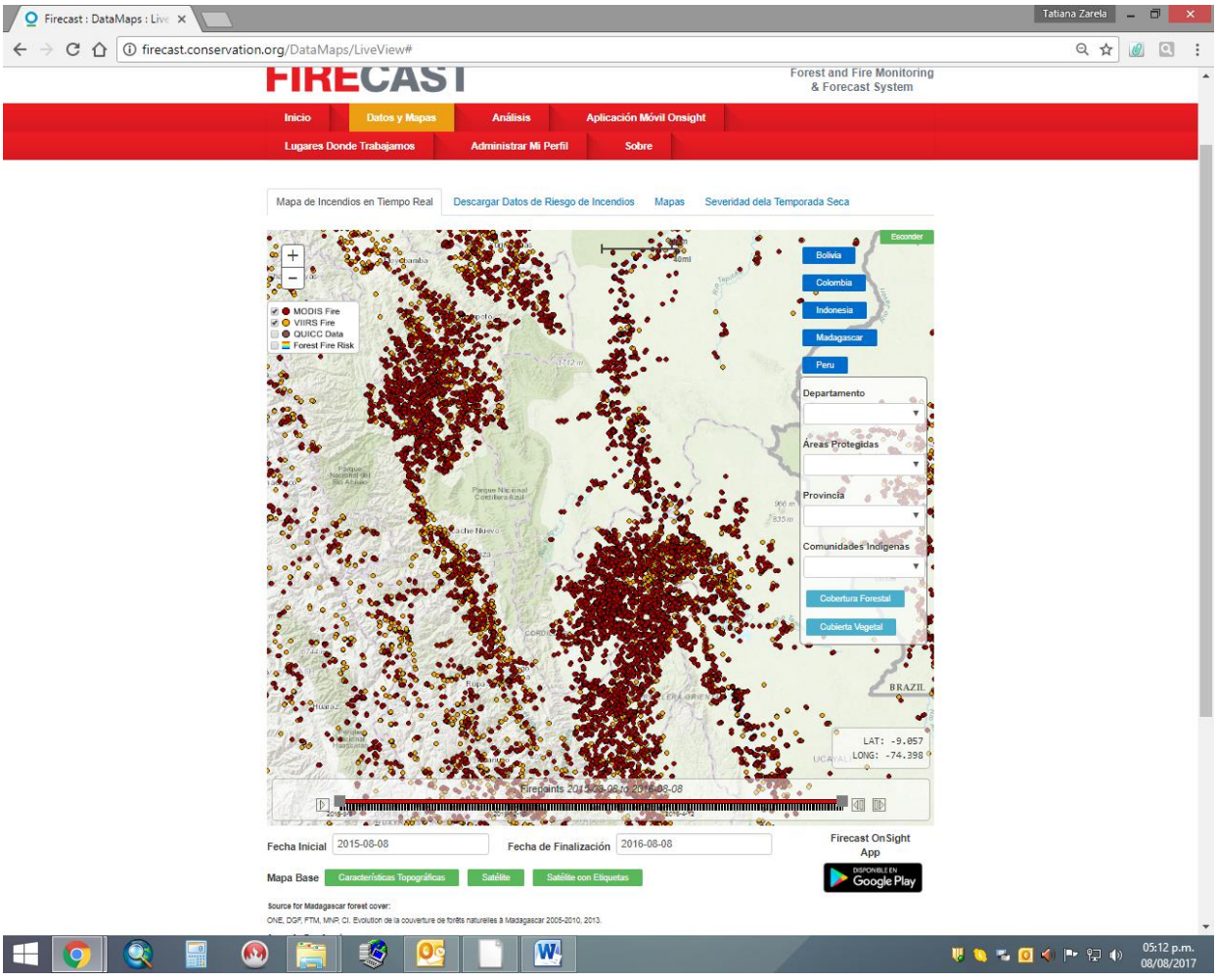
Year	*ΔCP,DistPA,i,t*				
	Alluvial	Collinsos (Hill forest)	Montanosos	Humedales (Aguajal)	Total
2016	0.0	168.0	0.0	0.0	168.0

Monitoring biomass burning

In the classification process, no evidence of fire scars was detected. Further, no fires were reported within PNCAZ during the 2015-2016 period from park guard patrols, and therefore $A_{burn,i,t}$ was 0.

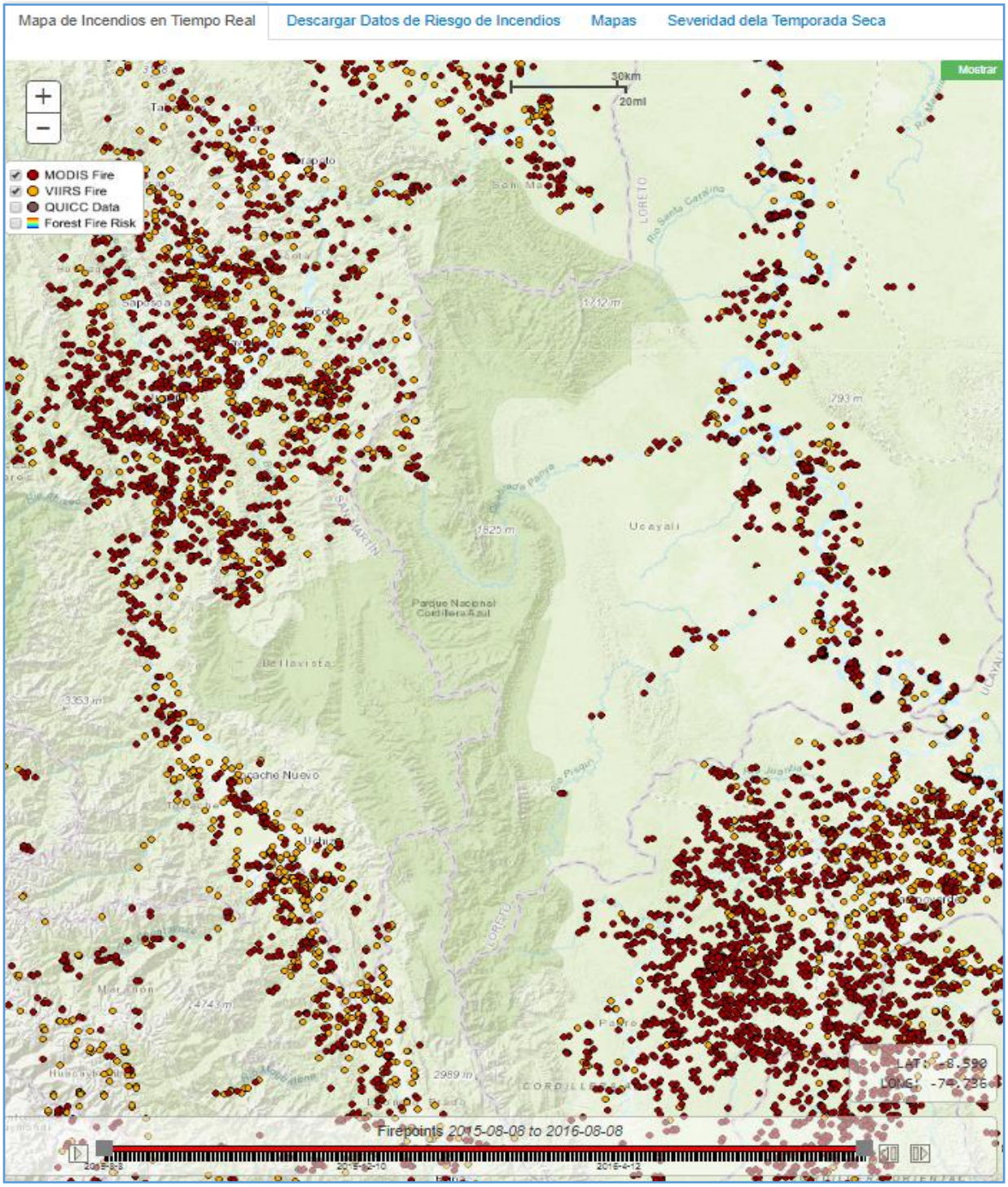
Further, during the monitoring period, no fires were detected in the project area by Firecast, within the period from August 2015 to August 2016. Firecast[29] is a MODIS-based fire monitoring system developed by Conservation International, NASA and ESRI, with highly precise detection of fires $\geq$50m^2. A map showing the location of all reported fires from Firecast is shown in Figure 10

Figures 10. Firecast report for the monitoring period showing that no fires were detected within the park boundaries



http://firecast.conservation.org/DataMaps/LiveView#

[29] http://firecast.conservation.org



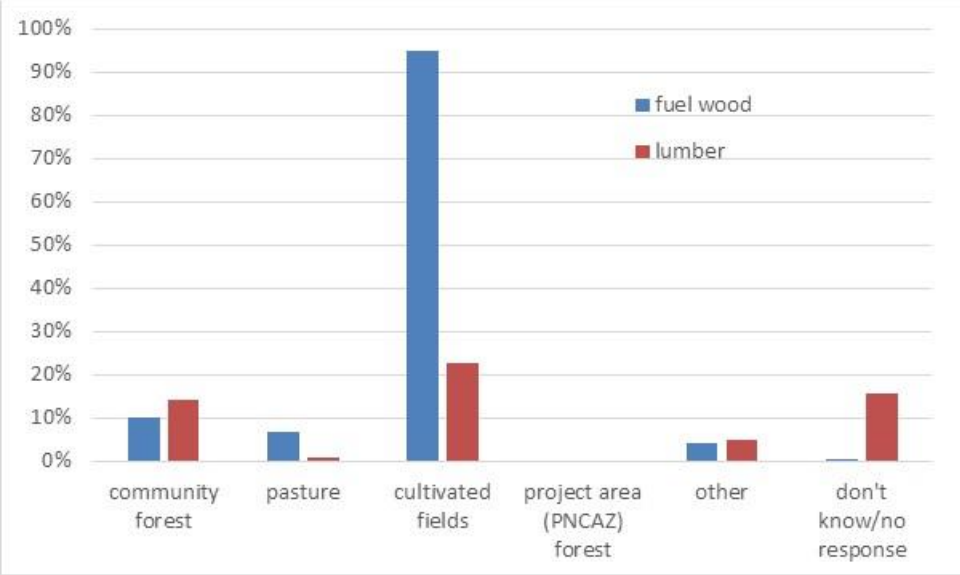
http://firecast.conservation.org/DataMaps/LiveView#

Monitoring illegal logging

From April to June 2016, surveys were carried out in 14 communities in the buffer zone of PNCAZ by CIMA to determine the potential of degradation occurring in the project area as a result of illegal logging of fuel wood and lumber for construction. In each community, 12 to 32 households were surveyed, depending on the size of the community (i.e. number of surveys was proportional to the size of the community). Communities were selected based on their relative dependence on the forest in the project area, and hence targeted those communities most likely to include baseline agents of degradation.

With respect to fuel wood/lumber use and collection, a total of 284 persons were interviewed. Among those respondents, none mentioned sourcing wood of any kind from within the project area. Most of the wood was collected from within community forests, and from remnant timber in cultivated fields outside the project area (Figure 11).

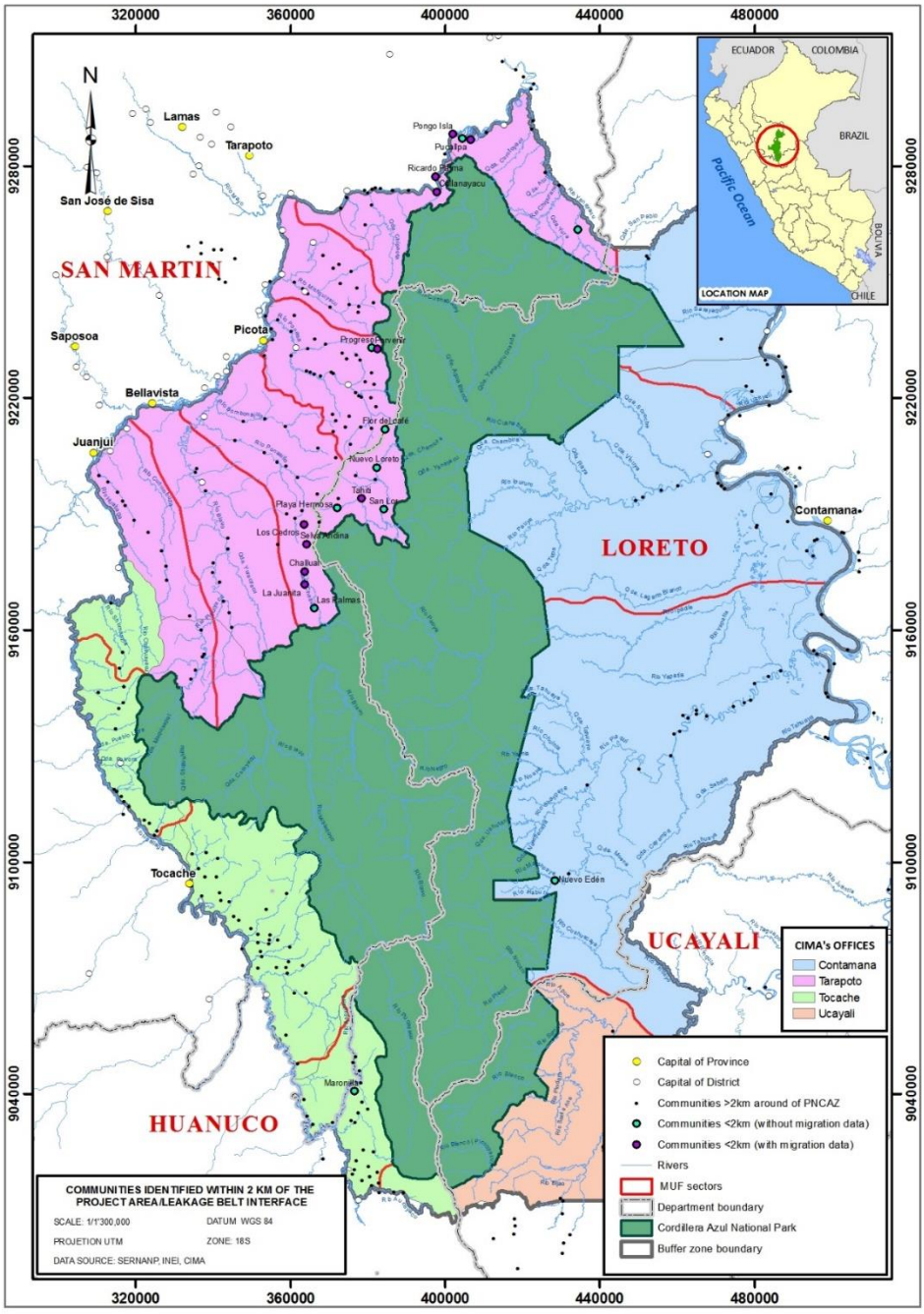
Figure 11. Results of 2016 wood collection surveys, source areas of wood collection by respondents (percentages represent % of respondents identifying a given source area; percentages do not sum to 100% across source areas as multiple source areas may be identified by a single respondent).



The methodology module M-MON requires that "If ≥ 10% of those interviewed/surveyed believe that degradation may be occurring within the project boundary then the limited on-the-ground degradation survey shall be triggered." Thus, no further surveys are warranted.

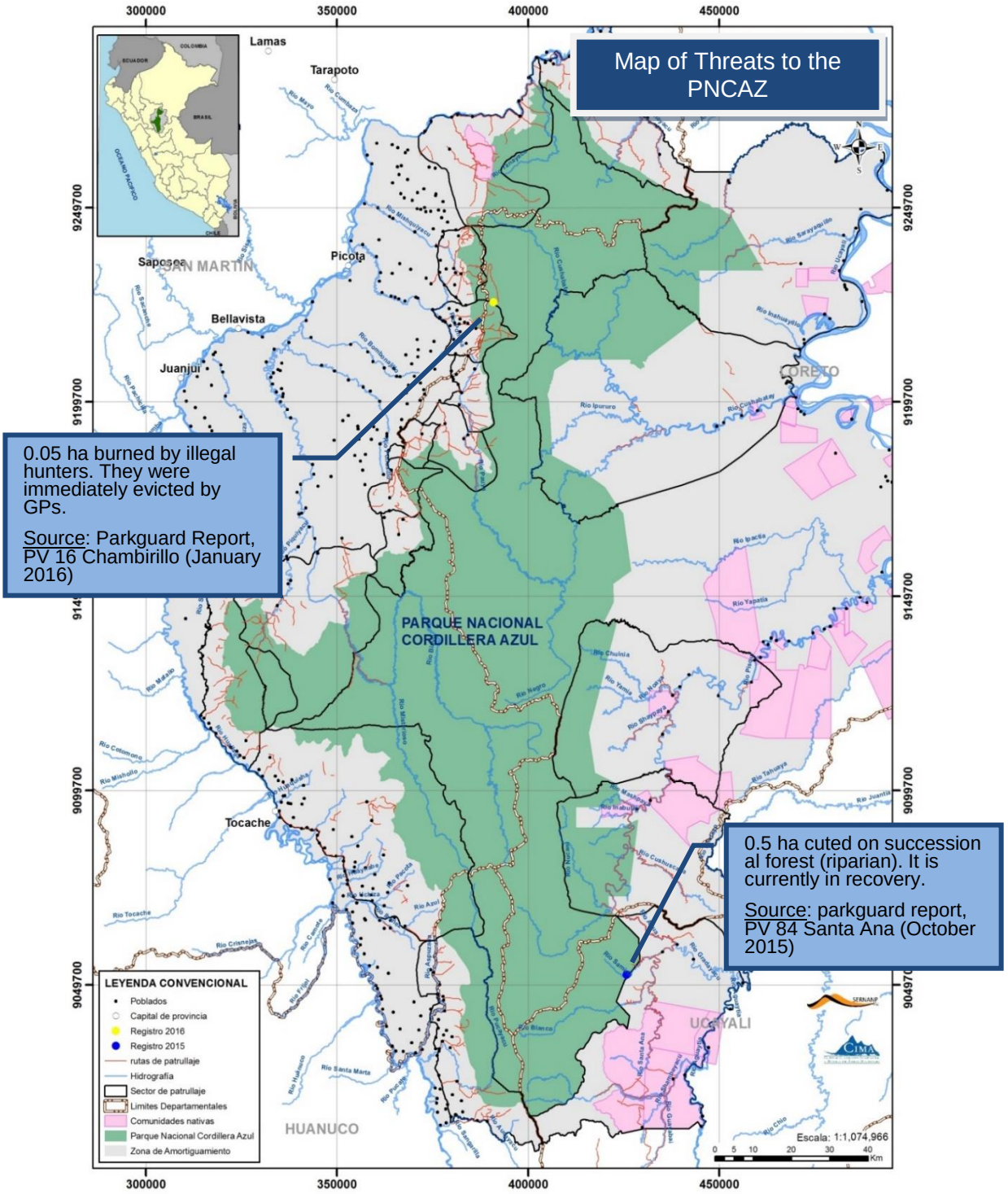
Among respondents giving information on the maximum distance travelled to collect wood, the average maximum distance stated was 1.2 km for fuel wood (min: 0 km, max: 8 km) and 2.9 km for lumber (min: 0.1 km, max: 10 km). There are only 20 communities located within 2 km of the project area (Figure 12), thus the potential for degradation from fuel wood and lumber collection is small. Further, many respondents to the degradation surveys noted the lack of a local commercial market for fuel wood or timber.

Figure 12. Communities identified within 2 km of the project area/leakage belt interface



Further, the results of the degradation surveys are supported by the minimal number of illegal logging or intrusions; those infractions were reported by PNCAZ park guards during the 2015-2016 monitoring period, which reported only two minor incidents: a 0.05 ha area burned by illegal hunters and a 0.5 ha area of secondary riverside forest cut (Figure 13), all reported and resolved by PNCAZ park guards.

Figure 13. Map showing sites of the illegal intrusions, 2015 - 206



In this context, the results of the degradation surveys are supported by reports from PNCAZ park guards during the 2015-2016 monitoring period, with a total of 535 control patrols focused on the boundaries between the PNCAZ and its buffer zone (Table 17), which reported only two instances of illegal intrusions, reported and resolved in the areas of: (1) Shamboyacu sector, in patrol area of the PV 16 Chambirillo, and (2) Aguaytía sector in patrol area of the PV 84 Santa Ana, just in the boundary inside the project area.

Table 17. Routine park guard patrols, infractions encountered and estimated area of impact in the PNCAZ and its buffer zone

Year	No. of patrols	No. of infractions	Conservative estimate of area of impact[30]
2015 (Aug-Dec)	265 patrols from 21 Control Points	1 infractions in the project area, patrol area from Santa Ana (PV 84 - Aguaytía sector)	0.5 hectareas
2016 (Jan-Ago)	270 patrols from 21 Control Points	1 infractions in the project area, patrol area from Chambirillo (PV 16 - Shamboyacu sector)	0.05 hectareas

Source: Annual report to SERNANP

Net project emissions within the project area calculated in Table 18 are based on the change in carbon stocks during the 2016 monitoring period.

Table 18. Net project emissions with the project area ΔCP (t CO_2-e)

Year	ΔCP,DefPA,i,t	ΔCP,Deg,i,t	ΔCP,DistPA,i,t	ΔCP
2016	588.5	0	168.0	756.5

3.2.3 Leakage

Leakage monitored in the project case is related to activity shifting of local and immigrant agents. Activity shifting from local agents (in the leakage belt) was tracked by monitoring deforestation and stock changes in the leakage belt in 2016.

[30] Previous findings indicate that the impacts of illegal harvest in the project area, if they do occur, are insignificant at the project scale. Conservative assumptions: (1) reported infraction represented an area of impact of 0.9 ha, (2) park guards only detect 10% of incidents of illegal logging in the patrolled area and (3) illegal logging is likely to be concentrated along access routes which are travelled by the patrols.

Table 19. Area deforested in the leakage belt in 2016 ADefLB,u,i,t (ha)

Year	*ADefLB,u,i,t* (ha)			Total
	Anthropogenic (forest)	Humedales – wetlands	Terra firme	
2016	2,749.32	1,515.96	9,935.46	14,200.7

Shape: LB_2016_Full_8917_interbanchmark

Emissions were calculated as the difference between stocks before and after deforestation, as for project emissions.

Table 20. Emissions from deforestation in the leakage belt in 2016 (t CO2e)

Year	ΔCP,DefLB,i,t (tCO_2)			Total
	Anthropogenic (forest)	Humedales – wetlands	Terra firme	*ΔCP,DefLB,i,t*
2016	1,229,217.4	853,992.6	4,144,737.5	6,227,947.4

The net greenhouse gas emission in the project case for the leakage belt, parameter *ΔCP,LB*, is equal to the sum of stock changes dues to deforestation in 2016, equal to 6,227,947.4 t CO_2e. Calculations of activity shifting leakage occurring in the leakage belt in the with-project case ($\Delta C_{LK\text{-}ASU\text{-}LB}$) are consolidated in Table 21 below.

Table 21. Calculations of area subject to activity shifting leakage in the leakage belt

equation	Derived in PD Sections 3.1 and 3.3		Derived from forest inventory estimates	M-MON 4	LK-ASU 1
Year	$\Delta C_{BSL,LK,unplanned}$ t CO_2	$A_{DefLB,u,i,t}$ ha	$\Delta C_{pools,Def,u,i,t}$ t CO_2/ha	$\Delta C_{P,DefLB,i,t}$ t CO_2	$\Delta C_{LK\text{-}ASU\text{-}LB}$ t CO_2
2015	18,451,176.86	14,200.74	Varies by strata	6,227,947.37	-12,223,229.49

Emissions from deforestation in the leakage belt were less than the projected emissions from deforestation in the leakage belt, and thus no leakage from activity shifting within the leakage belt is accounted.

Activity shifting leakage outside the leakage belt was tracked by monitoring deforestation in the project area ($A_{DefPA,i,t}$) and leakage belt ($A_{DefLB,i,t}$) and carrying out community surveys on the proportion of recent immigrants in the population within the proximity of the project area bounds.

