

CORDILLERA AZUL NATIONAL PARK REDD PROJECT



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GHG Accounting/Crediting Period	<p>The project crediting period is 20 years, extending from 8 August 2008 to 7 August 2028.</p> <p>The CCB and VCS have coincident crediting period.</p>
Monitoring Period of this Report	<p>August 8, 2016 to August 7, 2017; and August 8, 2017 to August 7, 2018</p>
History of CCB Status	<p>The project was validated under CCB Standards Second Edition on February 19, 2013 by SCS Global Services¹ and subsequently achieved four verification processes: (1) verified on March 21, 2014 by Rainforest Alliance², (2) verified January 04, 2016 by AENOR, (3) verified on December 20, 2016 by AENOR³, and (4) verified December 28, 2017 by AENOR⁴.</p>
Gold Level Criteria	<p>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.</p> <p>The Park harboring and protecting a variety of Critically Endangered (CR) and Endangered (EN) species, like Amphibious (<i>Atelopus pulcher</i>), birds (<i>Heliangelus regalis</i>) and Mammals (<i>Pteronura brasiliensis</i>), 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</p> <p>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.</p> <p>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.</p> <p>Note: Exceptional Biodiversity Benefits are development in section 7.</p>

²[https://s3.amazonaws.com/CCBA/Projects/Cordillera_Azul_National_Park_REDD_project/Verification/Verified/Updated/Cordillera+Azul+CCB+verif+statement+14+\(1\).pdf](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

⁴ file:///D:/Users/tpequeno/Downloads/VERIF_REP_985_8AUG2015_7AUG2016.pdf and https://www.vcsprojectdatabase.org/#/project_details/985

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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: <ul style="list-style-type: none"> • Huallaga • Ucayali With more than 45 microbasins	<ul style="list-style-type: none"> • Sec. 3.1.3 • Sec. 5.1.1 • Sec. 7 • Appendix 1 • Appendix 2 	Maintain the protection of the Headwaters of 2 great Amazonian basins: <ul style="list-style-type: none"> • 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.	4 New Species during 2017 and 2018: <ul style="list-style-type: none"> • Birds (2): <i>Machaeropterus eckelberryi</i> and <i>Myrmoderus eowilsonii</i> • Frog (1): <i>Rhinella lilyrodriguezae</i> • Fish (1): <i>Trichomycterus sp. nov.</i> (under description) 	<ul style="list-style-type: none"> • Sec. 5.1.1 • Sec. 5.3.2 • Sec. 5.3.3 • Sec. 7 • Appendix 1 • Appendix 3 	New Described Species: <ul style="list-style-type: none"> • Fishes: 4 spp • Amphibia: 1 sp • Reptiles: 2 spp • Birds: 3 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; also promote protection of isolated Kakataibos populations in the Aguaytía buffer zone	<ul style="list-style-type: none"> • Sec. 2.5.2 • Sec. 2.4.6 • Sec. 4.1.1 • Appendix 1 	Promote the creation of an Indigenous Reserve for Isolated Indigenous Kakatiabo People, in the PNCAZ buffer zone

<p>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</p> <p>→ 5.3 Based on the results of the ZEE, local communities manage conservation areas according to their interests.</p>	<p>8 Conservation initiatives in the buffer zone communities:</p> <ul style="list-style-type: none"> • Nuevo Jaén • Nuevo San Martín • Challual • Las Palma • Nuevo Trujillo • San Juan • Vista Alegre • Yamino • Concession for Conservation in Pauya Cushabatay 	<ul style="list-style-type: none"> • Sec. 4.1.2 • Sec. 5.1.1 • Appendix 1 	<p>8 Conservation initiatives near communities and villages.</p> <p>A great conservation area in Boca-Pauya, Cushabatay basin (aprox. 81,000 ha)</p>
<p>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</p>	<p>01 additional Blue Agreement (Conservation Agreements):</p> <ul style="list-style-type: none"> • Yamino Native Community <p>More than 7,675 beneficiaries under Blue Agreements</p>	<ul style="list-style-type: none"> • Sec. 2.2.1 • Sec. 4.1.1 • Sec. 4.3.3 • Appendix 1 	<p>9 Blue Agreements, including 7,677 beneficiaries, and covering a total area of 52,955 ha.</p>

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	9,576,449 t CO ₂ -e	Baseline tables, from PD Appendix 9 (3.2.4)	28,970,971.6 tCO ₂ -e
Forest ⁵ cover	For REDD ⁶ projects: Number of hectares of reduced forest loss in the project area measured against the without-project scenario	23,137.29 ha (23,157.72 ⁷ ha–20.43 ⁸ ha)	Baseline tables, from PD Appendix 9	68,351.85 ha
	For ARR ⁹ 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 ¹⁰ practices have occurred as a result of the project's activities, measured against the without-project scenario	not applicable	---	---

⁵ 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*)

⁶ 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*)

⁷ *Aunplanned, i, t* (ha): Deforested area according to baseline (Source: PD Appendix 9; Monitoring Workbook 2018: Baseline tables)

⁸ *ADefPA, u, i, t* (ha): Project area change (Source: Monitoring Workbook 2018).

⁹ 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*)

¹⁰ 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 of land-use zoning achieved in 2015, with 24 communities and villages (246,192ha)	<ul style="list-style-type: none"> • Sec. 2.2.5 • Sec. 4.1.2 • Sec. 4.3.3 • Appendix 1 	246,192 ha under land use zoning, including implementation of agroforestral systems, restoration or titling activities.
Training	Total number of community members who have improved skills and/or knowledge resulting from training provided as part of project activities	45 parkguards 4,188 head of the families	<ul style="list-style-type: none"> • Sec. 2.4.2 • Sec. 4.1.2 • Appendix 1 	At least 3 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	8 women's associations, and women actively participating on non-exclusive women institutions (educational and rondas campesinas)	<ul style="list-style-type: none"> • Sec. 4.1.2 • Appendix 1 	At least 300