Derivation of $PROP_{IMM}$ parameter

From January to February 2015, surveys were carried out in 13 communities in the buffer zone of PNCAZ by CIMA to determine the percentage of recent immigrants (i.e. arrived after 2009, within

less than or equal to 5 years of the survey). In each community, 20 to 40 households were surveyed depending on the size of the community (*i.e.* number of surveys was proportional to the size of the community). Communities were selected based on their relative dependence on the forest in the project area, and hence targeted those communities most likely to include baseline agents of deforestation. A total of 493 households and 1,721 persons were interviewed in total.

Persons who had immigrated to the community after 2009 (i.e. having arrived less than or equal to 5 years ago), and older than five years, were identified as recent immigrant potential deforestation agents. Per VM0007, the parameter $PROP_{IMM}$ is defined as "the proportion of area deforested by population that has migrated into the area in the last 5 years ($PROP_{IMM}$)." As it is extremely sensitive to ask explicit questions regarding responsibility for deforestation, interviewed persons were instead asked where they were originally from and when they had moved to the area. Thus, the percentage of recent immigrants among local population with potential access to the project area was used to infer "the proportion of area deforested by population that has migrated into the area in the last 5 years" (i.e. without directly asking if they are deforestation agents).

Results are detailed in Table 22. The resulting $PROP_{IMM}$ parameter is 19.7%, which is the average percent recent immigrant (potential deforestation agents) among the survey participants.

Leakage outside of the leakage belt has not occurred, as calculated in Table 4.3.5. As stated in Module LK-ASU if parameter ALK-OLB,t <0 then leakage outside the Leakage Belt has not occurred. If leakage outside the Leakage Belt has not occurred: $\Delta C_{LK-ASU,OLB} = 0$

Table 22. Immigrant survey results 2015

Zone	Community	Number of surveyed households	Number of surveyed persons	Recent imm arrived > 2009 and >5 yrs ago	% recent immigrants
Tocache	Alto Marona	20	103	9	8.7%
Tarapoto	El Dorado	22	78	33	42.3%
Pampa Hermosa	Flor de Café	40	186	26	14.0%
Tarapoto	Flor de Selva	40	159	46	28.9%
Alto Biavo	Las Palmas	40	164	40	24.4%
Contamana	Nuevo Dorado	112	131	41	31.3%
Huimbayoc	Pongo Isla	12	48	5	10.4%
Shamboyacu	Porvenir	28	124	12	9.7%
Huimbayoc	Pucallpa	40	172	5	2.9%
Bajo Biavo	Selva Andina	40	179	47	26.3%
Tarapoto	Siambal	37	118	10	8.5%
Pampa Hermosa	Tahiti	40	158	64	40.5%
Aguaytia	Yamino	22	101	1	1.0%
	TOTAL	493	1721	339	19.7%

Table 23: Emissions calculations for activity shifting leakage outside the leakage belt

equation		Derived in PD Section 3.1	LK-ASU 7			LK-ASU 8	LK-ASU 9	Derived in PD in Section 3.3	LK-ASU 10
Year	$PROP_{IMM}$	$A_{BSL,PA,unplanned,t}$ ha	$A_{LK\text{-}IMM,t}$ ha	$A_{DefPA,i,t}$ ha	$A_{DefLB,i,t}$ ha	$A_{LK\text{-}ACT\text{-}IMM,t}$ ha	$A_{LK\text{-}OLB,t}$ ha	$PROP_{CS}$	$\Delta C_{LK\text{-}ASU,OLB}$ t CO_2
2016	19.70%	9,533.5	1,878.1	1.1	14,200.7	2,797.8	-919.7	1.049	0

3.2.4 Net GHG Emission Reductions and Removals

Uncertainty

Deductions for uncertainty in carbon stock estimates and baseline deforestation projections were calculated applying module X-UNC. Total error in stock estimates (including live and dead above and belowground biomass C) from the 2009 PNCAZ forest inventory was +/-7.5% of the mean at the 95% confidence level (Table 24).

Table 24. Overall forest carbon density (live and dead above and belowground biomass C)

Mean Forest Carbon Density (t C/ha)	151.0
Standard Error (t C/ha)	5.68
90% Confidence Interval (t C/ha)	9.5
95% Confidence Interval (t C/ha)	11.4
90% Confidence Interval as percentage of mean	6.3%
95% Confidence Interval as percentage of mean	7.5%

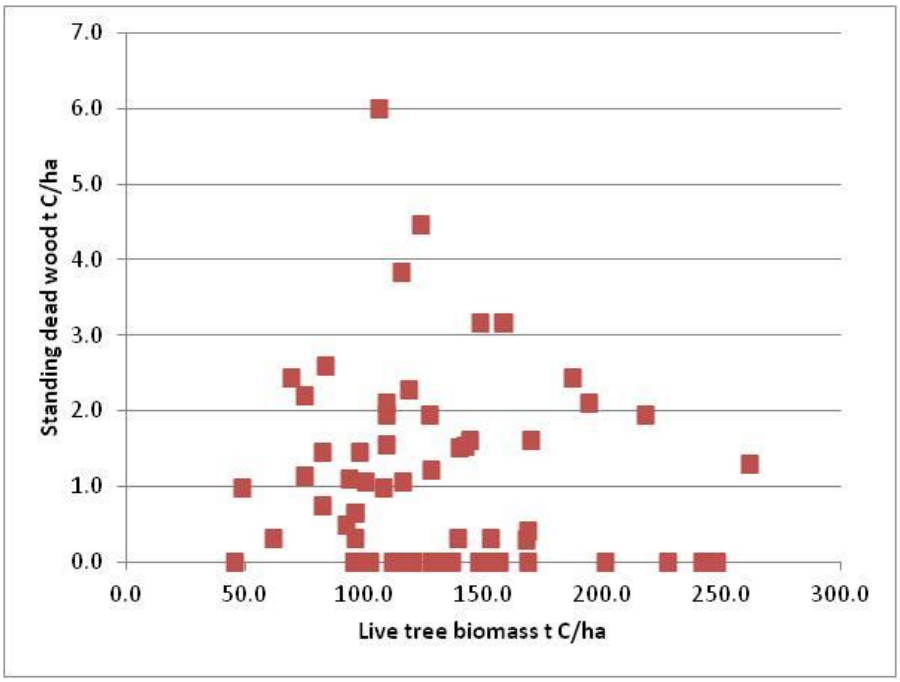
Source: Shoch et al. 2009 *Forest biomass carbon inventory of the Parque Nacional Cordillera Azul (PNCAZ)*

Note that error was not propagated across pools, because error propagation formulas require independence among component sources of error. This assumption often does not hold for aboveground biomass and dead wood, which are often inversely correlated (Figure 14), and instead pools are summed and composite errors estimated at the strata level, then propagated across strata.

Uncertainty in baseline deforestation projections was assessed referencing the 95% confidence interval of the regression model (Figure 15).

Only RRD subset 2 contributes to overall uncertainty. RRD subset 1, Huimbayoc, has a baseline rate of zero, thus its contribution to total uncertainty is zero. Calculations are detailed in Table 25 that follows the figures.

Figure 14. Standing dead wood plotted against live tree biomass, demonstrating apparent inverse correlation between live tree biomass and maximum standing dead wood.



Source: 2009 PNCAZ forest inventory (n=64)

Figure 15. The 95% confidence interval (dashed lines) of predicted deforestation rate

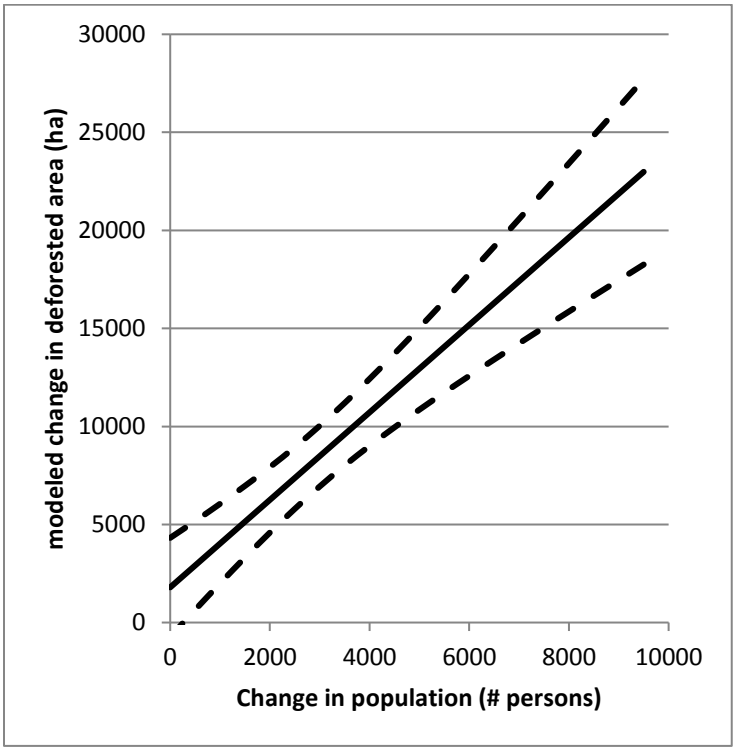


Table 25. Summary of uncertainty calculations

X-UNC eq #	5	Derived in PD Section 3	Regression model	1	3	6	10	11
Year	*Uncertainty* $y_{BSL,SS}$	Total population change	Modeled deforestation (ha)	*Uncertainty* $y_{BSL,RATE,t}$	*Uncertainty* $y_{BSL,RATE,t*}$	*Uncertainty* $y_{BSL,t*}$	$C_{REDD\_ERROR,t*}$	*Adjustment factor applied to* $C_{REDD,t*}$
2016	7.5%	26,401	60,681	26%	9%	12%	12%	100%

The final adjustment factor in Table 25 above is applied to parameter $C_{REDD,t}$, cumulative total net GHG emission reductions at time *t*, to produce parameter *Adjusted_*$C_{REDD,t}$, cumulative total net GHG emission reductions at time *t* adjusted to account for uncertainty.

Summary of net emission reduction calculations

Estimates of GHG credits eligible for issuance as VCU's are found in the table 26 below, where

- Estimated GHG emission reduction credits =
  - Baseline emissions, fixed for 10 years at validation *minus*
  - Project emissions *minus*
  - Leakage *minus*
  - Non-permanence Risk Buffer withholding (calculated as a percent of net change in carbon stocks prior to deduction of leakage)

Table 26: Table of estimated net GHG emission reductions or removals during this monitoring period (8 August 2015 to 7 August 2016)

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Risk buffer (%)	Deductions for AFOLU pooled buffer account	Available VCUs
2016	4,075,363	756	0	4,074,606	10%	407,461	3,667,145

Table 27: Table of estimated total net GHG emission reductions or removals considering vintage since 2009, and currently emission reductions

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Available VCUs
2009-2012	6,744,812	331,400	0	6,413,412	5,772,071
2013-2014	4,749,676	143,533	0	4,606,143	4,145,529
2015	3,396,760	22,511	0	3,374,248	3,036,823
2016	4,075,363	756	0	4,074,606	3,667,145
Total	18,966,611	498,200	0	18,468,409	16,621,568

3.3 Optional Criterion: Climate Change Adaptation Benefits

Not applicable to this project.

3.3.1 Activities and/or Processes Implemented for Adaptation (GL1.4)

Not applicable to this project.

4 COMMUNITY

4.1 Net Positive Community Impacts

4.1.1 Community Impacts (CM1.1)

The expected impacts on community well-being due to project activities were described in the validated PD, 6.1 Net Impacts on the Community.

Human Communities in the Project Area

The project is expected to ensure that there is no contact with the indigenous people in isolation who live inside the park, as well as to protect the area they use. This is a net positive impact.

CIMA and the Head of PNCAZ have a deep respect for these human populations, and encourage the best possible information is taken without generating any impacts. For this reason, CIMA supported - as part of its agreement with the *Instituto del Bien Común* (IBC) - the research conducted by anthropologists to update the diagnosis of the Kakataibo population in isolation that exists in the southeastern part of PNCAZ and its buffer zone. This is intended to contribute to the process of recognition of Indigenous Peoples in Isolation (PIA) in the Aguaytia-Pisqui sector for the Ministry of Culture (MINCUL).

It is known that these small groups of indigenous Kakataibo in isolation wander between the PNCAZ and the southeast zone of their buffer zone; being the first step for their protection the recognition of these population. This **recognition of the Kakataibo people in isolation** occurred precisely in August 2017, by the Ministry of Culture (MINCUL) and thanks to the efforts deployed in the area in conjunction with the indigenous federations, the IBC and CIMA, contributing in local efforts, and joint efforts to take records and testimonies (Figure 16).

Figure 16. News about recognition of indigenous people Kakataibo in isolation, on MINCUL website

http://www.andina.com.pe/agencia/noticia-ministerio-cultura-garantiza-derechos-del-pueblo-indigena-kakataibo-678171.aspx

Human Communities in the Project Zone

The project is expected to result in a net positive impact in the communities in the buffer zone of the PNCAZ by improving land use and land security, and overall quality of life. This trend will continue with the project. Community monitoring for period 2008-2016 demonstrated the project's successful efforts to build local capacity for sustainable land use and an improved quality of life for buffer zone communities through activities such as the development of economic and ecological zoning plans, development of community Quality of Life plans, development and use of individual technical skills relating to resource management and land use, project administration, and local governance, and increased participation of women in REDD project activities like gathering community data, developing community plans and forming formal production craft organizations.

In the previous validation periods (2012-2014 and 2014-2015) and during the current (2015-2016), CIMA has continued to focus its efforts on those communities and sector with the most direct access to the park, strategically concentrating first on these critical areas to stabilize land-use and prevent intrusion into the park. The aim is to ensure park protection and safeguard ecosystem services and natural resources. To improve the selection process for the intervention with local communities and populations, CIMA has developed a methodology to prioritize communities, considering variables of closeness to park, governance, threats, among others, as part of a toolkit that is being constructed.

In participating communities, governance over natural resource use has improved through development of land-use zoning and rules of coexistence and appropriate conduct (***Rules of Coexistent***), improved communal planning and decision-making processes (***Quality of Life Plans*** and ***Action Plans***), continuous access to technical assistance for agroforestry systems, tourism, environmental education, as well as employment opportunities related to park management (*i.e.* as official park guards and community park guards).

In the next section, the Table 25 presents comparative quantitative results of community project activities by indicator, during the four phases of the project (2008 baseline, and implementation periods: 2008-2012, 2012-2014, 2015 and 2016).

4.1.2 Net Positive Community Well-Being Impacts (CM1.1)

Table 25. Comparative quantitative results of community project activities by indicator since the Baseline of the project, to the currently period 2015-2016

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period			
		2008	2008-2012	2012-2014	2014-2015	2015-2016
Natural Capital	# of hectares under community-generated management or used according to land-use plans	Only 3 communities, from Chazuta sector, had completed the land use zoning process	17 communities/ villages, from 4 sectors (+3: Shamboyacu, Pisqui and Cushabatay), had completed the land use zoning process	**24 communities/ villages**, from 6 sectors (+2: Pikiyacu and Pólvora), had completed the land use zoning process	Until 2015, the number of **communities and villages with ZEE is 24**. At present, these processes have ended and CIMA has dedicated to the diffusion of the results to the communities. No new processes have started.	ZEE process with **24 communities and villages is completed.** Further, several populations had their own **conservation initiatives** to maintain forests in their own domain. CIMA has been supporting to define and consolidate some of these, such as: Challual, Las Palmas, Nuevo Jaen, Nuevo San Martin, Nuevo Trujillo, San Juan, Vista Alegre y Yamino.
		21,094 ha with land use zoning (ZEE)	86,991 ha with land use zoning (ZEE) + hectares of Tocache district with meso ZEE (GORESAM)	**117,066 ha** with land use zoning (ZEE) + hectares of Tres Unidos district with meso ZEE (GORESAM)	**246,192 ha** with land use zoning (ZEE) + hectares of Picota district with meso ZEE (GORESAM)	
Social Capital	# of communities implementing quality-of-life plans and sharing experiences with neighbors	Zero Quality of Life Plans	10 communities with Life Plans, not all with land use zoning	**20 communities** with Life Plans, all of them based on land use zoning.	Until August 2015 a total of **17 villages and communities** have developed their Quality of Life Plans as well as to continue the process of Implementing. Four new QLP has been development during this period.	Until August 2016, a total of **21 villages and communities** had been developed their Quality of Life Plans as well as to continue the process of Implementing**.** It is expected to reach 34 Quality of Life Plans in 2018.

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period			
		2008	2008-2012	2012-2014	2014-2015	2015-2016
					Through 2014, 13 plans Quality of Life Plans were well established and four will be updated. It is expected to reach 21 Quality of Life Plans in 2016.	
	# of communities with women as active participants in REDD project interventions	Zero; field activities were limited and women's groups were not yet specifically targeted	140 women of 6 native communities (La Cumbre, Manco Capac, Charashmaná, Yamino and Mariscal Cáceres) have formed formal organizations aimed at improving their quality of life by implementing craft production projects. Numerous women participated in the MUF process from a variety of communities and are participating in the development of Community Rules and Quality of Life Plans.	More than **250 women**, from 6 villages/communities actively participating in formal associations strengthened and supported by CIMA: Asoc. de Artesanas Kari Isa Xanu (38 women), Club de Madres Virgen de las Mercedes (12), CdM Virgen del Carmen (55), CdM Las Samaritanas (25), CdM Sarita Colonia (34), Instituciones educativas (157). Numerous women actively participated in development processes in >50 villages/ communities: ZEE, Community Rules, Strategic planning and implementation.	More than **160 women**, from **9 villages/communities** directly and actively participating in formal associations strengthened and supported by CIMA: - Asociación de Artesanas Shipibas del Río Pisqui "AASHRIPIS" (72), - Club de Madres "Sarita Colonia" (34), - Club de Madres "Las Samaritanas" (25), - Club de Madres "Virgen de las Mercedes" (12), - Asociación de Artesanas "Kari Isa Xanu" (18).	More than **319 women**, in at least **8 villages/ communities** directly and actively participating in formal associations strengthened and supported by CIMA: - Asociación de Artesanas Shipibas del Río Pisqui "AASHRIPIS" (130), - Club de Madres "Sarita Colonia" (34), - Club de Madres "Las Samaritanas" (25), - Club de Madres "Virgen de las Mercedes" (12), - Asociación de Artesanas "Kari Isa Xanu" (18). - Women health for Lejía (>100) Additionally, women participating from different *Instituciones educativas* (> 150), and permanent and actively

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period			
		2008	2008-2012	2012-2014	2014-2015	2015-2016
					Additionally, women participating from different *Instituciones educativas* (> 150), and permanent and actively participated in development processes in >50 villages/ communities: ZEE application, Community Rules, Strategic planning and implementation.	participated in development processes in >50 villages/ communities: ZEE application, Community Rules, Strategic planning and implementation.
Human Capital	# of REDD project participants applying new technical skills in resource management, project administration and governance	10 families were involved in learning agroforestry and technical training relating to farming	37 families implementing Quality of Life Plans, and individuals from Isolaya, Charashmaná, Manco Cápac and La Cumbre developed wetlands management plans. 30 families were involved in learning agroforestry and technical training relating to farming.	**766 families** (communal organization members) from 25 villages/communities are supported to implement strategic plans (Quality of Life Plans and ActionPlans) according to diverse community priorities: SNIP or Public Investment Projects; value chains; creation of local institutions such as cooperatives, committees, associations; development and updating action plans; tourism; handicrafts;	**2992 families** (communal organization members) from 30 villages/communities are supported to implement strategic plans (Quality of Life Plans and ActionPlans) according to diverse community priorities: PIP, value chains; creation of local institutions such as cooperatives, committees, associations; development and updating action plans; tourism; handicrafts; forestry and horticulture;	**3,801 families** from 39 villages/communities are supported to implement strategic plans (Quality of Life Plans and ActionPlans) according to diverse community priorities; in order to implement planning with Public Investment Projects (PIP), value chains (producers' cooperatives and committees), handicrafts and tourism associations, infrastructure, forestry, bee-keeping, recycling, boundary-marking and patrols, etc.

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period			
		2008	2008-2012	2012-2014	2014-2015	2015-2016
				forestry and horticulture; plant nurseries; bee-keeping; recycling; boundary-marking and patrols; and others.	plant nurseries; bee-keeping; recycling; boundary-marking and patrols; and others.	
Physical Capital	# of communities with Economic Capital infrastructure improvements and mechanisms for maintaining them sustainably	Zero. Most communities had only basic and often insufficient infrastructure to fulfill basic needs. Many had infrastructure needing repairs which the communities could not do due to the types of technology or materials needed to repair the infrastructure.	1 community, Yamino, where infrastructure was built to provide local artisans a market to sell goods. In addition, the need for infrastructure related to drinking water and drainage was identified in the Quality of Life Plans for Puerto Adelina, Charashmaná, Yamino and Mariscal Cáceres. These have been presented for inclusion in the municipal budget for 2012-2013. The construction of the infrastructure uses local workers and materials to ensure the long-term viability of the structures.	**8 communities** identified infrastructure improvements as a priority issue in their Life Plans and CIMA actively supported actions to implement these priorities such as: Projects to develop drinking water and drainage infrastructure, riparian protection, boundary demarcation and conservation patrols, community first aid kits, appropriate garbage disposal, communications (mobile phones), provision of electricity, Ampihuasca tourism route (signage and interpretation), formalizing requests with municipal governments, SNIP, local environmental	**17 communities** identify infrastructure improvements as a priority in their life plans and develops CIMA aimed at implementing these priorities actions, such as: Infrastructure projects water and sewage (6 communities), access roads (6 communities), proper management of solid waste (3 communities), mobile services (two communities), construction of health infrastructure (five communities), construction education infrastructure (3 communities), categorization (2 communities), reforestation and forest management (4 communities), riparian	**15 communities** identify infrastructure improvements as a priority in their life plans: ✓ Infrastructure projects water and sewage (4 communities), ✓ access roads (4 communities), ✓ communication services (2 communities), ✓ construction of health infrastructure (2 communities), ✓ construction education infrastructure (1 communities), ✓ categorization (2 communities). Additionally, 13 populations include plans for: ✓ reforestation and forest conservation (10 communities), ✓ proper management of solid waste (3 communities), among others. Among the actions developed by CIMA is linking with local governments, sub-national, sectoral organizations to promote public investment for the development of these infrastructure projects.

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period			
		2008	2008-2012	2012-2014	2014-2015	2015-2016
				plans (PIGARS[31]) and businesses (INCORP, Electro Oriente).	defense (1 community) among others. Among the actions developed by CIMA is linking with local governments, sub-national, sectoral organizations to promote public investment for the development of these infrastructure projects.	
Economic Capital	#of participating communities whose basic family and communal needs are satisfied through sustainable economic activities in accordance with land-use and quality-of-life plans	Zero communities. Only a few families were successfully practicing agriculture or economic activities sustainable over time	Zero communities. 2012 was too soon to state that this was occurring without projecting an outside perspective of satisfaction on to the communities. The Quality of Life Plans were being developed and implemented to allow communities to self-define their satisfaction and how to achieve it in a sustainable manner. Several communities	**8 communities** prioritized sustainable production activities in their Life Plans and CIMA actively supported them with technical and institutional strengthening, these include: Tourism and handicraft associations, Forestry oversight committee, Mother's clubs, cocoa-growers' associations, coffee-growers assoc., farming assoc., bee-keepers assoc., community	**18 communities, 15 community organizations and 15 action plans** Action plans linked to value chains had been development with agricultural committees, associations and cooperatives, mainly for cocoa, tourism and handicraft in 18 villages and communities: Cachiyacu (Sector Tocache), Yamino, Santa Rosa de Aguaytia (Sector Aguaytía), San Luis de Charashmana,	**23 communities, 20 community organizations** Action plans linked to value chains and infrastructure for connection had been development with local institucions (committees, associations etc.) in 23 villages and communities, for these activities: **Producers (15, mainly cocoa / coffe):** Vista Alegre (Comité de productores), Alto Ponaza (Small animal producers), Paraíso (Small animal producers), Santa Rosa (Selva Verde), Chambira (Allima Sacha), Nuevo Arica (Comité de

[31] Plan Integral de Gestión Ambiental de Residuos Sólidos, for local governments.

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period			
		2008	2008-2012	2012-2014	2014-2015	2015-2016
			were started the process and defining new opportunities.	vigilance groups (*rondas campesinas*),	La Cumbre, Manco Cápac, Nuevo Dorado De Insaya, Fernando Belaunde Terry, Nuevo San Martín, Isolaya, Nuevo Alan (Sector Contamana), Vista Alegre, Alto Ponaza, Paraiso, Santa Rosa, Chambira, Nuevo Arica, Vista Alegre (Sector Tarapoto). Business plan will be developed in future for these activities.	productores), Cachiyacu (Nueva vision), Maronilla (ronda campesina & cocoa), Shapaja (ronda campesina & honey), Nuevo Dorado (Coop Nvo. Dorado), Fernando Belaúnde Terry, Nuevo San Martín, Isolaya, Nuevo Alan (ADECAVACU), Yamino (Asociacion de Cacaoteros), Santa Rosa de Aguaytía (Coop. Cacaoteros). **Tourism and handicraft (4):** San Luis de Charashmaná, La Cumbre, Manco Cápac (AASHPIRIS) and Yamino (Asoc. Turismo y Asoc. Artesanas) **Infrastructure to improve acces (3):** Lejia, San Juan and Mariscal Cáceres **Restauration and resource management/conservation (2):** Chipaota, Cachiyacu (Nueva vision).

4.1.3 Protection of High Conservation Values (CM1.2)

Ecosystem services provided by mountain landscapes such as those of the PNCAZ are essential to the well-being of local communities and will be protected by the REDD project. Intact vegetation in project zone – inside PNCAZ and also in buffer zone forests – affords multiple benefits to neighboring communities (Figure 17). These services can be grouped into three main categories (Millennium Ecosystem Assessment 2005, MINAM 2015):

1. *Provisioning services*: A supply of **clean water** to human settlements in the buffer zone is largely guaranteed by PNCAZ. Streams that originate in the park are the principal source of water for crops, animal stock, agriculture and ranching operations and domestic uses.
2. *Regulating and supporting services*: Intact vegetation cover in the park is essential to maintain **water quality** in downstream areas by **reducing erosion and sedimentation** upstream. Clean streams provide a safe environment for fish, an important **protein source** for buffer zone communities. In addition, the park provides a protected area for **game species**, which are often overhunted in the buffer zone. Individuals from healthy populations in the park migrate into the buffer zone where they become available to local hunters.

Figure 17: CIMA 2016. Banner #1 Environmental Education

3. *Cultural services*: The PNCAZ protects landscapes important for the **traditional cultural identity** of indigenous people, as examples:
    - Shipibo peoples from the Pisqui basin periodically enter the PNCAZ on traditional walks in search of salt that is used for direct consumption and to conserve game meat, and according to tradition, they are not permitted to hunt or fish along the way (APECO 2001). The *Manashahuemana* mountain range in Pisqui is also an important spiritual location for

the Shipibo communities. In their language, "manashahuemana" means turtles in a line position (Alverson *et al.* 2001).

- At the other side of the park, the *Lost World* lagoon is an important cultural location for the Muchuk LLacta community of the Chazuta (Lamista Quechua). The lake of tectonic origin in the northern portion of PNCAZ is almost inaccessible. The route from the Chipaota community and the area around the lake are home to abundant game species that are only hunted on special occasions during traditional festivals (MUF-2003).

More examples of ecosystem services (i.e. food security, Figure 18) provided by the project area (with full protection within the national park) were presented in the PD, Table 1.6 of the section 1.13.5.1 Ecosystem Services.

Figure 18: CIMA 2016. Banner #2 Environmental Education

During 2016, the PNCAZ Headquarters and CIMA worked on updating the PNCAZ Master Plan with the active participation of local stakeholders. One of the first stages was the construction of the Consensual Vision, beginning with the identification of the "objects of the vision"; In addition, the vision of PNCAZ was expressed in the native language of the representatives of the Management Committee. As shown below, these elements highlight the landscapes important for the traditional cultural identity of indigenous people.

Identificación de los Elementos Consensuados de la Visión
1. Elementos Ambientales **Ecosistemas:** -Bosque Montano -Bosque de colina -Bosque Aluvial -Pantano de Altura -Aguajal -Arbustal/Herbazal -Cuerpo de Agua **Especies:** - Animales protegidos: guacamayo, maquizapa, otorongo, sachavaca, perro del monte y el Barbudo de pecho escarlata. - Animales para consumo: majás, venado, sajino, huangana, carachupa y boquichico, que son aprovechados en la zona de amortiguamiento. - Árboles: chuchuhuasha, cedro, caoba, capirona, tornillo, sachacanela, copaiba, uña de gato, sangre de grado, shihuahuaco, etc. 2. Elementos económicos productivos - Promoción de actividades sostenibles en las zonas adyacentes al PNCAZ: cultivos de cacao, café, maíz, papaya y plátano en agroforestería. - Ganadería. -Turismo y Artesanía sostenible. 3. Elementos Socioculturales -Cordillera Azul, federaciones indígenas, comunidades nativas, centros poblados, caseríos, gobiernos regionales, gobiernos locales, entre otros actores sociales públicos y privados, se articulan para promover la mejora de la calidad de vida de las poblaciones. -Presencia del Pueblo Cacataibo en el PNCAZ y Propuesta de Reserva Indígena Cacataibo Norte.
Visión Unificada y Validada del Parque Nacional Cordillera Azul
Al año 2037 el Parque Nacional Cordillera Azul conjuntamente con las comunidades nativas Yines, Shipibos, Cacataibos, Kechwas, y poblaciones vecinas, mantiene conservada la cadena montañosa de selva más extensa del Perú ubicada entre los ríos Huallaga y Ucayali; albergando los "Maná", "Bäshi", "Urku" o Bosque de Montaña representados por el "Mananxawe manan" o cerro Motelo y el cerro Cinco Puntos donde vive el Barbudo de Pecho Escarlata;, "Anima Manan", "Mata me", "Filu" o Bosque de Colina; "Sapan", "Me sapan", "Pampa Sacha" o Bosque Bajo; "Binon nexba", "Binun me", "Cocha" o Aguajal; "Weanbo", "Bácacama" o ríos y "Xanto", "Ian" o Lagunas; donde vive el Pueblo Indígena en Aislamiento Cacataibo, también conocidos localmente como Camanos; además de los Oconales o Pantanos de Altura y Arbustal / Herbasal encontrados en las formaciones Vivians. Cordillera Azul en alianza con el MINCU, GOREU, GOREL, ORAU, FENACOCA, FECONACURPI, Autoridades Locales, Poblaciones Vecinas y otros actores estratégicos, brindan apoyo para generar condiciones de bienestar, respeto de sus derechos fundamentales y la seguridad resultante de la ausencia de agentes externos en territorio del Pueblo Indígena en Aislamiento Cacataibo del PNCAZ y su ZA, proveyendo de recursos naturales que requieren para su continuidad sociocultural en el futuro. La conservación de estos ecosistemas mantiene especies representativas como el Capito wallaceii y vulnerables como osos de anteojo, lobos de río, sachavacas, perros de monte, otorongos, maquizapas y armadillos gigantes. Asimismo, el Parque es protegido por las poblaciones vecinas porque este les brinda servicios ecosistémicos de provisión de agua y carne de monte como venados, sajinos, huanganas, majas y de peces como los boquichicos; además, por ser un banco de semillas de árboles como Caoba, Cedro, Tornillo, Shihuahuaco, Chuchuhuasha, Sachacanela, Copaiba, Uña de gato, Sangre de grado, que son usados en prácticas tradicionales, agroforestería y contribuyen con la seguridad alimentaria.

Source: Acta del Quinto taller para la validación de la visión y objetivos estratégicos. Actualización participativa del Plan Maestro del Parque Nacional Cordillera Azul – PNCAZ (14 June 2016).

4.2 Offsite Stakeholder Impacts

4.2.1 Mitigation of Negative Impacts on Other Stakeholders (CM2.2)

No negative impacts on offsite stakeholders have occurred. Mitigating any potential negative impacts is facilitated by the fact that a large portion of the project zone perimeter is delimited by the Huallaga and Ucayali Rivers that are imposing natural barriers.

As no negative impacts to offsite stakeholders have occurred thus far and none are expected, no mitigation plans are required.

4.2.2 Net Impacts on Other Stakeholders (CM2.3)

Unchanged from description in the validated PDD.

The PNCAZ high conservation values relating to the communities (natural resources and environmental services and benefits) will be protected. Project activities will ensure the continuation of the ecosystem services provided to the communities by the project area, even in those were CIMA does not work directly. These actions allow communities to meet their basic needs in a sustainable manner and allow for the project area to continue providing the ecosystem services needed for communities to retain their traditional cultural identities.

Additionally, CIMA works closely with SERNANP and MINAM, but also with regional and local governments, several technical groups (i.e. REDD groups, Red Ambiental Peruana, RAP, UICN Peruvian commission, etc.) and other protected areas to demonstrate and teach the skills needed to successfully develop and implement a REDD project. This work may have indirect positive benefits for off-site communities if similar project activities are implemented in their areas.

4.3 Community Impact Monitoring

4.3.1 Community Monitoring Plan Development (CM3.3)

Unchanged from description in the validated PD.

Every three years CIMA will conduct a new *Mapeo de Usos y Fortalezas MUF* to get a more formal analysis of the status of communities and to detect positive or negative impacts of the project; for more details about MUF see the PDD section 6.2 Monitoring of human communities in the buffer zone. The last MUF were conducted in 2016, following the Guide of MUF (http://www.cima.org.pe/files/images/publicaciones/pdf/CIMA-2014-Guia-Mapeo-de-usos-y-Fortalezas-MUF.pdf).

MUF data are the responsibility of and are collected through the field technical team based in each of the four regional offices. The data analysis is the responsibility of the CIMA Management Program, which establishes the mechanisms for internal review of information, analysis of this information, and the methodology for the return of the data to the people and its validation by the communities.

4.3.2 Community Monitoring Plan Results (CM3.1, CM3.2, GL2.5)

Community impact monitoring was described in the 2012 PIR, section 5.6: Monitoring of Human Communities in the Buffer Zone. As described therein, social monitoring comprises five indicators corresponding to five aspects of life quality: natural, social, human, physical (infrastructure) and economics (Figure 19). These aspects are constantly reviewed together with the local actors.

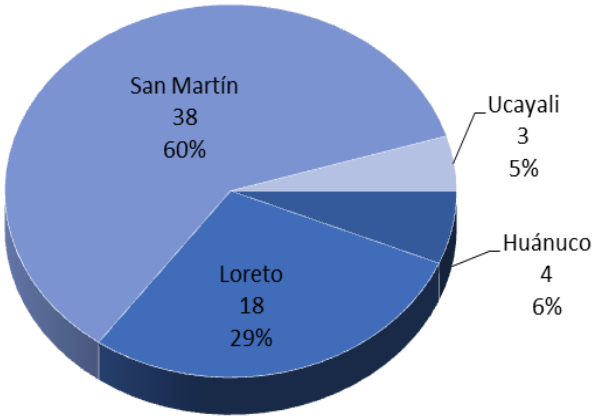
Figure 19: CIMA 2016. Banner #9 Environmental Education

Information relevant to these indicators is raised through two essential components:

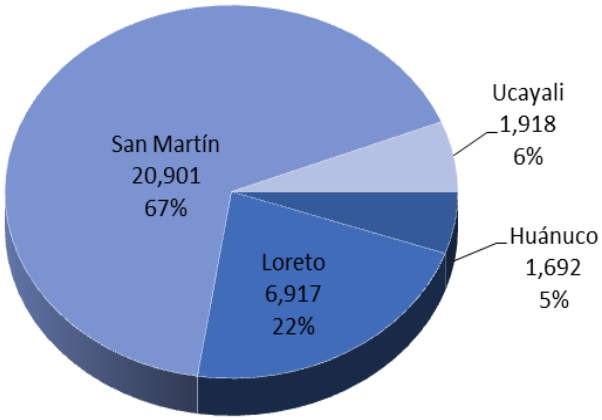
- Strengths and uses mapping (*Mapeo de Usos y Fortalezas* – MUF): This is the main tool to establish community and family profiles, implemented every 3-4 years, for the 104 communities and villages where implemented since 2002 (CIMA 2014), last MUF was in 2016 including 64 villages and communities (Figure 19).
- CIMA also can applies a real-time monitoring, with continual and direct monitoring by communities, park guards and CIMA field staff; reports are analyzed and synthesized quarterly allowing for adaptive management of the project area. Trends, changes, and suggestions or complaints guide the development and improve program strategies.

Figure 19. Populations evaluated during MUF 2016

Number of villages and communities by sector



Number of persons by sector



Source: MUF 2016

There are no negative impacts to communities caused by the project, quite the opposite as project activities aim and succeed in improving the standard of living of local residents. The only negative impact detected was the potential for increased tensions between the communities that CIMA is working with initially, and those that will be worked with in the future (more details about social risks in the PD, section 1.13.4 Risk Assessment). To mediate this potential negative impact, CIMA works to ensure constant communication with as many communities as possible to identify and address concerns as quickly as possible and to institute a strong, proactive communication program and complaint-resolution process. CIMA will never be able to work with all communities simultaneously but these measures help communities understand the priority-setting process and allow them to voice concerns.

In fact, SERNANP considers the PNCAZ as one of the Natural Protected Areas with the least amount of social and environmental conflicts in the National Protected Areas System (SINANPE).

Moreover, according to surveys of local populations (MUF 2016), they have a good perception of the PNCAZ:

Sector Tarapoto (35):

- 29 populations perceive PNCAZ as positive, with Vista Alegre being the only population that perceives it negatively.
- 31 populations feel that the PNCAZ directly benefits them, against the 04 that they say it does not benefit directly.
- 32 populations know what the *Environmental Services* means, and also they recognize it as a benefit of PNCAZ.
- **32 populations affirm that the work of the PNCAZ team is beneficial to them and 33 recognize that the PNCAZ team is part of the benefits of the ANP.**
- 28 populations carry out activities with PNCAZ's team and 23 participate or have participated in the management committee.
- 100% of the populations express the importance of participating in the conservation / protection of the PNCAZ.

Sector Tocache (14):

- 12 populations perceive PNCAZ as positive, and 02 perceive it in a very positive way (Maronilla and San Antonio de Alto Marona).
- All populations feel that the PNCAZ directly benefits them, know what the *Environmental Services* means, and also recognize it as a benefit from the PNCAZ.
- **All populations affirm that the work of the PNCAZ team is beneficial to them and also recognize that the PNCAZ team is part of the benefits of the ANP.**
- 12 populations carry out activities with PNCAZ's team and 05 participate or have participated in the management committee.
- 100% of the populations express the importance of participating in the conservation / protection of the PNCAZ

Sector Contamana (11):

- 08 populations perceive PNCAZ as positive and 01 perceive it in a very positive way (Nuevo Dorado de Insaya) and 02 perceive it in a neutral way (Inahuaya and San Luis de Charasmaná).
- 09 populations feel that the PNCAZ directly benefits them, and 02 who perceive the opposite (Inahuaya y San Luís de Charasmaná).
- 09 populations know what the *Environmental Services* means, and also they recognize it as a benefit of PNCAZ, but 02 state that they do not know about these services nor do they relate them to ANP (Inahuaya and San Luis de Charasmaná).
- **08 populations affirm that the work of the PNCAZ team is beneficial to them and 10 recognize that the PNCAZ team is part of the benefits of the ANP, San Luis de Charasmaná being the only one who manifests the opposite**
- 09 populations carry out activities with PNCAZ's team and 07 participate or have participated in the management committee.
- 100% of the populations express the importance of participating in the conservation / protection of the PNCAZ.

Sector Aguaytia (03):

- 02 native communities perceive PNCAZ as positive and 01 perceive it in a very positive way (Yamino).
- All 03 native communities feel that the PNCAZ directly benefits them.
- All 03 native communities feel that the PNCAZ directly benefits them, know what the *Environmental Services* means, and also recognize it as a benefit from the PNCAZ.
- **All 03 native communities affirm that the work of the PNCAZ team is beneficial to them and also recognize that the PNCAZ team is part of the benefits of the ANP.**
- All 03 native communities carry out activities with PNCAZ's team and participate or have participated in the management committee.
- 100% of the native communities express the importance of participating in the conservation / protection of the PNCAZ

4.3.3 Dissemination of Monitoring Plan and Results (CM3.3)

Unchanged from description in the validated PD; see section 6.2 Monitoring of human communities in the buffer zone.

The strategies and specific tools used by CIMA for park and project management are publicly available at no cost on CIMA's web page http://cima.org.pe. These tools and their advantages and limitations have been explained to local populations during training and consciousness-raising sessions as well as distributed in print to local leaders, institutions, authorities and other stakeholders.

The FOCAL process (Fortalecimiento de Capacidades Locales para la Conservación) seeks to generate commitments to the PNCAZ conservation and sustainable use of natural resources and territory that may lead to improved quality of life. FOCAL process is implemented at the level of village or community center. It has diagnostic tools, community planning, and participatory forms of consensus and making decisions (Figure 20).

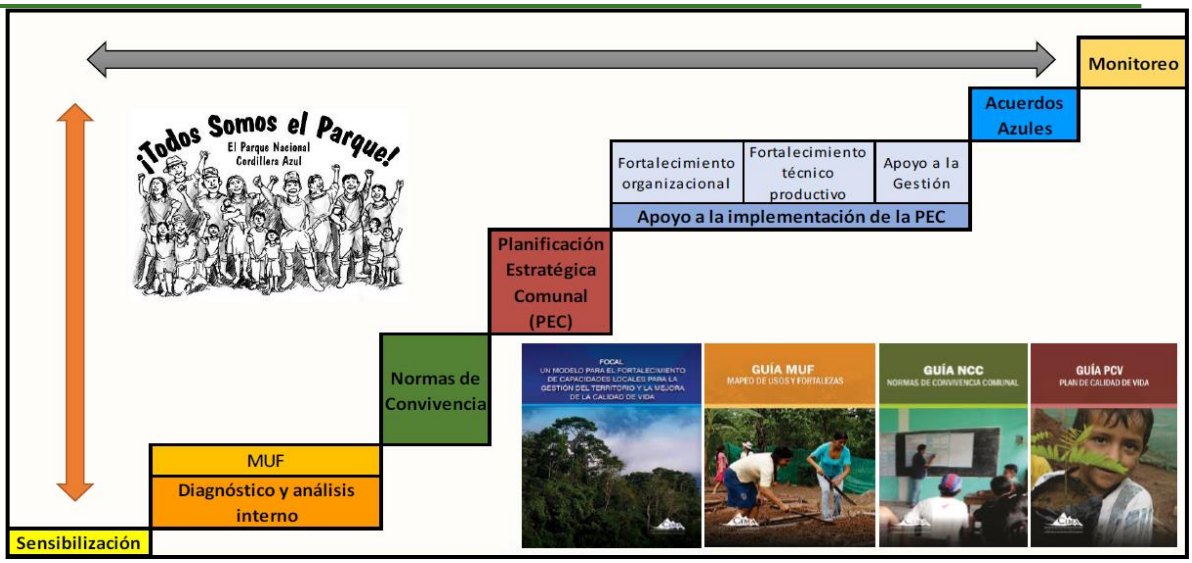


Figure 20: FOCAL process scheme, developed at the level of communities and villages.

The FOTP process (Fortalecimiento Organizacional Técnico-Productivo) seeks to strengthen communal organizations that have common objectives with the environmental conservation, to work in an organized way in meeting its objectives and goals, and to develop economic activities through sustainable management of land and natural resources. It has diagnostic tools, strategic planning and implementation actions, with participatory forms of consensus and making decisions (Figure 21).

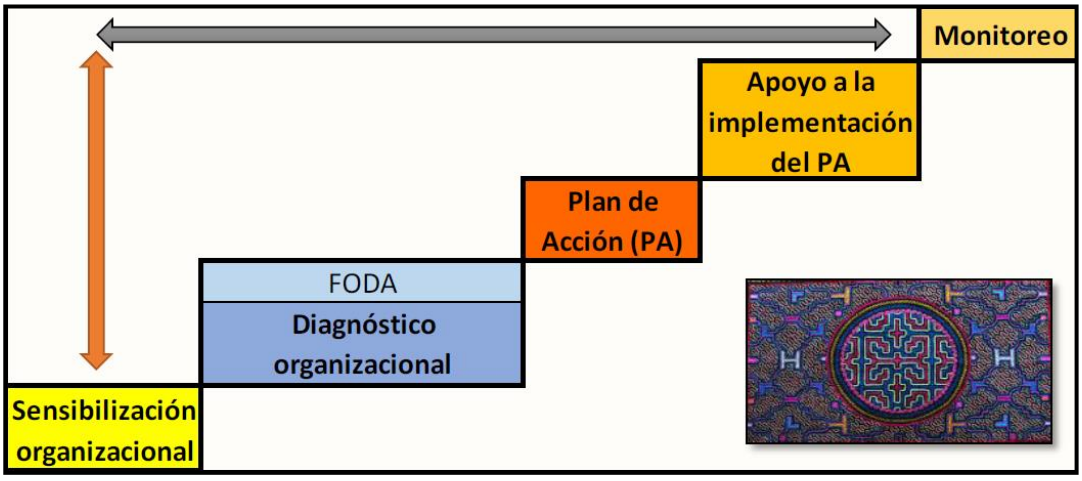


Figure 21: FOTP process scheme, developed at the level of community organizations.

The details of the activities are shown in table 11 of section 4.1.2. An example of these experiences is the one that has been developed in the subsector of Shapaja, with the peasant rounds, who implement economic activities compatible with the conservation to self-finance the conservation of their forests. https://www.youtube.com/watch?v=5VIPiTrndqw

The climax is these processes is the signature of the ***Blue Agreements (Acuerdos azules)***, when CIMA and the local populations (communities or villages) consolidated their commitments to work together, which are conservation agreements that are carried out with the whole community.

http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/acuerdos-azules-el-compromiso-de-las-comunidades-nativas-138967

The specific tool to raise social information is the MUF[32], which is published on the CIMA website, ensuring its availability not only for communities but also for the general public:

http://cima.org.pe/files/images/publicaciones/pdf/CIMA-2014-Guia-Mapeo-de-usos-y-Fortalezas-MUF.pdf (Guía MUF – Mapeo de Usos y Fortalezas – CIMA)

Specifically at the local level, this social monitoring tool has also been distributed to local, communal authorities and interested institutions that have some influence in the 4 regions where the project is developed.

The results of this collection of information have been returned directly to each community and particularly to each community where the tool was developed with presentations, brochures and banners containing the results of the MUF for each community. This delivery of results is accompanied by workshops in communities, and is the basis for the subsequent generation of its communal Rules of coexistence.

However, to the extent that specific information is required, *ad hoc* surveys can be performed without applying the whole MUF (which is more expensive, covers more area and contains more general information), as in the case of the collection of information on the use of fuel wood and lumber, to define leakage from illegal extraction within the project area, CL1.1 section.

4.4 Optional Criterion: Exceptional Community Benefits

Not applicable to this project.

4.4.1 Barriers to Benefits (GL2.3)

Not applicable to this project.

4.4.2 Protections for Poorer and More Vulnerable Households and Individuals (GL2.4)

Not applicable to this project.

[32] CIMA's technicians and extension team perform constant monitoring of populations around the PNCAZ, however, specific monitoring through the MUF is done every 3 or 4 years, next MUF will be made in 2016.

5 BIODIVERSITY

5.1 Net Positive Biodiversity Impacts

5.1.1 Biodiversity Changes (B1.1)

As predicted in the PD, the project has had a net positive impact on biodiversity and no HCVs related to biodiversity have been negatively affected. The baseline conditions (2008) were detailed in the previous PIR (2012) with a *Data and Index Rankings Table* for selected indicators used to monitor impact on biodiversity in the project area, according to section 5.2 Biodiversity Monitoring from PD. This information is updated through 2016 in Table 26.

Table 26. Comparative quantitative results and rankings of indicators to monitor impact on biodiversity in the project area along the project

Parameter	Indicator	Project Phase/Time period					Ranking				
		Baseline 2008	Implem. 2008-2012	Implem. 2012-2014	Implem. 2015	Implem. 2016	2008	2008-2012	2012-2014	2015	2016
Natural vegetation cover	# ha conserved forest (canopy cover) in the Project area	99.9 % of primary forest (Intact Forest)	99.9 % of primary forest (Intact Forest)	99.96 % of primary forest (Intact Forest)	99.98 % of primary forest (Intact Forest)	99.98 % of primary forest (Intact Forest)	3	3	3	3	3
Presence of species locally threatened by hunting	# key spp. registered (average) by park guards in the project zone (monkeys, tapir, deer, spectacled bear, jaguar and curassow).	8 key spp. (Intact Forest, low hunting activities)	7 key spp. (Intact Forest, low hunting activities)	8 key spp. (Intact Forest, low hunting activities)	10 key spp. (Intact Forest, low hunting activities)	10 key spp. (Intact Forest, low hunting activities)	4	4	4	4	4

Parameter	Indicator	Project Phase/Time period					Ranking				
		Baseline 2008	Implem. 2008-2012	Implem. 2012-2014	Implem. 2015	Implem. 2016	2008	2008-2012	2012-2014	2015	2016
Abundance of species locally threatened by hunting	# individuals by species (monkeys, tapirs, jaguar, deer and curassow) registered by park guards	# individuals/ patrol: 8 (High Abundance)	# individuals/ patrol: 11 (High Abundance)	# individuals/ patrol: 15 (High Abundance)	# individuals/ patrol: 15 (High Abundance)	# individuals/ patrol: 13 (High Abundance)	2	3	4	4	4
Amount of rules violated according to the protection status and zoning of the park	# unauthorized hunters, use of illegal hunting methods or hunting forbidden species	30 infractions by hunters or fishermen	15 infractions by hunters or fishermen	0 infractions	0 infractions	1 infraction	-3	-3	0	0	-1
	# unauthorized loggers, or selective extraction of timber species	39 infractions by loggers or invaders (Disturbed)	1 infraction by loggers or invaders (Slightly disturbed)	1 infraction by loggers or invaders (Slightly disturbed)	0 infractions	0 infractions	-3	-1	-1	0	0

Parameter	Indicator	Project Phase/Time period					Ranking				
		Baseline 2008	Implem. 2008-2012	Implem. 2012-2014	Implem. 2015	Implem. 2016	2008	2008-2012	2012-2014	2015	2016
	# exotic animal or plant species introduced to the PNCAZ	3 infractions	0 infractions	0 infractions	0 infractions	0 infractions	-2	0	0	0	0
Index evolution							**1**	**6**	**10**	**11**	**10**

Natural vegetation cover: The analysis of the 2016 satellite imagery for the project area (For details see the Climate Monitoring Report) shows 99.98% intact primary forest inside the PNCAZ. Only 1.1 ha of anthropic deforestation was observed by satellite imageries, and parkguards detect interventions in the patrol sector of Chambirillo and Santa Ana, more details in section CL1.1.

Presence and abundance of species locally threatened by hunting: During July 2015 to June 2016, park guards obtained data on the frequency (number of fauna encountered, groups of individuals counted as one encounter) and abundance (number of individuals by species, for flocks or grouped individuals) during a total of 356 routine patrols in which fauna registries were made, this represent 28% more patrols with fauna registers than the last period (277 patrols with wildlife encounters). Park guards focused on *key indicator species* defined as those sensitive to hunting. A total of 4,544 individual animals were registered from a total of 22 indicator species. These numbers are especially impressive in that they compare favorably with the baseline in 2008, and even during 2008 - 2012 period data; later, since 2012 the data of wildlife registered by parkguards shows an improvement and remains more constant.

During 2015, to evaluate the effectiveness of parkguard's wildlife reports, an investigation was conducted using all georeferenced fauna records collected between 2011 and 2014. The selected species were 5: *Tapirus terrestris, Mazama americana, Tayassu pecari, Pecari tajacu* and *Panthera onca*. The information was analyzed using PRESENCE 9.2 software; and to evaluate the models three covariates were used: (1) deforestation, (2) distance from PNCAZ, to evaluate intangibility of the PA, and (3) distance from the nearest populated center, to evaluate the anthropogenic impacts. We then analyzed the probability that the sampling used could detect a significant difference in occupation between seasons.

The results showed that the model that best represents the results was the PNCAZ distance, which indicates that more individuals are seen closer to the PNCAZ or within it. Although the sampling methodology currently used is opportunistic[33], the sampling effort and data are sufficient to detect a difference between seasons with a significance of 80% to 90%[34] (Pizarro 2016). However, having an 80% security that the state of the area is being degraded is sufficient for the management to decide to invest resources in conservation measures (Harcum and Dressing, 2015).

On the other hand, and as we mentioned in the previous report, CIMA has complementary methods, since some species that are not detected by the ranger, such as the elusive mountain dog - for this reason were not included as indicator species - but can be registered by the Trap cameras installed along trails (i.e. in areas that can be used as shelters or dormers (i.e. hollows and burrows in the ground) around some control posts (Alvarez y Pequeño 2017) where they can show the presence and relative abundance of large mammals and birds that inhabit the Park (Alvarez *et al.* 2014).

Also, the work done with river turtles (*Podocnemis unifilis*), known as "taricaya," is a further example of the success of resource management in the project area where population conditions of these

[33] Opportunistic Sampling: records the presence of the animal during patrol, when the guardparques is by chance encountered with an animal, footprint or trail, instead of actively looking for traces.

[34] These significances were used because less resources and effort are needed to detect a difference with a safety of 80%, as opposed to a significance of 95% -99% as usual.

turtles has enhanced35. On the Cushabatay and Pauya Rivers, many taricayas have been identified and their nesting beaches mapped; in addition, CIMA technicians and parkguards work hard to raise consciousness about the impact of unsustainable extractive activities and provide training on the use of artificial nests with collected eggs on river beaches. This activity has resulted in a recovery of taricaya population without prohibiting egg collection by local residents for family consumption. Furthermore, the turtle known as "charapa" (*Podocnemis expansa*), thought to be locally extinct for quite some time, was seen in the area.

Violations of rules of use or other infractions: The park guards looked for signs of activities within the park and buffer zone that were inconsistent with the approved uses as defined in the law creating PNCAZ. Park guards recorded information about possible threats or infractions committed in the park on their monthly reports.

In the project zone the following illegal activities were detected during the implementation period 2015-2016, with the described actions taken:

In the Project area there are numerous drivers of deforestation, mainly livestock and shifting agriculture; however, in recent years the illegal activities such as drug trafficking has returned to proliferate in the forest. During the last period of verification, a landing strip was discovered in the buffer zone at the north of Contamana sector, so CIMA made coordination for closure, with the support of SERNANP and relevant institutions; in this occasion the security of parkguards and CIMA's technicians could not be exposed to this risk.

During this period, the only permanent illegal activity within the PNCAZ has been livestock in Pólvora sector, while this area of grassland is not considered within the Project Area (because grassland is previous to PNCAZ's REDD project), but in the Project zone. A main action was the coordination between MINAM's Attorney, SERNANP and PNCAZ's Head with the Court of Bellavista (San Martín) to review the case of the Ganadero Suarez. Since December 2014 the case has been followed to expedite the eviction Ganadero Suarez by the judgment. Great legal advances have been achieved in 2016; so much so that in 2017 the eviction order was declared.

Baseline 'Without project' biodiversity scenario

The impact on biodiversity by deforestation in the PNCAZ would be especially devastating because it would fragment one of the largest protected areas and one of the last remaining, intact altitudinal corridors in the eastern tropical Andes. The area most vulnerable to encroachment in the PNCAZ is the site known as "el cuellito" (the neck) where special attention is being paid by CIMA and SERNANP to increase protection, especially to the sector Boca Pauya.

Without the project, notable reductions in population sizes and declines in species numbers are expected in the PNCAZ and the surrounding region. Most affected would be the endemic, rare, and already threatened species that characterize the park and represent a globally important array of natural communities of the tropical Andes, which are endangered or unprotected elsewhere and are fast disappearing. As a region, the tropical Andes is expected to experience a great loss of

[35] During early assessments, people were found to enter unpatrolled rivers to take taricaya eggs from nests on beaches, and even egg-laying females, which caused a strong negative impact on turtle population.

species or species migrations in the near future, given present rates of deforestation and projected impact of climate change (Brooks et al 2002; Malcolm et al 2006) and would likely cause alterations in ecosystem services (Anderson *et al*. 2011, Marengo *et al.* 2011).

In the absence of enforcement of park boundaries and stabilization of land-use in the buffer zone, deforestation, and forest degradation will compromise the integrity of the park. The projected deforestation results show significant deforestation along rivers and in a path across the north portion of the park (PD, Section 3.1.7 Projected Deforestation Location). Deforestation along this path would cut the park in two and decrease the effective size of the protected area. In addition, deforestation would facilitate access into the park and its resources.

Habitat loss and fragmentation of the park would have cascading effects on biological communities. Deforestation and degradation would alter the basic structure of the landscape as a mosaic of habitats within which many faunal species move in search of habitat, food, or reproducing grounds. Habitat fragmentation and degradation is one of the primary drivers of faunal species declines worldwide, in both terrestrial and aquatic environments. A limited number of species would thrive in the newly cleared areas, but the majority, beginning with the rare and specialized species, would decline rapidly. Also, as deforestation occurs along the rivers, it will limit the water supply for species that are unable or will not travel through cleared spaces to reach the rivers. The fragmentation of the park would have a significant impact on the larger mammals, especially spectacled bears, tapir, spider monkeys, and the large herds of white-lipped peccaries (Bodmer et al. 2013)

The implications of species loss extend beyond reduction in numbers, as deforestation can negatively affect community structure. Of particular concern would be the decline of large carnivores, seed dispersers, and pollinators, based on their key roles in ecosystems. The risk of faunal extinctions is also high in PNCAZ: the Rapid Biological Inventory (2001) found more than 30 species likely new to science and potentially restricted to the park.

Information provided by neighboring villagers through the MUF process, park guard reports and CIMA staff indicate that local residents have been suffering the effects of deforestation in the buffer zone. According to resource-use information, it is known, for example, that hunters have to travel much farther to find game, especially in the Huallaga populations when compared to the native communities of the Ucayali – where game species and fish are the principal source of protein- who live further from access routes and therefore have more intact forest. In some areas, people have forbidden hunting of certain species to protect them from local extinction, unless it is for traditional use such as in indigenous communities (Gálvez-Durand 2009, Pérez 2013). The most vulnerable game animals in the park include tapir, spider monkey, and curassow, and other big mammals as spectacle bear and jaguar; all these species show healthy individuals and healthy populations within PNCAZ, as shown in the results of the trap cameras installed in 2013 (Figures 22).

Figure 22. Images captured by the camera trap: (a) tapir, (b) couple of curassows, (c) spectacle bear and (d) jaguar. (Alvarez *et al.* 2014).

Subsequently, in 2016, a small set of trap cameras were installed in the forest of Shapaja sector, around armadillo burrows, in order to evaluate the use of the same for other animals, such as wild dogs (Figures 23), founding healthy populations of animals, including several species in couples and other species with young descendants.

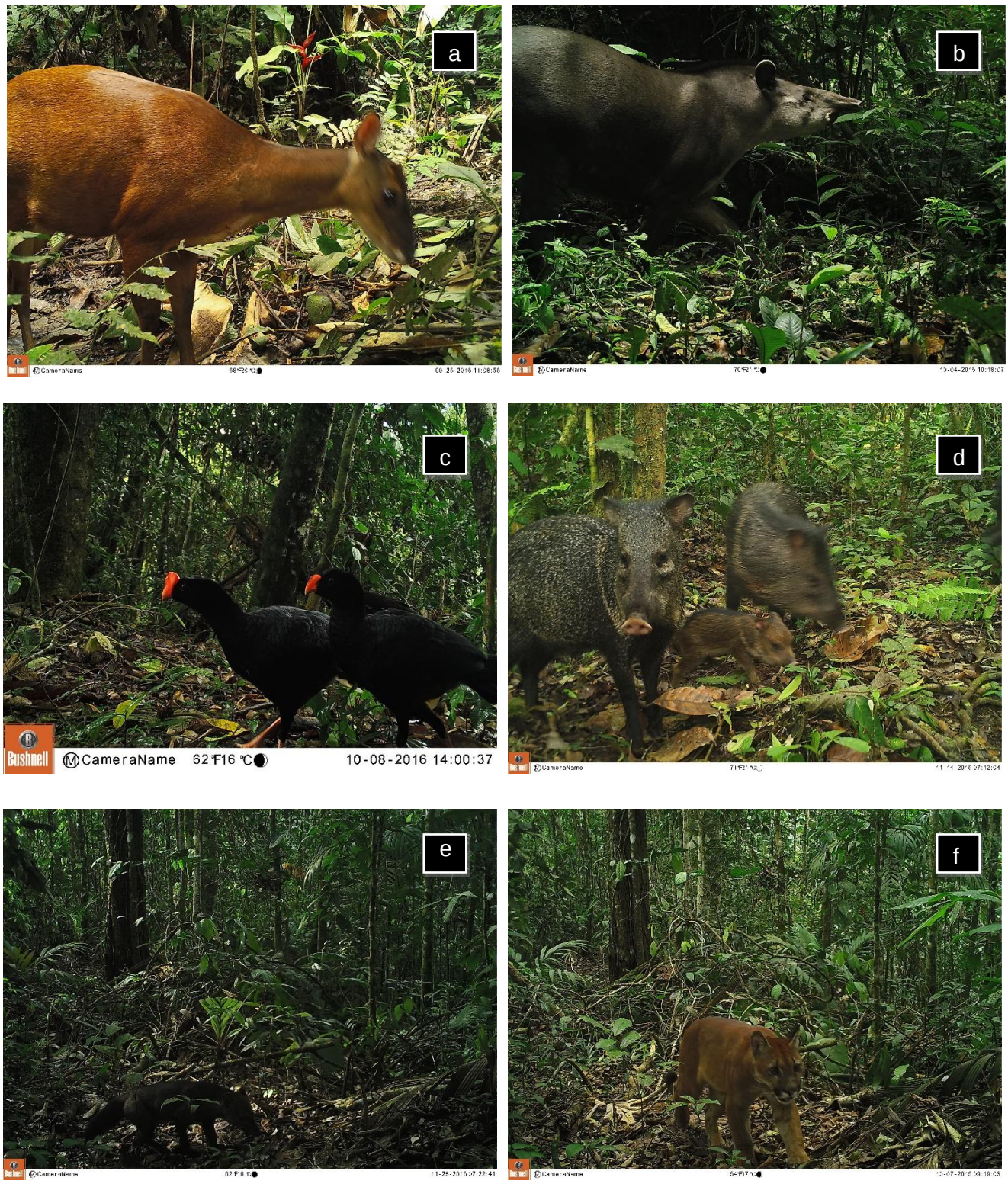


Figure 23. Images captured by the camera trap in 2016: (a) adult deer, (b) adult tapir, (c) couple of curassows, (d) family of peccaries, (e) adult bush dog, and (f) young puma.

Aquatic systems suffer degradation as a result of deforestation. The direct consequences of deforestation for aquatic environments have been well documented (Pusey and Arthington 2003) and include increased sediment, increased water temperatures, greater runoff from rain events, changes to river channels, and pollution. Of most concern for aquatic biota is increased sediment loading, as it alters aquatic habitats and results in physiological stress for gill-breathing organisms. Deforestation in other parts of the tropical Andes has been linked to major reductions in fish species richness, and the elimination of migratory fishes, such as *Brycon, Prochilodus*, and *Salminus* (Winemiller *et al.* 2008). These same genera are known to occur in streams of PNCAZ. Through the MUF process and the work monitoring the effects of extraction activities in the buffer zone, fishermen in the buffer zone have indicated that they have observed declines in several catfish such as "zungaro" (*Zungaro zungaro*), "dorado" (*Brachyplatystoma* sp.), "doncella" (*Pseudoplatystoma fasciatum*) and "carachama" (*Chaetostoma* and other Loricariids), as well as "boquichico" (*Prochilodus nigricans*) among others, over the last ten years (Macedo 2013).

A greater concern would have those species associated with aquatic environments, where the loss of a minimum quality or quantity of water has a dramatic impact, especially in restricted habitats species, including some that have not yet been described or remain unknown, such as fishes in caves[36] (Figure 24) or other *troglophile* species (Ñahuicopa et al. 2016 and Hidalgo et al. 2016). More details about this fishes in section 5.


MONGABAY LATAM
Periodismo ambiental independiente

BOSQUES OCÉANOS ANIMALES CONSERVACIÓN MEDIOAMBIENTE OPORTUNIDADES ORGANIZACIÓN Para buscar, teclee y hag

Hallan posible nueva especie de pez ciego cerca del Parqu e Nacional Cordillera Azul

por Joaquín Ortiz en 25 Agosto 2016

- La especie encontrada no tiene escamas en el cuerpo, presenta espinas en la cabeza, carece de pigmentación o tiene una pigmentación muy tenue —lo que indica su adaptación a condiciones sin luz— y presenta barbos largos en la boca.
- El hallazgo se llevó a cabo en la cueva Milagrosa, cerca de Tocache en la región San Martín.
- El Parque Nacional Cordillera Azul "protege una diversidad biológica muy alta porque el ámbito que cubre es de más de 1 millón 300 mil hectáreas de bosques primarios y pristinos", explica Tatiana Pequeño, Directora de

NUESTRA MISIÓN

Mongabay pretende aumentar el interés y la apreciación por la tierra salvaje y la vida silvestre a la vez que examina los efectos de las tendencias emergentes en el clima, la tecnología, la economía y las finanzas en la conservación y el desarrollo.

Figure 24. Troglophile fishes (*Trichomycterus* sp.nov.) in a stream's cave in Tocache Sector.

Source: https://es.mongabay.com/2016/08/peru-hallan-posible-nueva-especie-pez-ciego-cerca-del-parque-nacional-cordillera-azul/

[36] http://www.unmsm.edu.pe/noticias/ver/Investigadores-sanmarquinos-descubren-nueva-especie-de-pez

The fact that PNCAZ encompasses the headwaters of two major Amazon tributaries - Huallaga and Ucayali rivers - deserves special mention, as the impacts of deforestation in this region under the baseline scenario would be exported to downstream areas. It is well known that ecological processes occurring in headwater streams influence biological communities and ecosystem function downstream, and for this reason river basins should be managed as a unit. Aquatic ecosystems in headwater streams are often driven by allochthonous inputs from terrestrial systems; deforestation in riparian areas would compromise the habitat, community structure, and ecosystem function of these streams. Several migratory species of fishes spawn within streams of the park: their survival depends on connectivity between upstream and downstream areas, and adequate habitat quality. As well, river turtles (especially taricayas whose eggs are favored food for Amazonian indigenous groups) and other aquatic reptiles depend on river beaches for laying eggs.

Without the project, increased deforestation and absence of CIMA's activities in the buffer zone will lead to a significant increase in human activity within the park. Increased hunting pressures, stemming from uncontrolled park access in the absence of the project, would compromise survival of the more vulnerable species in PNCAZ. Indiscriminate hunting would affect large mammals (tapirs, monkeys, peccaries, deer), game birds (curassows, guans), and favored fishes most quickly. But eventually, the entire biotic community would deteriorate.

5.1.2 High Conservation Value Protection (B1.2)

Park guard patrol routes are used to collect the monitoring data and these routes encompass large areas both in the park and in the buffer zone, resulting in monitoring of the entire project zone. The information presented above shows a clear net positive impact on biodiversity as a result of the project activities.

Forest cover inside the park remained about the same, but the overall Index Score jumped from a 1 in 2008 to 11 in 2015. This was due to similar findings or a slight increase in number of species and average abundance, but a significant reduction in the number of infractions for illegal use of the park area and exotic species (such as dogs, which are used to assist hunters, and left the area when the hunters left).

Communities did not report any new isolated negative biodiversity issues during the monitoring period and the scientific research provided supplemental data for use in project activities and monitoring. MUF data demonstrated a perception that flora and fauna both thrived when the park is protected and sustainable community activities are implemented.

Additionally, records of researchers show good populations of birds and large mammals (Alvarez *et al.* 2014), as well as amphibians endangered and sensitive to diseases such as those believed to occur by changes in weather conditions (Hörnes 2016).

Biodiversity has therefore remained about the same over the monitoring period 2014-2015 with a significant decrease in the number of infractions for illegal use of the park area. These results are consistent with a successful conservation project and indicate that the project has had a net positive impact on biodiversity over the without project scenario and maintained the HCVs relating to biodiversity.

5.1.3 Invasive Species (B1.3)

As stated in the PDD, no invasive or exotic species were used in the project activities. Project activities were shown to have lowered the number of incidents where exotic species were used by those not associated with the project.

5.1.4 Impacts of Non-native Species (B1.4)

Not applicable to the project.

5.1.5 GMO Exclusion (B1.5)

As stated in the PDD, no GMOs were used in the project activities.

5.2 Offsite Biodiversity Impacts

5.2.1 Negative Offsite Biodiversity Impact Mitigation (B2.2)

This project is devoted to preventing negative biodiversity impacts inside the project area and in the project zone. Project activities themselves generate positive, not negative impacts on biodiversity. Work with communities in the buffer zone focuses primarily on land-use stabilization and wildlife management. Both efforts benefit native biodiversity outside the park. In addition, stream recovery and agroforestry with native species is promoted in the buffer zone as well as reducing hunting pressure inside PNCAZ, further benefiting the native biota in the region which in turn benefits the local communities.

Similar positive impacts may also be felt beyond the buffer zone (offsite). Stream recovery and erosion prevention measures will have impacts on biodiversity all along the stream and downstream waters. Increases in herd size and habitat may allow biota to travel in wider ranges and some locations offsite might also notice increases in biota numbers.

In the worst-case scenario, the project's efforts will result in unchanged conditions for biodiversity outside the project zone. More likely, results from project activities will greatly improve conditions for native biodiversity in the buffer zone, in accordance with the Source and Sink Model (Pulliam 1988) that has been described in the first Master Plan for PNCAZ (INRENA 2006), which in turn will positively impact the off-site biodiversity. Combined with the positive benefits for biodiversity in the park, the overall effect of project activities for biodiversity conservation will be extremely positive.

Protection of species in the park will likely result in greater numbers of the species in the buffer zone as well. By providing a protected environment, especially for overhunted game animals such as deer, peccaries (white lipped and collared), tapir, several species of monkeys, guans and curassow, the park will allow the populations of the species to increase and stabilize. Larger populations inside the park will lead to larger populations in the buffer zone as animals travel or migrate. This benefits both the animals and the communities in the buffer zone. As discussed in

Because no negative impacts for offsite biodiversity are expected, no mitigation plans are required and none were implemented during this period.

Section 4.4.3 of the PD, hunting provides an important source of protein for the communities, but all the hunt which is performed is only for subsistence. This concept is discussed in more detail in the wildlife management section of the 2003 Master Plan (INRENA 2006) and in the PD.

It is worth noting that PNCAZ is a significant benchmark by its REDD project, but also is an international reference for its biological diversity and also for good management, so it has been postulated to integrate the Green List of Protected Areas of IUCN (Figure 25).

Figure 25: SERNANP Bulletin, announcing the neutralization of UICN World Conservation Congress with the PNCAZ REDD Project, and the postulation of PNCAZ for the Green List of UICN.

https://issuu.com/sernanp_/docs/boletin_agosto-setiembre_c79d704ea347e1

http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/sernanp-cuatro-areas-naturales-protegidas-del-peru-postulan-218312

5.2.2 Net Offsite Biodiversity Benefits (B2.3)

There are no likely unmitigated negative offsite biodiversity impacts so this is not applicable to the project.

5.3 Biodiversity Impact Monitoring

5.3.1 Biodiversity Monitoring Plan Development (B3.3)

The plan and its implementation remain unchanged from description in the validated PDD.

At the landscape level, CIMA analyze the forest cover with satellite images and aerial overflights when feasible, to confirm that there is no deforestation inside the park; during the last year the availability of satellite images is better, so the analysis could be more frequently than annual. Deforestation in the park is the best indicator readily available to the project, of any negative impact to biodiversity. Where incursions into the park are detected through review of images or park guard reports, cessation of the illegal activities and appropriate remediation become the highest management priority.

At the biological community level CIMA will focus on organisms that indicate habitat health and are easy to sight and identify. CIMA will specifically focus on sensitive game animals (tapir, deer, curassow, monkeys and big carnivores). Since the project began, regular observations (sightings and tracks) by park guards have occurred monthly inside the park, along the regular patrol routes (in PNCAZ and buffer zone) around 18 control posts and park guards' centers that include a good sample of the habitat heterogeneity of the landscape.

In addition, CIMA evaluates forest and biological communities' integrity at the landscape level using parkguards information based on records of specific threats (violation of rules of use). This information will further assist in defining threats or possible impacts to biodiversity.

There are several benefits to using park guards to record information about flora and fauna, especially the species used by local villagers. Park guards routinely patrol large portions of the park and already have a system of reporting back to CIMA. Because most of the guards are from local communities, they usually have good knowledge of local flora and fauna and they receive additional training.

More details and results in next section 5.3.2.

5.3.2 Biodiversity Monitoring Results (B3.1, B3.2)

The plan for selecting variables for quantitative monitoring and its implementation remain unchanged from the description in the validated PDD, but currently more non quantitative information is being considered to have a greater context of the situation of biodiversity in the project zone.

Thus, the monitoring plan has not been modified. In fact, the indicators and all its components (methods, sources, and frequency) have remained the same between the PDD and the RIP. However, some clarifications were required, which are highlighted below:

- The information obtained comes from the project area, in the rangers' patrol areas, precisely areas with higher human pressure where it is more likely that land use changes or increased hunting pressures exist.
- The quantitative analysis has not changed, so it is comparable. An index has been created based on indicator species (not on all the PNCAZ biodiversity) because of its size and large biodiversity it would be unlikely to assess at that level. This clarification and the improvement of work with the rangers have been coordinated with SERNANP. Field Reporting systems have also been improved by training rangers, who collect basic information for this analysis.
- It is prohibited to draw threatened species (both flora and fauna) from PNCAZ, and that component is detailed in the "breaches" or illegal actions indicator in terms of: (1) poaching through methods that are not allowed or poaching of prohibited species, (2) logging or (3) introduction of invasive species.
- In addition to the quantitative analysis done using the indicators mentioned before, all the available information provided by the research conducted during the verification period (see below, Table 27. New research Conducted During the monitoring period Aug 2015-Aug 2016) is considered for the management of the project area, as well as the information which comes from the communities, especially from the participatory processes of economic ecological zoning. As it is mentioned in the section B.1 of PIR, this information contributes to the improvement of the development of activities and the overall implementation of the project, including its monitoring system.
- Methodologies to estimate and monitor biodiversity were described in PDD (Section 5.2 Biodiversity Monitoring). Protocols to monitor wildlife were shared with SERNANP staff, the Director of the PNCAZ and park guards. The park rangers conduct the survey of wildlife information in the field, along its patrol routes from at least 18 control points.
- In order to ensure that the data required by the methodology do not fall in quality, a course for parkguards, offered by CIMA, was carried out in February 2016; to applying techniques for environmental education and to strengthen the wildlife monitoring efforts, where the main wildlife monitoring results, protocols and recommendations were returned to the staff, in order to ensure understanding of data collection and monitoring procedures by field personnel.

As described in section 5.1.1, the project has had a net positive impact on biodiversity and no HCVs related to biodiversity have been negatively affected. The baseline conditions (2008) were detailed in the previous PIR (2012), when contrasted with 2016 (Table 27) show improvements in the conditions to find wildlife in the patrol routes.

Table 27. Comparative quantitative results and rankings of indicators to monitor impact on biodiversity in the project area along the project

Parameter	Indicator	Project Phase/Time period		Ranking	
		Baseline 2008	Implem. 2016	2008	2016
Natural vegetation cover	# ha conserved forest (canopy cover) in the Project area	99.9 % of primary forest (Intact Forest)	99.98 % of primary forest (Intact Forest)	3	3
Presence of species locally threatened by hunting	# key spp. registered (average) by park guards in the project zone (monkeys, tapir, deer, spectacled bear, jaguar and curassow).	8 key spp. (Intact Forest, low hunting activities)	10 key spp. (Intact Forest, low hunting activities)	4	4
Abundance of species locally threatened by hunting	# individuals by species (monkeys, tapirs, jaguar, deer and curassow) registered by park guards	# individuals/ patrol: 8 (High Abundance)	# individuals/ patrol: 13 (High Abundance)	2	4
Amount of rules violated according to the protection status and zoning of the park	# unauthorized hunters, use of illegal hunting methods or hunting forbidden species	30 infractions by hunters or fishermen	1 infraction	-3	-1
	# unauthorized loggers, or selective extraction of timber species	39 infractions by loggers or invaders (Disturbed)	0 infractions	-3	0
	# exotic animal or plant species introduced to the PNCAZ	3 infractions	0 infractions	-2	0
Index evolution				**1**	**10**

The most recent wildlife course for parkguards was carried out in August 2017, to apply techniques to calibrate an install cameras trap to take pictures of animals in natural conditions. This is a complementary method to detect more inconspicuous fauna (i.e. wild dogs), as well as behavior. The course was theoretical – practical (Figure 26), developing the part of field in the neighboring of the Otorongo steam and the Parkguards center of Pucayacu, in the valley of the Aspuzana river, Huánuco.

Figure 26. Course for Parkguards, to setup and install Camera Trap (Theory part)

It is important to say that many rangers have extensive experience in data logging protocols in the field; in fact, many participated in the design of the current logging sheet. In addition, CIMA follows up their wildlife records to ensure that the information obtained during their routine patrols can be used[37]; besides, Official Park Guards provide continuous training to Community Park Guards as part of their regular activities. The trap cameras are a complementary method that provides information to the reports of wildlife of the park rangers (Figure 27).

Figure 27. Course for Parkguards, to install Camera Trap (Field part)

[37] Since 2015, a thesis candidate of the *Universidad Peruana Cayetano Heredia* is using Wildlife parkguards' data to assess probabilities for presence of key species in northwest sector of PNCAZ and its buffer zone.

'With project' biodiversity scenario

The 'with project' scenario was developed to prevent deforestation in the PNCAZ which protects a large, intact expanse of lower-montane forest remaining in Peru. Besides encompassing a wide range of habitat types— from lush lowland forests, to stunted vegetation on the rugged sandstone ridges, to elfin forests on the mountain tops—and rare geologic formations such as the Vivians, the park offers intact forest cover from the lowlands at 150 meters to mountain peaks at 2,400 meters. The park protects an eastern outlier of the Andes that has been isolated for a sufficiently long period for massive speciation to occur.

The initial knowledge of the project area's impressive biodiversity and endemism comes from scientists from the Louisiana State University (1996), The Field Museum of Chicago and the Museo de Historia Natural-UNMSM (2000) as Peruvian counterparts. To complement the biological information CIMA promotes research in the PNCAZ and its buffer zone. During the period 2015-2016 at least 13 studies updated and enriched the knowledge about the project zone biodiversity and the relevance of this biodiversity and natural processes to human populations surrounding the park (Table 27).

Table 27. New research conducted during the monitoring period Aug 2015-Aug 2016

Year	Institution		Research Title
2015	1	CIMA – Cordillera Azul	Análisis de deforestación en PNCAZ, periodo 2014
	2	Terra Carbon	2014 Climate Monitoring Report - Cordillera Azul National Park REDD Project: Report of deforestation in PNCAZ and its buffer zone
		Terra Carbon	2014 Climate Monitoring Report - Cordillera Azul National Park REDD Project: Report of Leakage from migration into PNCAZ's buffer zone
		Terra Carbon / CIMA	2014 Climate Monitoring Report - Cordillera Azul National Park REDD Project: Use of wood and charcoal
	3	*Instituto de Investigación de la Amazonía Peruana / Gob. Reg. San Martín*	Inventario Biológico Bosques Secos del Huallaga – BSH. (IIAP 2016) http://www.iiap.org.pe/Archivos/Publicaciones/Publicacion_1995.pdf
	4	University of Texas, Austin	Informing the carbon Frontiers: Economics and Landscape in the Western Amazon (Tasker 2016). http://sites.utexas.edu/gage/2015/07/19/kaitlin-tasker-explores-conservation-in-cordillera-azul-national-park-peru/
	5	*Universidad Peruana Cayetano Heredia*	Programa de capacitación sobre técnicas básicas de producción para pollos y gallinas en los centros poblados Paraíso y Alto Ponaza
	6	*Universidad Peruana Cayetano Heredia*	Estimación de la ocupación de venado (*Mazama americana*), paujil (*Mitu tuberosum*), sachavaca (*Tapirus terrestris*), oso de anteojos (*Tremarctos ornatus*) y otorongo (*Panthera onca*) en el Parque Nacional Cordillera Azul como metodología de monitoreo biológico. Submitted thesis.

Year	Institution		Research Title
			http://repositorio.upch.edu.pe/bitstream/handle/upch/485/Utilizando%20estimaciones%20de%20ocupaci%C3%B3n%20para%20el%20monitoreo%20de%20la%20biodiversidad%20en%20%C3%A1reas%20naturales%20protegidas%20el%20caso%20del%20Parque%20Nacional%20Cordillera%20Azul.pdf?sequence=1
2016	7	University of Bonn (Germany)	Amphibian community of north-western Parque Nacional Cordillera Azul, Peru. Thesis submited in 2016, Master of Science.
	8	*Terra Carbon*	2015 Climate Monitoring Report - Cordillera Azul National Park REDD Project: Report of deforestation in PNCAZ and its buffer zone
	9	*Universidad de Cambridge*	Análisis de estrategias de intervención social y ecológico, San Martín
	10	*CIMA - MUSM*	Hallazgo de una nueva especie de pez ciego descubierto en cuevas del sector Atusparia, en zona de amortiguamiento del Parque Nacional Cordillera Azul, Tocache - Perú
	11	*Duke University*	Estudio de perro de monte y yungunturo
	12	*Universidad Nacional Agraria La Molina*	Evaluación desde el enfoque de ciclo adaptativo del manejo de quelonios acuáticos en la Cuenca del Río Cushabatay, Loreto.
	13	*CIMA*	Mapeo de Usos y Fortalezas 2016

The results of these studies were used in multiple ways to improve project activity development and implementation, for example:

- As inputs for CIMA's biodiversity / forest monitoring and activities planning;
- To identify areas with better probabilities to development restauration projects/programs, especially in areas with high historical deforestation, like Shamboyacu sector.
- To identify new species or species ranges for the park or buffer zone which are highlighted in the summary of project biodiversity;
- As inputs for a wide range of community activities (Quality of Life planning, zoning, communication and education programs);
- To provide new data to local, regional and national government authorities for their planning and monitoring use.

5.3.3 Monitoring Plan and Results Dissemination (B3.3)

The monitoring plan developed during the preparation of PDD has remained unchanged in its essence (section B3.1), but it was gradually fitted with input from the specialist of the General Directorate of Natural Protected Areas from SERNANP. Likewise, more specific information on the diversity of the PNCAZ's fauna based on biological monitoring and other investigations was sent to the DGANP - SERNANP specialist in order to enrich the list of species of the National System of Natural Protected Areas (SINANPE). The monitoring results and procedures have been

disseminated to communities and other stakeholders in culturally appropriate formats, these include:

- Monitoring Workshop for parkguards, which also included CIMA technicians, where wildlife monitoring protocols and main results are reviewed.
- During the PNCAZ Master Plan updating workshops, which included a wide range of stakeholders related to the management of PNCAZ: local, regional, local population, organized groups (i.e. indigenous federations or producer associations, etc.).
- Report of the preliminary identification of a new species of blind catfish founded in a cave of Tocache, having as source information of a resident of the area and a video of the Municipality of Tocache.

  http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/nueva-especie-de-pez-es-registrada-en-ambito-del-parque-220671

  http://www.cima.org.pe/es/noticias/encuentran-posible-nueva-especie-de-pez-gato-blanco

  http://munitocache.gob.pe/tocache-tours-para-el-peru-y-el-mundo/

  http://rpp.pe/blog/mongabay/hallan-pez-ciego-cerca-del-parque-nacional-cordillera-azul-noticia-991766

  http://elcomercio.pe/sociedad/san-martin/descubren-especie-pez-ciego-cordillera-azul-noticia-1928378#next
- Posters about camera traps, in Pre COP 20 event (Alvarez et. al 2014).
- Video to disseminate knowledge about the diversity of the park, prepared with photos of the camera traps placed in the PNCAZ https://www.youtube.com/watch?v=7ir1LwYRT1Q
- Brochures about PNCAZ REDD Project for distribution during COP20 in Lima (Dec. 2014)
- *PNCAZ's Picture Book*, given to relevant and strategic stakeholders, within the framework of the presentation of PNCAZ REDD project in the USA pavilion during COP20 http://www.cima.org.pe/es/noticias/parque-nacional-cordillera-azul-logra-acuerdo-historico
- Presentation of public-private partnership (SERNANP-CIMA-Althelia) to finance PNCAZ thanks to REDD Project, during COP20 in Lima. http://www.minam.gob.pe/notas-de-prensa/anuncian-prestamo-por-ocho-millones-de-creditos-de-carbono-para-conservacion-del-parque-nacional-cordillera-azul/
- A guide about frogs from PNCAZ (Tasker & Twomey 2015)

  http://fieldguides.fieldmuseum.org/guides/guide/596
- A guide Guide To Setting Up and Installing Trap Cameras (Alvarez y Pequeño 2017)


GUIA PARA LA
CONFIGURACIÓN E INSTALACION DE
CÁMARAS TRAMPA

Preparado por:
Patricia Álvarez-Loayza y Tatiana Pequeño Saco

Basado en:
Curso de cámaras trampa para guardaparques del PNCAZ
y técnicos de CIMA, en el Valle del río Aspuzana

CG 63 Pucayacu – Quebrada Otorongo
14-16 julio, 2017

Figure 28. Preliminary version of the Guide to the use of camera traps; with details showed during Wildlife Monitoring Course for Parkguards.

6 ADDITIONAL PROJECT IMPLEMENTATION INFORMATION

Not applicable to this project

7 ADDITIONAL PROJECT IMPACT INFORMATION: EXCEPTIONAL BIODIVERSITY BENEFITS

The PNCAZ REDD project has the CCB Gold Level for Biodiversity, so we believe it is pertinent to highlight these project qualities in this section.

The PNCAZ counts with Critically Endangered (CR) and Endangered (EN), also populations of Vulnerable species (VU), and likewise a surprising biodiversity.

- **Critically Endangered (CR) and Endangered (EN) species: presence of at least a single individual**

Potential negative impact	There is no negative impact derived from the Project for these Critically Endangered (CR) and Endangered (EN) species, listed in Appendix 2 of the PD[38]. On the contrary, this project prevents any event that might affect them.

[38] Appendix 2 of the Project PD contains a table of the endemic, endangered, and threatened species within the project zone, as classified by the following entities: IUNC Red List, CITES, and the Peruvian government's lists; i.e. the amphibian *Atelopus pulcher*, in critical danger, great birds like *Harpia harpyja,*

	The only species that could be affected are those that are allowed to be hunted (i.e. peccaries, deer, big and medium rodents, some guans); as already mentioned in the PD this is traditional and subsistence hunting. While precisely endangered species are prohibited from being hunted within the project area.
Species or individuals affected	• Amphibia: *Atelopus pulcher* (CR) • Bird: *Heliangelus regalis* (EN) • Mammal: *Pteronura brasiliensis* (EN) None of the mentioned species is affected. These species are protected legally and effectively within the PNCAZ thanks to the parkguards patrols. They are species whose permanence and the health of their populations depend directly on the conservation of the forest.
Impact aversion and mitigation	Parkguards conduct continuous surveillance actions to ensure the following and respect the wildlife use rules in the park. Monitoring reports are made with the hunting data provided by parkguards, in order to ensure that no endangered species is being hunted.

- **Vulnerable species (VU): presence of at least 30 individuals or 10 pairs.**

Potential negative impact	There is no negative impact derived from the Project for these Vulnerable species (VU), listed in Appendix 2 of the PD[39]. On the contrary, this project prevents any event that might affect them.
Species or individuals affected	• Amphibia: *Epipedobates cainarachi* • Reptile: *Podocnemis unifilis, Podocnemis sextuberculata, Geochelone denticulata* • Bird: *Ara militaris, Capito wallacei* • Mammal: *Priodontes maximus, Calimico goeldii, Ateles chamek, Ateles belzebuth, Speothos venaticus, Tremarctos ornatus, Tapirus terrestris* None of the mentioned species is affected. These species are protected legally and effectively within the PNCAZ thanks to the parkguards patrols.
Impact aversion and mitigation	Parkguards conduct continuous surveillance actions to ensure the following and respect the wildlife use rules in the park. Monitoring reports are made with the hunting data provided by parkguards, in order to ensure that no endangered species is being hunted. Only subsistence hunting is allowed.

Morphnus guianensis and *Aburria aburri*, restricted especies like the humimbirg *Heliangelus regalis* and the great mammals *Myrmecophaga tridactyla, Cacajao calvus, Pteronura brasiliensis, Panthera onca* and *Puma concolor.*

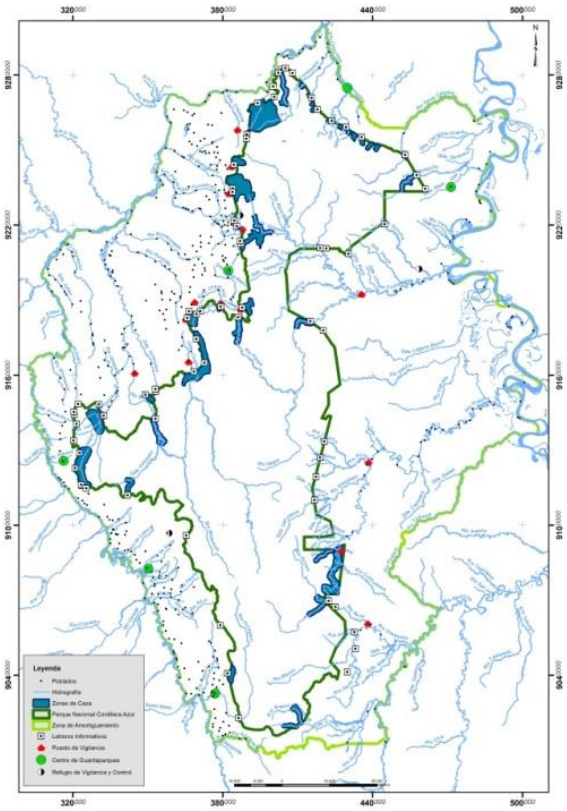
[39] Appendix 2 of the Project PD contains a table of the endemic, endangered, and threatened species within the project zone, as classified by the following entities: IUNC Red List, CITES, and the Peruvian government's lists; i.e. the amphibian *Atelopus pulcher*, in critical danger, great birds like *Harpia harpyja, Morphnus guianensis* and *Aburria aburri*, restricted especies like the humimbirg *Heliangelus regalis* and the great mammals *Myrmecophaga tridactyla, Cacajao calvus, Pteronura brasiliensis, Panthera onca* and *Puma concolor.*

It should be noted that the hunting areas within the park cover only 6% (Blue areas in PNCAZ Map), and are those that traditionally had been used since before the creation of the ANP.

When a hunter enters the park, the parkguards register their income, and when hunter leave, parkguards record the species and quantity hunted, the sector of hunting and the time they stayed inside. So, parkguards ensure that hunting and fishing regulations within the park are complied with.

Hunting and fishing is part of the benefits that neighboring residents receive from the Park, as an additional protein supply.

More details in section 5.1. Net Positive Biodiversity Impacts.



- ***Project Zone includes an extensive area of high biodiversity conservation priority***

The success of the project's activities in producing net positive impacts on biodiversity means that project activities have also protected the endemic and endangered species in the project area, fulfilling the criteria of protection to vulnerable and irreplaceable species. In fact, the park was recognized by SERNANP as the protected area that exhibits the best species conservation rate in the national protected area system.

As described earlier in the PIR, the project offers remarkable opportunities for protection of large numbers of endemic and rare species in all groups of organisms that were sampled in the Rapid Inventory and others: vascular plants, fishes, amphibians and reptiles, birds, and large mammals. The project zone also harbors many range-restricted species and unique assemblages of species.

New species have been identified in the park since the PDD was written and additional species have been classified more accurately. An updated summary of the exceptional biodiversity benefits of the project was presented in the previous PIR Section 8.3 Exceptional Biodiversity Benefits (GL3). Results of the extensive investigations conducted to date in the project zone are summarized in Table 29.

Table 29: Numbers of species observed, regional species estimations and species new to science in the project zone

Taxa	No. species from Rapid Inventory (2001)	Total Species Observed		Estimated for the Region	New to Science since 2000	
		To 2008	To 2012		Estimated	Described
Plants	1600	> 1600	> 1600	6000	>12	0
Fishes	84	176	176	200	> 17 + 1 (2016)	4
Amphibians	58	66	71	210	11 +1 (2017)	1
Reptiles	26	41	59		4	2
Birds	575	611	617	800	1 + 1 (2017)	2
Mammals	71	91	91	120	1	0

The PNCAZ has one of the most successful biodiversity conservation initiatives in Peru. It has qualified as the protected area that exhibits the best conservation rate in the national system of protected areas (SINANPE), and with the least amount of socio-environmental conflicts due the participatory and peaceful structure of work with local populations adjacent to the area. These same populations benefit from the variety and abundance of natural resources provided by the park. This recognition of the benefits of conservation of natural resources by local people living in the buffer zone is one of the principal reasons why they take care of the park, not only elements used to ensure food security, but the whole forest and biological diversity within the park.

Plants - At least 12 species of plants new to science were recorded during the Rapid Inventory along with several new records for Peru and hundreds more that were range extensions. A list of all plant species identified during the inventory is included in Alverson *et al.* 2001. Rapid Inventory scientists also found plants with unusual biological features or behaviors, including more than 20 species that have obligate mutualism with ants. At least five tree species, all in the genus *Tachigali*, show evidence of monocarpy (*i.e.* flowering only once in their life, then dispersing seed and dying). Large, commercially valuable species—such as mahogany (*Swietenia macrophylla*) and tropical cedars (*Cedrela odorata, Cedrela fissilis*)—are now very rare and have nearly vanished from riparian and river floodplain areas due to selective harvesting elsewhere in the tropics.

Large Mammals - The fauna of PNCAZ includes several endemic and rare mammals. Of the 71 species registered in 2000, 12 are of international concern because of their global rarity—three species of monkeys—Spider monkey (*Ateles belzebuth*), Woolly monkey (*Lagothrix poepiigii*), and Saki monkey (*Pithecia monachus*)—and nine other mammals are listed in CITES: Spectacled bears (*Tremarctos ornatus*), Neotropical otters (*Lontra longicaudis*), Giant river otters (*Pteronura brasiliensis*), Tapirs (*Tapirus terrestris*), White-lipped peccaries (*Tayassu pecari*), Jaguars (*Panthera onca*), Bush dogs (*Speothos venaticus*), Giant anteaters (*Myrmecophaga tridactyla*), and Giant armadillos (*Priodontes maximus*). The

inventory team also found a likely new species of squirrel (*Microsciurus* "oscura"). Two species, the water opossum (*Chironectes minimus*) and the short-eared dog (*Atelocynus microtis*) are rare.

Birds - The park's stunted forests seem to be the center of distribution of three endemic, very poorly known species of birds: (1) Scarlet-banded Barbet (*Capito wallacei*) (O'Neill et al. 2000), (2) Bar-winged Wood-Wren (*Henicorhina leucoptera*) and (3) Royal Sunangel (*Heliangelus regalis*).

During 2017, ornithologist describe a new species of *Saltarín* (Manakin), called *Machaeropterus eckelberryi* is part of the species complex of the bird known as the Striped Ptarmigan (*Machaeropterus regulus*), from the foothills of hills and mountains in southwest Loreto to San Martín (Peru). It is almost identical to the one that inhabits the Tepui, but with a great difference in the voice, which is a very important characteristic to differentiate birds.

This species is likely to be endemic (spatially restricted) to the buttresses of the north-central Peruvian Andes, at elevations between 400-1400 m.s.m., particularly where there are humid forests of short stature on poor and sandy soils; just as are the mountain ridges characteristic of the Cordillera Azul.

This species is described after many years, since the first specimens were obtained in 1996 and 2000, during ornithological expeditions in the Cordillera Azul, in sites known as Cerro Cinco Puntos (Cushabatay Valley) and the mountains of the Pauya Pauya (Figure 29). The field group of the expedition was composed of scientists from the University of Louisiana (USA), and the Museum of Natural History of the Universidad Mayor de San Marcos (Peru).

Here was found a unique population, not previously described of this Saltarín with a particular song that immediately distinguished it to other more Amazonian populations.

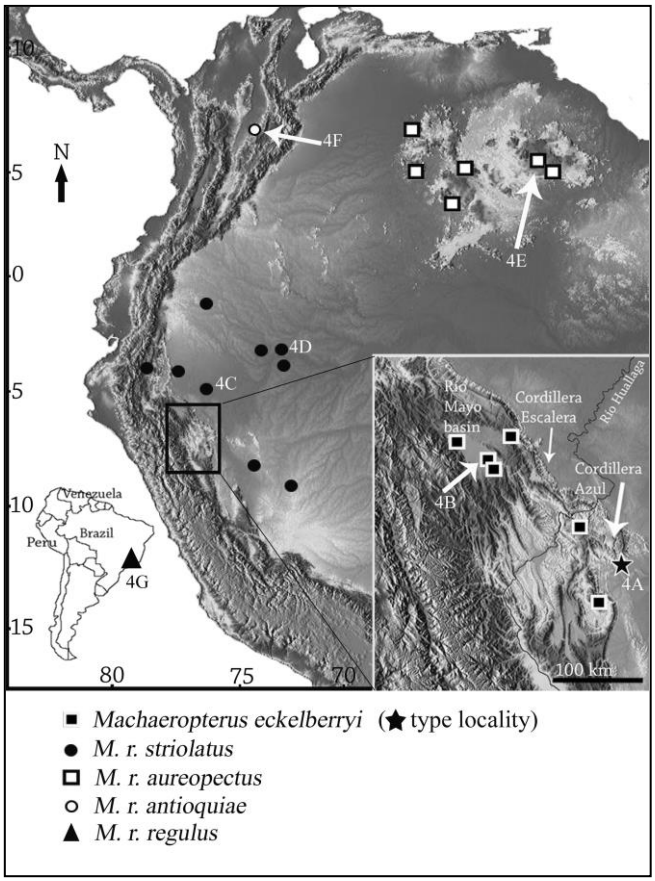


Figure 29. Map of records for the new species of Manakin (*Machaeropterus eckelberryi*), and the related species of the *Machaeropterus* group.

The park also protects large populations of big gamebirds that are threatened by hunting throughout their range: the Spix's Guan (*Penelope jacquacu*), Blue-throated Piping-Guan (*Pipile cumanensis*), Wattled Guan (*Aburria aburri*), and importantly, the Razor-billed Curassow (*Crax tuberosa*), which is particularly vulnerable to local extinctions.

Descriptions by ornithological experts of the aforementioned rare bird endemics are described in the boxes below and maps of their restricted distributions, based on these findings, can be found on the IUCN Red List website.

Scarlet-banded Barbet (*Capito wallacei*): locally fairly common in humid montane forest in the northeast of the Cordillera Azul (1300-1550 masl) (Schulenberg *et al.* 2010), at the east bank of the upper Río Cushabatay, 77 km west-north-west of Contamana in Loreto. The ridge is long (>50 km) and narrow (O'Neill et al. 2000) and, in spite of searches at suitable elevations in the adjacent Cordillera Azul, this species remains known only from Peak 1538 (Lane, D. and T. S. Schulenberg in litt. 2000), currently Cerro Cinco Puntas.
But we know that this bird has had new register locations on the *Plataforma site* (Biabo Valley), where birdwatchers eventually look for it; and in 2013 this species was registered by the team of the Department of Ornithology from The Field Museum, at Cerro El Oso in Pucayacu sector, between 1400-1839 meters (Bates *et al.* 2013).

Bar-winged Wood-Wren (*Henicorhina leucoptera*): very local species, in isolated mountain chains, especially in low stature forests, such as those of sandy soils and poor nutrients, altitudinal range between 1350-2600 msnm (Schulenberg *et al.* 2010); has a very restricted range in north Peru (La Libertad, San Martín, on the Cordillera del Cóndor in Cajamarca, with a single record from Amazonas) (Ridgely and Tudor 1989, Schulenberg and Awbrey 1997, Clements and Shany 2001) and extreme south Ecuador (the north end of the Cordillera del Cóndor [Krabbe and Sornoza 1994]). It was recorded in mountains of the Pauya camp during the RBI 2000. Although its habitats are reasonably intact (Schulenberg and Awbrey 1997), this species has a small, apparently disjunct range, with elfin forest in the south of its range readily accessible from the páramo and clearly vulnerable to grazing and burning (Stattersfield *et al*. 1998).

Royal Sunangel (*Heliangelus regalis*) fairly common, but irregularly distributed in patches. Restricted to humid forests of low stature and shrubby areas, usually in sandy soils and rocks of sandstone, in isolated mountains; altitudinal ranges between the 1350 – 2200 masl. This species is now known from eight areas in northern Peru – Amazonas, San Martin, Cajamarca y Loreto) and south-eastern Ecuador (Graves *et al*. 2011). San Martín (Davis 1986); the río Chipaota valley in the Cordillera Azul, San Martín (Merkord *et al*. 2009); and the río Pauya valley in the Cordillera Azul, Loreto (Schulenberg *et al*. 2001). In San Martín occurs the more striking johnsoni, recently described subspecies from a specimens collected at Pauya, Loreto, is as yet only known from the Cordillera Azul (Graves *et al*. 2011).

Reptiles and Amphibians - In terms of reptiles and amphibians, the park protects the habitat of a rare salamander (*Bolitoglossa sp.*), and several species of endemic, new, or geographically restricted frogs in the genera *Pristimantis (Eleutherodactylus in RBI)* and *Ameerega* (*Epipedobates* in the inventory report).

It is worth noting that the *Atelopus pulcher* frog is a species considered by the IUCN as Critically Endangered (CR) species. This species has a restricted range in the Andean foothills of Amazonian slope of the eastern Andes of northern Peru in the regions of Amazonas and San Martin. So far, little is known about the natural history of *A. pulcher* and there are records of his disappearance in some localities of San Martín (Lotters *et al*. 2005).

One of the main causes of the decline of amphibians in the Neotropical region is chytridiomycosis, caused by the fungus *Batrachochytrium dendrobatidis*, linked primarily to the rapid disappearance of many species of *Atelopus* (La Marca *et al.* 2005). Chytridiomycosis is often the only explanation for the disappearance of *Atelopus* frogs in pristine places like national parks, where habitat destruction, pollution and overfishing are not possible (La Marca *et al*. 2005); in contrast, the road between Tingo Maria and Tarapoto has been identified as one of the most critical to the survival of these genus of amphibians in terms of loss of habitat (Catenazzi and Von May 2014).

Between 2010 and 2012 CORBIDI conducted a herpetological inventory in the area, finding three new species to science, two new species of woodlizards, genus *Enyailioides*, and a new species of frog, genus *Rhinella* (Venegas et al. 2013), so far these are the only places where the distribution of these species is known. It is not possible to show these species in any category of IUCN since its discovery is very recent and have not yet been evaluated.

In the buffer zone of PNCAZ, the dry forests of Huallaga valley harbor endemic species. In the assessment conducted by biologists *Instituto de Investigación de la Amazonía Peruana* (IIAP), were recorded 41 species of amphibians, 21 species of reptiles; a remarkable record is *Chelonoidis carbonaria* (Figure 30), terrestrial turtle at risk of extinction; also they have been collected three species of amphibians from the genus *Chiasmocleis, Phyllomeduusa* and *Scinax* (Figure 31), and two lizards from the genus *Stenocercus* and *Morunasaurus*, probably new to science (Mejia and Gagliardi 2015).

Figura 30: *Chelonoidis carbonaria*, turtle from the Huallaga Dry forests, at risk of extinction

Figura 31: *Scinax sp. nov*. frog from the Huallaga Dry forests, new to science

The most remarkable is the discovery of a new semiarboreal species of the *Rhinella festae* group described, called ***Rhinella lilyrodriguezae*** in honor of the CIMA´s founder PhD Lily Rodriguez. This frog lives in the montane forests of the Cordillera Azul National Park between 1,245 and 1,280 m.a.s.l. in the Cordillera Oriental, San Martín (Figure 32). This new species is morphologically and genetically compared with other members of the *Rhinella acrolopha* group and members of the *R. festae* group; so, is characterized by its large size (female SVL 47.1–58.3 mm, n = 4) and other morphological characters[40] (Figure 33). Phylogenetically it is a member of the *R. festae* group which is most closely related to *R. chavin* and *R. yanachaga* from Peru. Morphologically the new species shares similarities with *R. tenrec* and *R. truebae*, members of the *R. acrolopha* group from Colombia (Cusi et al. 2017).

[40] Eight presacral vertebrae, fusion of the sacrum and coccyx, long protuberant snout, snout directed slightly anteroventral in lateral view, cranial crests moderately developed, absence of occipital crest, presence of tympanic membrane, dorsolateral rows of small conical tubercles extending from parotoid gland to groin, hands and feet with long digits, fingers basally webbed and toes moderately webbed (Cusi et al. 2017).

Figure 32. Location map of the site where the *Rhinella lilyrodriguezae* toad was recorded**.**

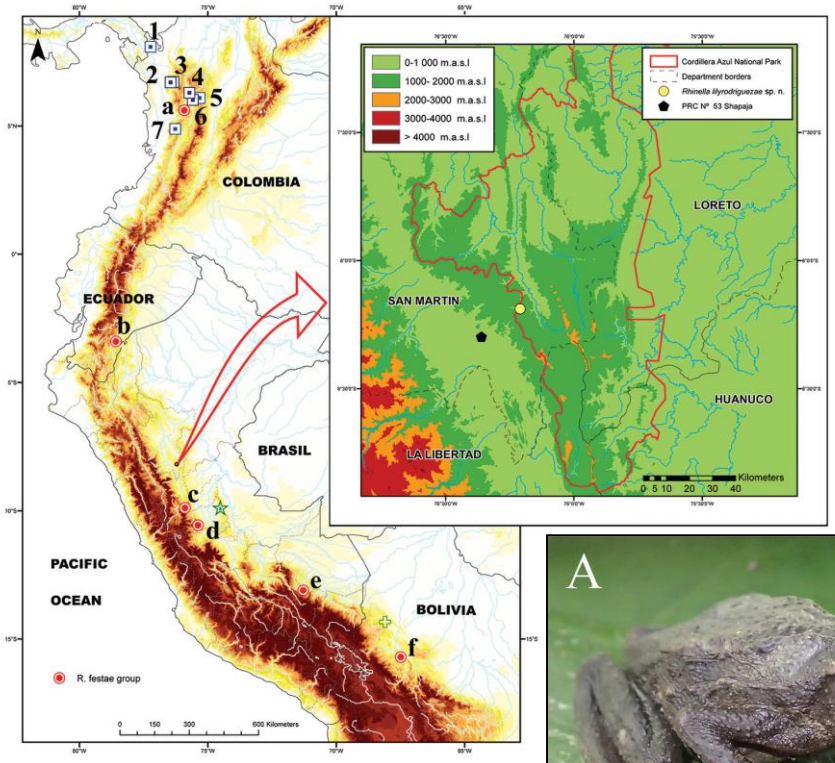


Figure 33. Dorsal and ventral view of the toad *Rhinella lilyrodriguezae*

Fishes - Streams and rivers draining the park contain unique species assemblages of fishes, particularly in headwater areas (Weber and Montoya-Burgos 2002, Reis *et al.* 2003, Rengifo *et al.* 2007 and Lujan *et al.* 2010). In the 2000 inventory, scientists recorded 22 new species for Peru and ten probably new to science. Some examples are *Hipostomus fonchii*, a new species recorded during the RBI, restricted to Cushabatay River, *Tahuantinsuyoa macantzatza* restricted to Aguaytia basin and its tributaries, *Crossoloricaria Pisqui* (Alverson *et al*. 2001), and the new species of Giant Carachama, the great *Panaque schaeferi* (Lujan, et al. 2010).

Fishes in headwater areas are adapted to life in shallow, fast-flowing water. Aquatic habitats in the park also provide spawning areas for migratory species, including large species consumed by riparian human communities: *Colossoma macropomum* (gamitana), *Piaractus brachypomus* (paco), *Prochilodus nigricans* (boquichico), *Brycon cephalus* (sábalo cola roja), *Brycon melanopterum* (sábalo cola negra), *Salminus affinis* (sábalo macho), *Pseudoplatystoma punctifer* (doncella), *Zungaro zungaro* (zúngaro), large Loriicarids (carachamas), and *Potamotrygon spp.* (rays), among others.

Since 2015, CIMA was informed about a fish that inhabiting a cave in the buffer zone in Tocache sector (Ñahuicopa *et al.* 2016), and during 2016 a group of researchers from CIMA and the Museum of Natural History (MUSM) conducted an expedition confirming the discovery of a rare blind catfish, probably to the genus *Trichomycterus* sp. nov.

During 2016, this unique "blind fish", as they say locally, started to be studied for its description by the scientists of the Museo de Historia Natural de la Universida Nacional Mayor de San Marcos (Figure 34). This fish has typical characteristics of troglobióticas species, like absence of eyes in adults, barbs elongated in the region of the mouth and the lack of pigmentation of the skin. Animal with phenotype of adaptation to areas of darkness (eg caves, abyssal-hadales): ocular degeneration, loss of pigmentation, increase or greater development of sensory elements. Being a species of caves and restricted distribution, it is estimated that its permanence is highly related to the constriction of the surrounding forests in the buffer zone of the PNCAZ.

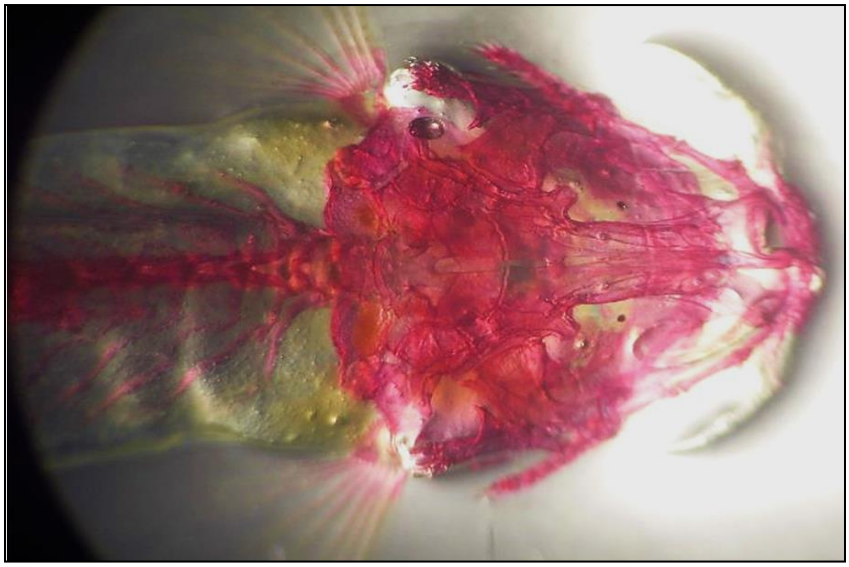


Figure 34. Diaphanization process, to evidence osseous structures, during the descriptive studies of the new species of the troglomorphic fish.

It should be noted that in the last report of the IUCN RED List about the State of Conservation and distribution of freshwater biodiversity in the AndesTropicales (Tognelli *et all*. 2017) it is highlighted that the Cordillera Azul National Park boasts one of the largest interregional conservation efforts, contains a very diverse biota, numerous aquatic habitats and probably numerous endemic species; standing out those species that have been described from their findings in this area protected. The conservation of two of two important basins headwaters: Huallaga and Ucayali, was one of the conservation objectives for the creation of the PNCAZ (INRENA 2016), considered in the zoning of the Master Plan as Zones of strict Protection and Wild Zone, that is to say, with the lowest degree of disturbance and greater protection status (SERNANP 2012).

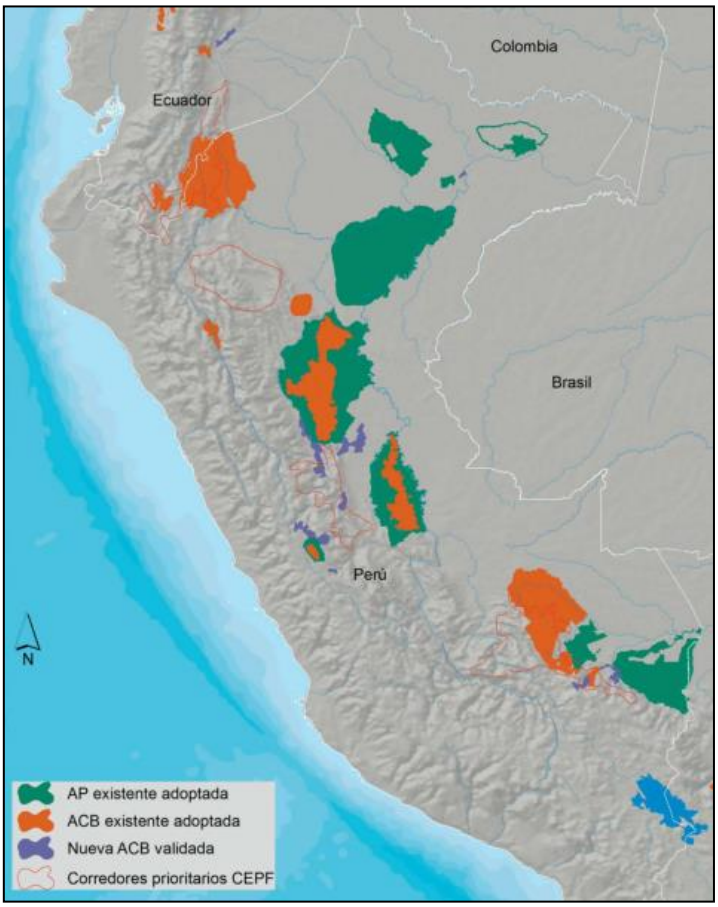


Figure 35 Protected areas and ACB[41] of freshwater delimited in Peru. Red indicates the priority corridors identified by the Critical Ecosystem Partnership Fund (CEPF).

Fuente: Tognelli, et al. 2016 – UICN https://portals.iucn.org/library/node/46341

[41] Key Biodiversity Areas (ACB, for its acronym in Spanish) are important sites for the global persistence of biodiversity, which can be protected under different management categories and different governance mechanisms. However, the identification of CBAs does not imply specific conservation actions, such as the designation of protected areas.
These are identified by establishing conservation priorities, combining data on the importance and vulnerability of species taking into account other factors such as conservation cost, opportunities for action, evolutionary history and connectivity (IUCN 2016).

APPENDIX 1: PNCAZ REDD PROJECT ACTIVITIES, OUTPUTS, OUTCOMES, AND CLIMATE, COMMUNITY AND BIODIVERSITY IMPACTS FOR THE PERIOD AUG 2015-AUG 2016

GOAL 1: Protecting the park, maintaining its conservation targets and continuing work towards the recovery of degraded areas.					
Objective 1: The PNCAZ remains undamaged its conservation targets and continues the recovery of degraded areas.					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
1.1.1: Park Guards perform effective protection in PNCAZ	Patrols	130 (T3) 135 (T4)	142 (T1) 128 (T2)	Park Guard patrols and infrastructure maintenance were fully met as per annual plans. It was expected to carry out at least 400 patrols / year, but **535 patrols** were done.	1.1 The PNCAZ's ecosystems remain intact.
1.1.2: Development and implementation of a Maintenance Plan for PNCAZ Control Posts including restoring/repairing infrastructure and equipment	Maintenance Plan	1			
	Control Posts	21	21		
1.1.3: Training for Park Guards and technical staff	Courses and training events	2	2	2015: (1) 2 new parkguards attended to the ***Induction Course for New Parkguards***; and (2) 2 parkguards attended to the ***Course on Socio-Environmental Conflict Management at ANP***. 2016: CIMA carried out 2 training courses for the whole parkguards: (1) training for the Implementation of the ***Non-Formal Environmental Education Information Guide*** (EANF); (2) Training for ***Wildlife Monitoring*** by parkguards; This last course was complemented by training for use of SMART software. *Note*: Official Park Guards provide continuous training to Community Park Guards as part of their regular activities	

1.1.4: Monitoring the vegetation cover of PNCAZ with GIS support	Annual Report	1		Monitoring was carried out by CIMA GIS specialists with satellite data that was ground-truthed by Park Guards	
1.2.1: Control and surveillance	Quarterly reports	2	2	Monthly Park Guard reports were organized by staff as inputs for reports to SERNANP; sites patrolled by park rangers are recorded in quarterly reports. Note: Since 2013, the indicator changed from counting monthly reports from each control post to consolidated quarterly or trimester reports prepared by the Director of the PNCAZ.	1.2. The conservation status of principal game species is maintained in the permitted hunting areas within the PNCAZ.
1.2.2 Wildlife observation reports from data collected by Park Guards	Wildlife reports	1	1	CIMA analyzed wildlife information annually, based on observations in monthly Park Guard reports; these data are presented in an Annual Reports of Hunting in park, to SERNANP	
1.2.3 Hunting reports based on data records of hunters in the PNCAZ	Benefits reports	135 (T3) 128 (T4)	120 (T1) 129 (T2)	Data on hunting in the park was analyzed annually: 512 beneficiaries from PNCAZ's wildlife *Note*: The indicator used to evaluate hunting demand was changed to consider wildlife as a benefit from the park to buffer zone residents.	
1.3.1 Legal proceedings to evict illegal cattle rancher in park	Legal Report	1		The one cattle farmer within the park has still not been evicted. The legal process continues, led by SERNANP and its Office of Legal Advice; they inform CIMA about coordination actions with the Environmental Attorney's Office To date, CIMA and the Head of PNCAZ are only waiting the judge's decision for the exit of the cattle; so, CIMA remains committed to supporting the removal of livestock once this case is resolved.	
1.3.2: Court-ordered evacuation of livestock	Livestock removal report	0			
1.3.3: Monitoring natural regeneration at disturbed sites	Disturbed site recovery report	1		Disturbed sites monitored by GIS specialists using satellite data and ground-truthed by Park Guards	

Objective 2: PNCAZ and its buffer zone have become a place of research of global importance which gathers researchers/scientists and contributes to the management of natural protected areas.					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
2.1.1: Development of research involving the PNCAZ team	Research projects	7	5	More than 10 research projects were carried out during the period of this evaluation; including wildlife, landscapes and social researches. *Note*: The research goal of the initial contract was 2 projects/yr and in 2014 this was increased to 5/yr.	2.1. PNCAZ research priorities are known and attractive to scientists who are able to finance their own research.
2.1.2 Promotion of PNCAZ and its buffer zone as an opportunity for research.	Research dissemination events	1	5	Updating CIMA's web page. CIMA shares research information with SERNANP, Althelia, several researchers, local people and other interested actors. Researches carried out in the PNCAZ were presented as case studies in Peruvian universities courses at least once a year.	
2.1.3 Development of a Research Strategy with the PNCAZ team (SERNANP, CIMA, PNCAZ's Management Committee).	Workshops and meetings	---		In 2016 the PNCAZ updated its Master Plan 2017-2022, based on new parameters. This strategic plan has reflected the general research priorities for the ANP and its buffer zone	
2.2.1: Periodic update of social and environmental databases in the project area.	Database with updated records	1	1	Geo-referenced social and biological information is updated and available (2 databases: Fauna from parkguards and MUF 2016)	2.2. Research topics respond to identified priorities, and results and recommendations
2.2.2 Research dissemination events	Meeting minutes	3	1		

2.2.3: Information analysis is incorporated into management documents that are available to the technical team and communities.	Reports	0	1	Participation in events and courses, with presentations on the REDD Project and the PNCAZ's management: 2015:PUCP, UPCH, IAI http://www.iai.int/wp-content/uploads/2015/08/CIMA-IAI-2015.pdf 2016: UNALM, Science Forum COP13. REDD Project information (Technical & scientific) available on the web and accessed by local authorities.	are taken into account in decision making for PNCAZ management.
2.3.1: Promote the participation of local people in research activities.	Events	0	1	Participation of local inhabitants in investigations, including their recognition in the credits of the findings made. Return of information, including training of local populations. Training of the team (CIMA and Park rangers) in environmental education techniques to improve local participation; It includes delivery of materials to communities and working guidelines. Land Use Zoning processes were carried out in a participatory manner as detailed in the "Guide for Development of Community Participatory Zoning" (unpublished). CIMA continued working intensively with three Aguaytía native communities.	2.3 Residents of PNCAZ's buffer zone are involved in research activities and are informed of their results.
2.3.3: Analysis and dissemination of the results of participatory research.	Informative meetings	1	2		

GOAL 2: Building local capacity for sustainable land use and improving the quality of life in the buffer zone communities, expanding benefits for local people without causing negative impacts to the protected area, promoting Land-use planning with the support of Regional and Local Governments, contributing to improving the quality of life of neighboring populations through the benefits generated by PNCAZ conservation.					
Objective 3. Tourism promoted in PNCAZ's buffer zone has expanded benefits for local people without causing negative impacts to the protected area.					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
3.1.1 Identification, prioritization and strengthening of local populations with potential for sustainable tourism development, according to the results of land-use zoning and community interests.	Reports	0		For tourism, CIMA has focused on a single pilot community, the native community of Yamino, which showed interest in this activity during its own strategic planning. Previously in 2013, an analysis of the community's tourism potential was carried out as part of its land-use zoning project. Since the approved of its Quality of Life Plan where Tourism and Craftwork were priority activities. The Tourism and the Artisan Associations were formalized and registered in the Public Registry. Currently the Yamino Tourism organization maintain its tourist trails in accordance with the tourism action plan.	3.1. Local people are organized and empowered to participate in the development of sustainable tourism in their area.
	Population	1			
3.2.1: Sustainable tourism research.	Research projects	---			
3.2.1: Development of sustainable tourism plans.	Plans	0	2	2016: The action plans of both formalized associations have been developed. They include strengthening and training actions for the Tourism and Craft Associations, the latter with women of the community. Furthermore, seeking inclusion of the community in the tourist route "Yamino-Aguaytía."	3.2. Local people receive benefits derived from sustainable tourism.
3.2.3: Support for the products and services related to sustainable tourism.	Promotion strategy	1	1		

Objective 4. Land-use planning is promoted in the "intervention areas" of the PNCAZ's buffer zone with the support of Regional and Local Governments					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
4.1.1 Development of a local Land-use Zoning process (ZEE) in areas prioritized for intervention	Additional villages with ZEE	---		At present, these local processes have ended and CIMA has dedicated to following the process with the DGTO – MINAM until official approval, and also the implementation of the results to the communities, with sustainable economic activities like tourism. No new processes have started the number of communities and villages with ZEE increased to 24.	4.1 Local populations have land-use zoning as a tool for managing territories.
4.2.1. Development and implementation of Rules of Conduct.	Additional villages with Rules of Conduct	2 (Total 26)		Until August 2016 a total of 26 villages have developed, approved and monitoring their Rules of Conduct or convivence as well as to continue the process of implementing them and assess their level of compliance. Previously through 2015, 24 villages had developed and implemented Rules of Conduct; the lower level of development for new Rules of Conduct is because a greater emphasis in the QLP implementation.	4.2 Local populations have improved their strategic planning processes.
4.2.2 Updated Quality of Life Plans (Planes de Calidad de Vida-PCV) that include land-use zoning for strategic decision-making.	Additional villages with updated PCV	2 (Total 19)		Until August 2016 a total of 19 villages have developed their Quality of Life Plans as well as to continue the process of Implementing. Two new QLP has been development until the end of the evaluating period, and two more until the end of the year 2016. Through 2015, 17 plans Quality of Life Plans were well established. It is expected to reach 21 Quality of Life Plans 2016 and 34 in 2018.	

4.3.1 Priority activities are formalized with communities through signed agreements, roadmaps, minutes, etc.	Agreements	---	CIMA doesn't have new Agreements with indigenous federations, but maintain their previously agreements with: *Federación de Comunidades Nativas del Bajo Ucayali* (FECONBU) and *Federación de Comunidades Nativas de la Cuenca del Rio Pisqui* (FECONACURPI). CIMA is in permanent contact and coordination with regional and local authorities; also with national authorities. During 2016, CIMA signed agreements with the environmental and forestry authority: MINAM and SERFOR. CIMA continues working closely with local and regional authorities/governments, for mutual support for implement sustainable activities, i.e. implement priorities in PCV.	4.3 Local authorities use participatory management tools generated by the project that benefit buffer zone communities.

Objective 5. PNCAZ conservation contributes to improving the quality of life of neighboring populations through the benefits generated, especially those located in the intervention areas established in the Master Plan.					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
5.1.1 Implementation of sustainable activities derived from strategic planning	Activities related to value chains (Active organizations or associations developing economic activities compatible with conservation)	20 (20 organizations, from 23 communities and villages)		Main sustainable economic activities, development in the buffer zone, are: cocoa in agroforestry systems (based on cocoa and coffee), tourism and handicraft, improving infrastructure (rural roads and telecommunications) to improve the products delivery, etc. CIMA works in activities related to value chains with about 20 community organizations: producer associations/ committees (12 for cocoa, 2 for minor animals), associations of artisans (2) and tourism (1), and also for conservation and reforestation activities (rural patrols like *rondas campesinas* (3). But there are other non-economic activities that also contribute to improving their quality of life, such as	5.1 Local communities develop sustainable economic activities derived from ZEE and prioritized in their PCV.

			community forest conservation and protection (conservation initiatives), health (4 for medical posts, solid waste management and improved kitchens), education (10 educational organizations and mothers' clubs), etc. Sustainable activities (economic and non-economic) are fully framed within strategic planning defined for each community in their Quality of Life Plans (QLP), and at the level of grassroots organizations in their Action Plans (AP). In addition, CIMA has been working on developing the Cacao Business Plan for the Aspuzana Valley, and with some cooperatives for cocoa collection, such as Naranjillo	
5.1.2 Strategic partnerships to develop productive activities prioritized in the PCV.	Strategic partnerships	3	CIMA signed an agreement with the Municipalidad provincial de Contamana. Also, CIMA signed agreements with the environmental and forestry authority: MINAM and SERFOR. Maintain agreements and coordination with local institutions (Agreements for partnerships during 2014-2015), with whom constant meetings and coordination in order to develop productive activities prioritized in the PCV and in communal organizations: - Five (05) agreements in force with Municipalities: Provincial Municipality of Picota, Distrital Municipalities of Pampa Hermosa, Pólvora, Uchiza and Shamboyacu. - Four (04) agreements with Producers Cooperatives for Cocoa, to develop future sustainable productive activities. - Additionally, four (04) agreements with native federations: FECONACURPI, FECONBU, CEPKA and FENACOCA.	
5.1.3 Development of actions linked to value chains to	Action plans	34 (19 QLP and 34 AP)	23 communities, 20 community organizations; with 23 action plans for economic activities and 14 for other activities.	

support economic activities that favor conservation.	(Focus on sustainable economic activities)		Action plans linked to value chains had been development with agricultural associations and cooperatives (cocoa and coffee), tourism and handicraft in 10 villages and communities: Tocache (5): Cachiyacu (Nueva vision), Maronila (ronda campesina & cocoa), Shapaja (ronda campesina & honey), Nuevo Jaen y Nuevo San Martin. A business plan for cocoa has been worked out in order to be implemented in the Aspuzana valley, in Tocache sector. Contamana (9): Orellana (AREMPU), San Luis de Charashmaná, La Cumbre, Manco Cápac (AASHPIRIS), Nuevo Dorado (Coop Nvo. Dorado), Fernando Belaúnde Terry, Nuevo San Martín, Isolaya, Nuevo Alan (ADECAVACU). Aguaytía (2): Yamino (Asociacion de Cacaoteros, Asoc. Turismo y Asoc. Artesanas) y Santa Rosa de Aguaytía (Coop. Cacaoteros). Tarapoto (7): Vista Alegre (Comite de productoes), Alto Ponaza, Paraíso (Small animal producers), Santa Rosa (Selva Verde), Chambira (Allima Sacha), Nuevo Arica (Comité de productores), Challual (Ronda).	
5.2.1 Implementation of the *Monitoring and Impact Assessment (MUF)* of the quality of life of local people.	MUF events	1	MUF 2016 was totally designed and implemented; the previous one was in 2012. MUF process is carried out directly and permanently by CIMA technicians under the guidance of the Extension Director.	5.2 The quality of life of local people has improved thanks to the implementation of the MUF

5.3.1 Technical support for the formalization of action plans for community conservation initiatives	Action plans for conservation initiatives	8	Between 2015 and 2016 CIMA worked to support 8 conservation initiatives, in order to establish concessions for conservation or other categories: 1. Nuevo Jaén 2. Nuevo San Martín 3. Challual (jardín botánico) 4. Las Palma 5. Nuevo Trujillo 6. San Juan 7. Vista Alegre (Bosque escolar) 8. Yamino Feasibility analysis and technical documents have been developed for the recognition of conservation initiatives from local governments, however under the new Forestry Regulations and the Forest zoning, are still under evaluation. Updated action plans refer to processes of local organizations to develop sustainable activities with diverse stakeholders: associations, committees, vigilance teams, etc. CIMA addressed issues about forest conservation, control and surveillance, riparian protection, solid waste management, etc.	5.3 Based on the results of the ZEE, local communities manage conservation areas according to their interests.
5.4.1 Promotion and subscription of Conservation Agreements	Conservation Agreements (Acuerdos Azules)	3	In November 17-18, 2015, CIMA signed three new Conservation Agreements with villages in the Tocache sector. These agreements were signed after the implementation of the FOCAL process was completed and are a way to build confidence and long-term commitment between CIMA and communities. CIMA has carried out the constant evaluation of compliance with previous Conservation Agreements. *Note*: These agreements are different from other conservation agreements that were signed before activities began.	5.4 The local population and authorities are committed to sustainable land management and understand its link with PNCAZ's conservation.

GOAL 3: Strengthening relationships with local, regional and national government agencies, in order to insure PNCAZ's long-term and proper management, considering governance and administration.					
Objective 6: Administration fee and distribution of carbon revenues					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
6.1.1 Update and implementation of the Financial Plan for PNCAZ.	Updated financial plan	0		It was not necessary to update the financial plan, since the management of the PNCAZ continues to depend almost totally on its REDD project through ACF.	6.1 Financial arrangements to support the PNCAZ's conservation are maintained and new arrangements are actively pursued.
6.1.2 Sale of carbon credits from the PNCAZ REDD+ Project	(Signed contracts) Carbon credits sold	11,606	11,606	2015: Authorization of SERNANP to formalize the sale of carbon credits to Scotiabank. CIMA continued making remarkable efforts to place the credits to new buyers. Cima and Althelia work with the Stand for Trees sales platform. 2016: total of 14,213 carbon credits were sold during this verification period Note: In 2014 CIMA signed a contract with Althelia Climate Fund (ACF) for the financing of the PNCAZ's operations in exchange for VCU from the project. This Anthelia's investment (loan) covers 75% of PNCAZ's operations costs, and it shall be repaid by selling the credits ACF.	
6.2.1 Endowment Fund Management Derivation of the surplus from the sale of carbon credits from PNCAZ REDD+ Project.	Fund	---		There are no changes from the previous period, situation is maintained. Since the end of 2014 CIMA maintain its successful partnership with Althelia Climate Fund to invest in PNCAZ, based on of VCUs generated. This allowed, even though there is no surplus from the sale of carbon credits, is achieved building an alliance with PROFONANPE for the establishment of the Endowment Fund.	6.2 Ideas for sustainable management of the PNCAZ include a long term fund (Endowment, Trust Fund, or other).
6.2.2 Setting the parameters for the Fund	Parameters	---		There are no changes from the previous period, situation is maintained.	

			A joint work was developed with PROFONANPE and SERNANP for the management of the funds received from REDD.	
6.2.3 Establishment and functioning of the Board of Directors of the Fund.	Minutes	---	There are no changes from the previous period, situation is maintained. CIMA signed an agreement with PROFONANPE for the management of the PNCAZ's REDD+ Project funds, according to the agreement with SERNANP. In November 2014, the Fund Management Board is constituted.	

Objective 7: Government relations and fundraising					
Activities	**Outputs**			**Outcomes**	**Impacts**
	Units	**Number**			
		Aug-Dic 2015	Jan-Jul 2016		
7.1 Monitoring PNCAZ management	Decentralized coordination meetings	4	3	This is the process of monitoring PNCAZ management conducted through financial, technical and administrative external audits: (1) financial and administrative external audit, (2) supervision by the national government (SERNANP), with several meetings, but 2 for the direct supervision of the management contract; (3) supervision by the ESG team from Althelia (ACF) (4) visit from the USA Ambassador and (5) Internal supervision (CIMA) to ensure optimal management.	7.1 PNCAZ's management used tools for transparent and proactive monitoring of implemented strategies to assess impact.
	Financial audits of CIMA	1/yr			
7.2: Monitoring the management contract with SERNANP	Meetings and supervision of performance	1	1		7.2 PNCAZ is emblematic as a protected area that reached high rates of conservation and maintained good social relations.

7.3: Participation in technical platforms and roundtables	Participatory events	5	2	More than the projected number of events. Main work platforms: - Commission and committee of the Sierra del Divisor National Park (SDNP) - Land Use Planning Platform - REDD Safeguards - IUCN National Committee - Water and ecosystem services	7.3 Participation and interest in project activities at high level
7.4: Follow-up on the dossier for proposed PNCAZ expansion	Follow-up report	1		During 2015, CIMA had many meetings with SERNANP, in order to keep the PNCAZ expansion issue alive. Sadly, SERNANP was losing interest in the expansion, prioritizing other ANP (like the process in SDNP, and marine areas); So the public consultation process never started in 2016.	7.4 The plan to increase the area of the PNCAZ remains open if legal hurdles overcome.
7.5. Meetings of the PNCAZ's Management Committee	Meetings	0	5	In April, 2016 the PNCAZ's Management Committee was created and achieve the SERNANP's Recognition of its Executive Commission (RD-028-2016-SERNANP-DGANP). Between May and June 2016, the Management Committee met at least 5 more times for the formulation of the vision and objectives of the Master Plan (update process 2017-2022).	7.5 Good coordination by the PNCAZ management committee during the implementation period.
7.6: Dissemination of experiences	Publications and events	>8	3	Several publications and events appeared during 2015 and 2016, most of these in relation to conservation management, carbon emissions and climate change. The PNCAZ is used as a case study at an international level, mainly for its management effectiveness and its REDD project.	7.6 Good dissemination of scientific research park management achievements.
7.7 Verification with VCS and CCB	Verification certificate	1		The verification process the PNCAZ REDD Project, for August 2012 – August 2014 period, finished during the last quarter of 2015, against VCS Version 3 and CCBS Second Edition. Later, the monitoring process of the August 2014 – August 2015 period begins during the second quarter of 2016.	7.7. VCS and CCB certification process is completed

APPENDIX 2: INTERPRETATION AND CLASSIFICATION OF IMAGERY

Landsat imagery

The Landsat program has provided the longest temporal archive of moderate resolution satellite imagery available, and as of 2008 USGS made all of this data freely available to all users. The combination of frequent data capture, moderate resolution (30m) and accessibility have made Landsat data the most widely used satellite platform for land cover change analysis.

On May 31, 2003 the Scan Line Corrector (SLC) in the ETM+ instrument failed on Landsat 7. The SLC consists of a pair of small mirrors that rotate about an axis in tandem with the motion of the main ETM+ scan mirror. The purpose of the SLC is to compensate for the forward motion (along-track) of the spacecraft so that the resulting scans are aligned parallel to each other. Without the effects of the SLC, the instrument images the Earth in a "zig-zag" fashion, resulting in some areas that are imaged twice and others that are not imaged at all. The net effect is that approximately one-fourth of the data in a Landsat 7 scene is missing when acquired without a functional SLC. Therefore, all Landsat 7 imagery after 2003 first has significant data gaps.

As a result the older platform, Landsat 5, was used more frequently. Landsat 5 had a critical instrument error in November 2011 which resulted in the suspension of all imagery acquisition. From late 2011 until the launch of Landsat 8 in February 2013, the only available Landsat imagery was from the Landsat 7 sensor with the SLC-error. Therefore, to conduct a monitoring event for 2012 required a modification of the original classification procedures to compensate for the scan line error which was detailed in the previous monitoring report. Landsat 8 imagery became available in 2013 and therefore was used preferentially over Landsat 7 in this monitoring period. Due to cloud coverage in many areas, Landsat 7 was used in some scenes to help fill in gaps.

This combination of Landsat 7 and Landsat 8 is the same for this monitoring period as for the previous one, and does not constitute a change in platform since Landsat platforms are cross-calibrated. As stated in the module M-MON, if the same remotely sensed spatial data source used in baseline development is no longer available (e.g., due to satellites or sensors going out of service) an alternate source may be used. To ensure consistency with all previous monitoring events, the classification method employed followed the approach used for the previous monitoring events in 2014 and 2012. This method was used both to ensure continuity in the analysis and to overcome the problem of cloud cover. All methods are based on common good practice in the remote sensing field.

To overcome the cloud cover and shadow problems and maintain continuity with the previous monitoring, all available 2015 images from the reference region were combined through a post-classification concatenation procedure. For each Landsat path/ row in the reference region all images with useable (cloud free) data were obtained from USGS EarthExplorer.

Table 2.1: Images that were used in the final classification

Path Row	Date	Image ID	cloud cover
path 7 row 66			
	6/24/2016	LC80070662016176LGN01	8.64
	8/27/2016	LC80070662016304LGN01	16.99
	10/30/2016	LC80070662016240LGN01	9.75
path 7 row 65			
	7/10/2016	LC80070652015221LGN00	3.27
	6/24/2016	LC80070652016176LGN01	13.11
	5/7/2016	LC80070652016128LGN01	29.21
	10/30/2016	LC80070652016240LGN01	4.38
path 8 row 65			
	6/15/2016	LC80080652016167LGN01	11.52
	7/1/206	LC80080652016183LGN01	16.03
	7/17/2016	LC80080652016199LGN01	57.21
	11/23/2016	LC80080652016327LGN01	17.14
path 8 row 64			
	7/1/2016	LC80080642016183LGN01	20.79

Pre-processing

When using Lansat 8 data, imagery can be obtained from Earth Resource Observation Systems - EROS with multiple pre-processing steps completed. These processing steps are summarized below and more detail information can be found from NASA[42].

The 1G product available to users is both radiometrically and geometrically corrected. The correction algorithms employed model the spacecraft and sensor using data generated by onboard computers during imaging events and ground control points and a digital elevation model are also used to improve the overall geometric fidelity. The geometric correction process utilizes both ground control points (GCP) and digital elevation models (DEM) to attain absolute geodetic accuracy. The WGS84 ellipsoid is employed as the Earth model for the Universal Transverse Mercator (UTM) coordinate transformation. Associated with the UTM projection is a unique set of projection parameters that flow from the USGS General Cartographic Transformation Package. The end result is a geometrically

[42] http://landsathandbook.gsfc.nasa.gov/level/

rectified product free from distortions related to the sensor (*e.g.*, jitter, view angle effects), satellite (*e.g.,* attitude deviations from nominal), and Earth *(e.g.,* rotation, curvature, relief).

When using Level 1G-processed imagery, geometric accuracy should be confirmed, but extra geo-referencing steps are unnecessary.

Processing

Each image was processed using a hard classification technique. Using a clustering technique all useable data were identified. Through this process, pixels are grouped according to their spectral similarities and are then identified to land cover classes. Therefore, pixels with no data due to clouds and shadow can be removed. For each image, the remaining data is processed to identify all forest and non-forest clusters. Using known areas of forest, these cluster groups are identified and clumped. The same process is conducted for non-forest clusters. Since the non-forest category also includes categories that can be difficult to separate, such as agroforestry, secondary forests, swamps and mountain areas that have illumination variability, a secondary classification step was used in cases when forest and non-forest could not be distinguished. Challenges were isolated for clusters in all classes that included potential confusion and separability. These areas were processed again through a secondary cluster analysis focused only on these categories, and resulted in further dividing confusion classes. Through careful inspection of these new finely distinguished clusters, areas of non-forest were distinguished. This secondary classification was done for the best images available for each area (path/row). All areas that were identified as non-forest through this process (agriculture & re-growth) were then aggregated. In a final processing step all forest and non-forest groups from each image are then combined.

Post-processing

After all areas of usable 2016 data were distinguished into forest and non-forest, a mode filtering procedure was used to align the classification as closely as possible with the Peruvian DNA forest definition. A 3 pixel x 3 pixel filter was used which increases the minimum mapping unit to 0.81 ha. (90m x 90m). In some cases where clouds, cloud shadows and terrain shadows caused classification errors, shadow effects were delineated and classified correctly.

The result of this classification procedure is shown in Figure 2.1. where 99% of the reference region is classified with less than 1% unclassifiable due to cloud coverage (Table 2.2).

Figure 2.1: 2016 Classification for full reference region

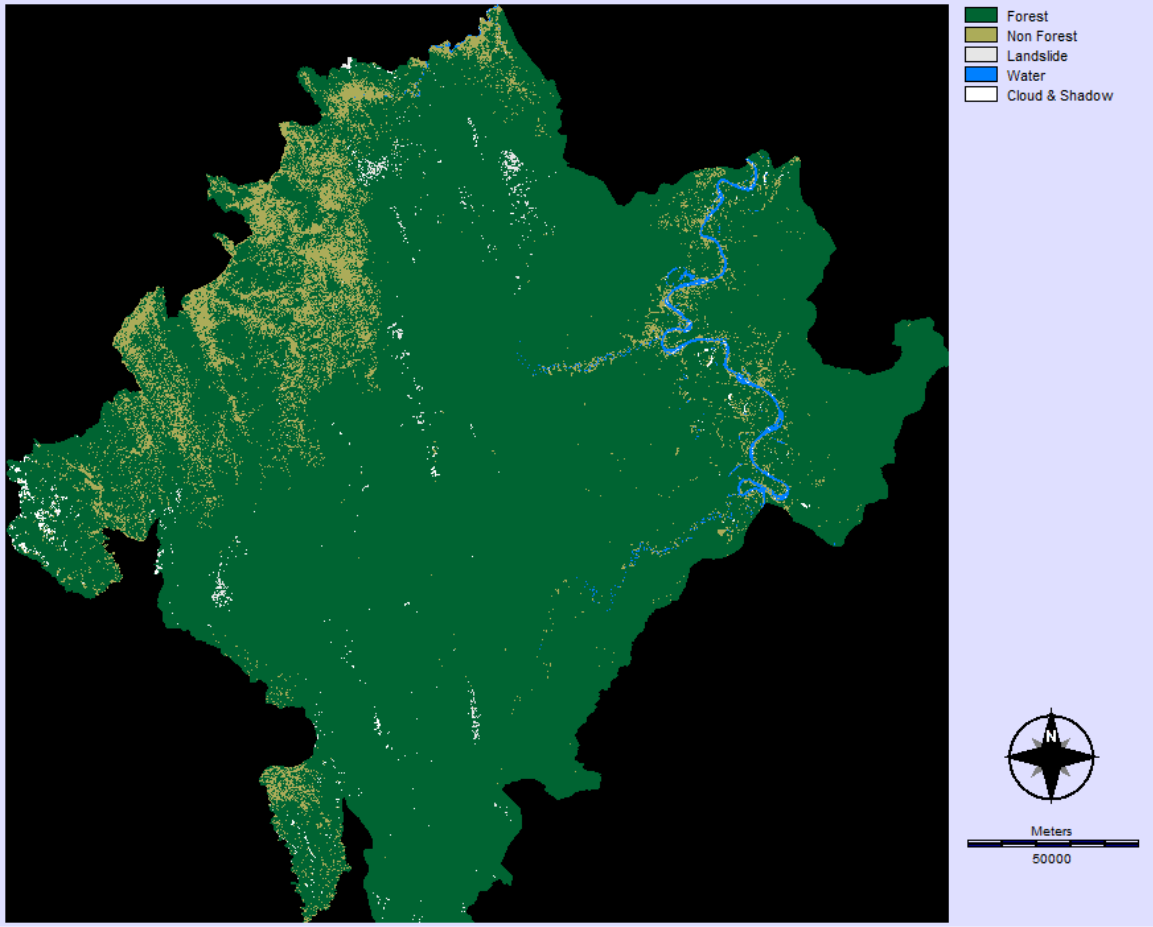


Table 2.2: Classification area

Category	Hectares
Forest & Non-Forest	3,747,535.47
Cloud & shadow	15,795.36
Total area classified	3,763,330.83
% cloud	0.42%

shape 2016_Full_classified_8917

Analysis of the total cloud cover in the year 2015 and 2016 show that less than 10% of the region is obscured by clouds for both years combined (Table 2.3).

Table 2.3: Cloud obscured total area

CLOUD COVER ANALYSIS	ha	% of area
Area that is clouded in 2014 & 2015	1,118.8	
Area this is only clouded in either 2014 or 2015	28,074.5	
Cloud cover total for both dates	29,193.3	0.78%

Quality Assurance/Quality Control

To ensure consistency and quality results, all data sources and analytical procedures are documented and archived (detailed under data archiving above).

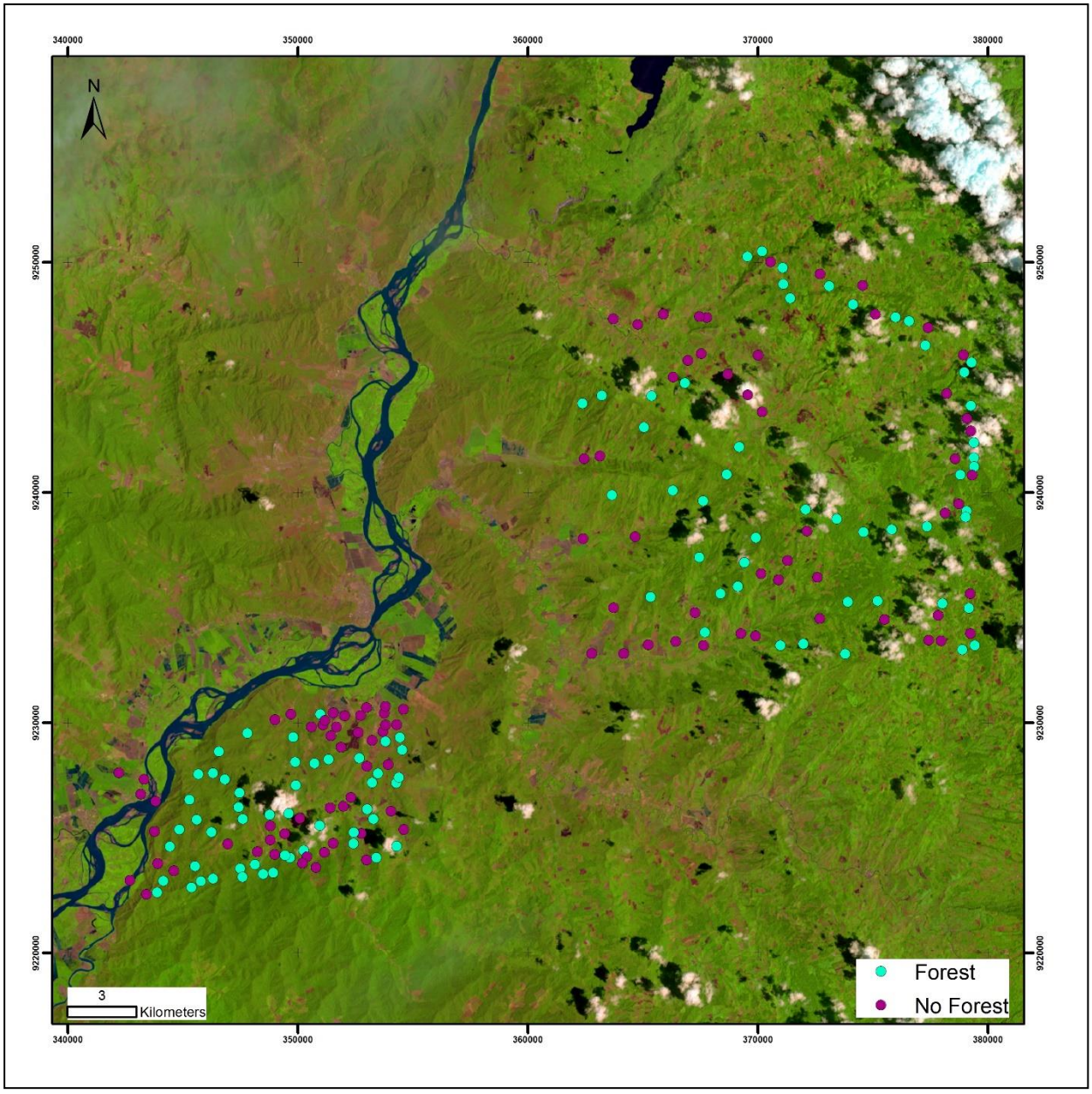
Accuracy of the classification was assessed by comparing the classification with ground truth points and samples of high resolution imagery (Quickbird imagery/ Astirum ~5m resolution available on Google Earth). All data collected from ground-truth points are recorded (including GPS coordinates and identified land-use class) and archived. Any sample points of high resolution imagery used to assess classification accuracy are also archived. Samples used to assess classification accuracy are well-distributed throughout the classification area (as far as is possible considering availability of high resolution imagery), with a minimum sampling intensity of 50 points each for the forest and non-forest classes. Distribution of all points is shown in Figure 2.2.

Overall classification accuracy was 95.5% Results of the accuracy assessment are in Table 2.4.

Table 2.4 Classification accuracy assessment 2016.

Classification	**Land-use class as determined from ground-truth points**		**Total**	**Accuracy (%)**	**Error of Commission (%)**
				User's accuracy	
	Forest	**Non-forest**		***(# correct/ row total)***	
Forest	97	3	100	93.00%	7.00%
Non-forest	4	96	100	98.30%	1.70%
Total	101	99	200		
Accuracy (%) ***Producer's accuracy*** ***(# correct/ column total)***	98.30%	92.70%		Overall Accuracy	
Error of Omission (%)	1.70%	7.30%		95.5%	

Figure 2.2: Accuracy assessment points

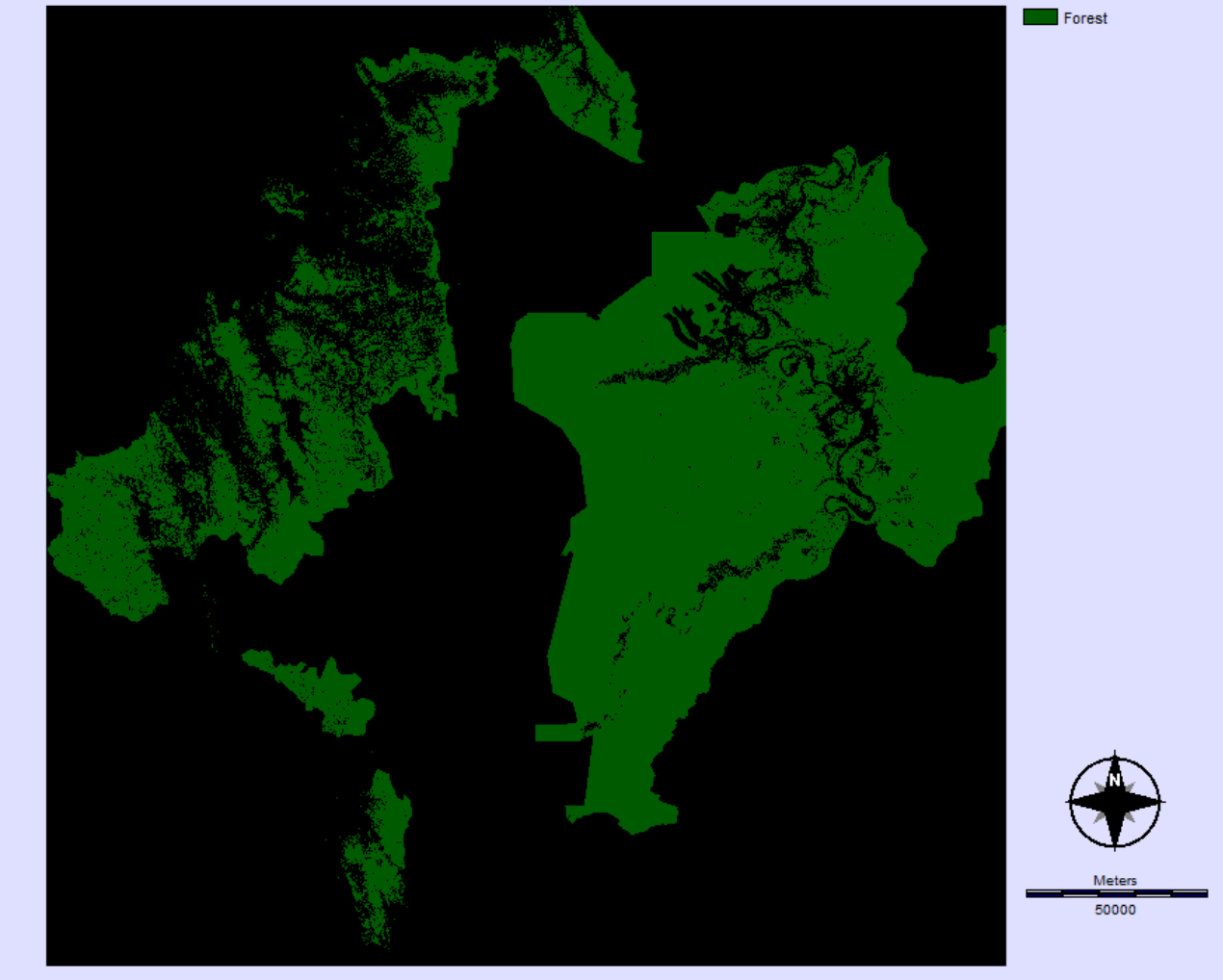


New benchmark maps were created for 2016 for the project area (Figure 2.3) and leakage belt (Figure 2.4)

Figure 2.3: Project Forest Cover Benchmark Map 2016

Shape: PA_2016_ benchmark _pncaz
Shape: PA_2016_allclasses_pncaz

Figure 2.4: Leakage Belt Forest Cover Monitoring Map 2016



APPENDIX 3: REFERENCES CITED

Alvarez-Loayza, P. and K. Tasker. 2013. Evaluación de la población de Vertebrados terrestres y Anfibios en el Parque Nacional Cordillera Azul: Áreas del Puesto de Control 19 y el Puesto de Control Pólvora. Center for Tropical Conservation (CTC), Duke University, EEUU. Reporte de investigación 2013-2014.

Alvarez-Loayza, P., I. Serrano Z., T. Pequeño, A. Acuña, W. Guerrero J., J. Quinchuya P., S. Cenepo C. 2014. Cordillera Azul National Park: Biodiversity hotspot for terrestrial vertebrates. From Science to Policy: Contributions from Science to Cope with Climate Change. Pre-COP20 event.

Alvarez-Loayza, P. y T. Pequeño (2017) Guía para la Configuración e Instalación de Cámaras Trampa. CIMA and Center for Tropical Conservation (CTC).

Alverson, W. S., L. O. Rodríguez and D. K. Moskovits (editors). 2001. Perú: Biabo Cordillera Azul. Rapid Biological Inventories Report 2. Chicago, Illinois: The Field Museum.

Anderson, E. J. A. Marengo, R. Villalba, S. R. Halloy, B. E. Young. D. Cordero, G. Gast, E. Jaimes y D. Ruiz. 2011. Consecuencias del cambio Climático en los Ecosistemas y Servicios Ecosistémicos de los Andes Tropicales. Ed. Herzog et al. Cambio Climático y Diversidad en los Andes Tropicales. Inter-American Institute for Global Change Research (IAI) and Scientific Committee on Problems of the Environment (SCOPE) pp. 1-22.

Bates et al. 2013. Lista de las aves del sector Shapaja, Cerro el Oso, Tocache. Proyecto: Inventario y colecta de aves y parásitos, en sector Pucayacu. The Field Museum, Chicago, IL.

Bodmer, R., T. Fang, P. Puertas, M. Antunez, K. Chota y E. William. 2013. Cambio climático y fauna silvestre en la amazonia peruana. Impacto de la sequía e inundaciones intensas en la Reserva Nacional Pacaya Samiria. WCS. Perú.

Brooks, T.M. et al. 2002. Habitat loss and extinction in the hotspots of biodiversity. Conservation Biology 16: 909-23.

Catenazzi, A. and R. von May. 2014. Conservation Status of Amphibians in Peru. Herpetological Monographs: December 2014, Vol. 28, No. 1, pp. 1-23.

CIMA. 2011. Pueblos Indígenas en Aislamiento. Apoyando su protección. Centro de Conservación, Investigación y Maneo de Áreas Naturales. Perú. pp. 20.

CIMA. 2014. Guía Mapeo de Usos y Fortalezas – MUF. CIMA – Cordillera Azul.

CIMA 2016. Informe del Mapeo de Usos y Fortalezas 2016.

CIMA 2017. UCAYALI: SINERGIAS POR EL CLIMA. Lima, Peru. 28 pp.

Clements, J. and N. Shany. 2001. A Field Guide to the Birds of Peru. Ibis. 283 pp.

Cusi, J.C., J. Moravec, E. Lehr3, V. Gvoždík. 2017. A new species of semiarboreal toad of the *Rhinella festae* group (Anura, Bufonidae) from the Cordillera Azul National Park, Peru. ZooKeys 673: 21–47 (2017) doi: 10.3897/zookeys.673.13050. http://zookeys.pensoft.net

Davis, T. J. 1986. Distribution and natural history of some birds from the departments of San Martín and Amazonas, northern Peru. Condor 88: 50-56.

FENACOCA/IBC. 2005. Propuesta de Creación de dos Reservas Territoriales a favor de los Cacataibos en aislamiento. Aguaytía-Lima, Perú. 275 pp.

Gálvez-Durand, C. 2009. Monitoreo ambiental del impacto de las actividades extractivas, en la fauna de importancia económica, en las cuencas de los ríos Pisqui y Aguaytia al lado sureste de zona de amortiguamiento del Parque Nacional Cordillera Azul.

Graves, G. R., Lane, D. F., O'Neill, J. P., Valqui, T. 2011. A distinctive new subspecies of the Royal Sunangel (Aves: Trochiliformes; *Heliangelus regalis*) from the Cordillera Azul, northern Peru. Zootaxa 3002: 52–58.

Harcum J y Dressing S. Technical Memorandum #3: Minimum Detectable Change and Power Analysis. Virginia, U.S. Environmental Protection Agency. 2015. Available online at www.epa.gov/xxx/tech_memos.htm

Hörnes, D. 2016 Amphibian community of north-western Parque Nacional Cordillera Azul, Peru. Thesis submitted in partial fulfillment of the requirements for the degree Master of Science. Universität Bonn. 98 pp.

IIAP. 2016. Memoria Institucional 2015. Instituto de Investigaciones de la Amazonía Peruana. 146 pp.

INRENA 2006. Plan Maestro del Parque Nacional Cordillera Azul: 2003 – 2008. Editado por CIMA. Lima. 273pp.

IPCC. 2006 Guidelines for National Greenhouse Gas Inventories. Chapter 4 AFOLU (Agriculture, Forestry and Other Land-use).

Krabbe, N. and M. Sornoza. 1994. Avifaunistic results of a subtropical camp in the Cordillera del Condor, southeastern Ecuador. Bulletin British Ornithologists' Club 114: 55–61.

La Marca, E. et al. 2005 Catastrophic population declines and extinctions in neotropical harlequin frogs (Bufonidae: *Atelopus*). Biotropica, 2005:37(2):190-201.

Lotters, S., R. Schulte, J. H. Córdova and M. Veith. 2005. Conservation priorities for Harlequin frogs (*Atelopus* spp.) of Peru. Oryx Vol. 39 No. 3.

Lujan, N., M. Hidalgo and D. Stewart. 2010. Revision of *Panaque*, with descriptions of three new species from the Amazon Basin (Siluriformes, Loricariidae). Copeia 2010, No. 4, 676–704.

Macedo, M. 2013. Informe de análisis del Mapeo de Usos y Fortalezas 2012. CIMA – Cordillera Azul. Peru.

Malcolm, J. R., C. Liu, R. P. Neilson, L. Hansen and L. Hannah. 2006. Global warming and extinctions of endemic species from biodiversity hotspots. Conservation Biology 20: 538-48.

Marengo J. A., J. D. Pabón, A. Díaz, G. Rosas, G. Ávalos, E. Montealegre, M. Villacís, S. Solman y M. Rojas. 2011. Cambio climático: Evidencias y futuros escenarios en la región andina. In: Herzog et al. (editors) Cambio Climático y Diversidad en los Andes Tropicales. Inter-American Institute for Global Change Research (IAI) and Scientific Committee on Problems of the Environment (SCOPE) pp. 131-149.

Mejía, K. y G. Gagliardi. 2015. Gestión sostenible de los recursos naturales y la diversidad biológica (Programa Presupuestal (PP) 0035), En: IIAP. 2016. Memoria Institucional. Pp. 57.

Merkord, C. L.; Mark, T.; Susanibar, D.; Johnson, A.; Witt, C. C. 2009. Avifaunal survey of the Río Chipaota Valley in the Cordillera Azul Region, San Martín, Peru. Ornitologia Neotropical 20: 535-552.Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being.

MINAM 2015. Guía Nacional de Valoración Económica del Patrimonio Natural.

Ñahuicopa, A., M. Hidalgo, E. Díaz, C. Augusto y T. Pequeño. 2016. Hallazgo de bagres ciegos del género Trichomycterus en la cueva Milagrosa en la zona de amortiguamiento del Parque Nacional Cordillera Azul: alcances sobre conservación y potencial turístico. Presentación en Simposium Kart. Tarapoto, San Martín, Perú.

O'Neill, J., D. Lane, K. Andrew, A. Capparella, and C. Fox. 2000. A striking new species of barbet (Capitoninae: *Capito*) from the eastern Andes of Peru. Auk 117 (3): 569–577.

Pérez, A. 2013. Monitoreo del Impacto de las Actividades Extractivas del Recurso Fauna, en la Diversidad Biológica en los Sectores Shamboyacu y Tres Unidos, San Martín. USAID / TNC / CIMA.

Pizarro, A. Choy. 2016. Utilizando estimaciones de ocupación para el monitoreo de la biodiversidad en áreas naturales protegidas: el caso del Parque Nacional Cordillera Azul. Tesis para optar el título de Licenciada en Biología. Universidad Peruana Cayetano Heredia. Lima, Perú

Pusey, B. J. and A. H. Arthington. 2003. Importance of the riparian zone to the conservation and management of freshwater fish: a review. Marine and Freshwater Research 54(1): 1-16.

Rengifo B., M. Hidalgo, N. Lujan, J. Armbruster, D. Stewart y H. Ortega. 2007. Notables especies nuevas de carachamas (Pisces, Siluriformes, Loricariidae) de la región Norte y Central de la Amazonía Peruana. Poster en la Reunión de Ictiólogos y Herpetólogos en Saint Louis - USA

Ridgely, R. and G. Tudor. 1989. Field Guide to the Songbirds of South America: The Passerines. University of Texas Press.

Schulenberg, T. and K. Awbrey. (Eds.) 1997. The Cordillera del Condor Region of Ecuador and Perú: A Biological Assesment. Conservation International RAP Working Papers N0. 7. Washington DC. USA.

Schulenberg, T.; Stotz, D.; Lane, D.; O'Neill, J.; Parker III, T. 2010. Aves de Peru.

Schulenberg, T.S., O'Neill, J.P., Lane, D.F., Valqui, T., Albújar, C. 2001. Birds. In: Alverson, W. S.; Rodríguez, L. O.; Moskovits, D. K. (ed.), Perú: Biabo Cordillera Azul. Rapid Biological Inventories Report No. 2, pp. 146–155. Field Museum, Chicago.

SERNANP 2012. Parque Nacional Cordillera Azul-PNCAZ Plan Maestro 2011–2016.

Stattersfield et al. 1998. Endemic Bird Areas of the World: Priorities for Biodiversity Conservation. BirdLife International. University of Michigan.

Tasker, K. 2013. Conservación e Inventario de los Anfibios y Reptiles de Tornillal (PC 19), Pólvora (CG 23) y Shapaja (CG 57) en el Parque Nacional Cordillera Azul, San Martín, Perú. Fullbright / Universidad Nacional Mayor de San Marcos / CIMA.

Tasker, K., and E. Twomey. 2015. San Martín, Loreto, Ucayali and Huánuco -- Amphibians of Cordillera Azul National Park. Fieldguides. The Field Museum. Rapid Color Guide # 596 http://fieldguides.fieldmuseum.org/sites/default/files/rapid-color-guides-pdfs/596_peru-anfibios_cordillera_azul_a3.pdf

Tasker, K. 2016. Informing the carbon Frontiers: Economics and Landscape in the Western Amazon. Thesis Presented to the Faculty of the Graduate School of The University of Texas at Austin. Master of Arts in Geography. Pp. 106.

Tognelli, M.F., Lasso, C.A., Bota-Sierra, C.A., Jiménez-Segura, L.F. y Cox, N.A. (Editores). 2016. Estado de Conservación y Distribución de la Biodiversidad de Agua Dulce en los Andes Tropicales. Gland, Suiza, Cambridge, UK y Arlington, USA: UICN. xii + 199 pp.

Venegas, P., O. Torres-Carvajal, V. Duran and K. de Queiroz. 2013. Two sympatric new species of wood-lizards (Hoplocercinae, *Enyalioides*) from Cordillera Azul National Park in northeastern Peru. ZooKeys 277: 69–9.

Weber and Montoya-Burgos. 2002. *Hypostomus fonchii* n. sp. (Siluriformes: Loricariidae) from Peru, a key species suggesting synonymy of *Cochliodon* with *Hypostomus*. Rev. Suisse Zool., 109 (2): 355-368.

Reis, R., S. Kullander and C. Ferraris. 2003. Check list of the freshwater fishes of South and Central America. EDIPUCRS. Porto Alegre. 742

Winemiller, K. O., A. A. Agostinho and E. Pellegrini-Carasmachi. 2008. Fish ecology in tropical streams. In: D. Dudgeon (editor). Tropical Stream Ecology. Aquatic Ecology Series. London: Academic Press.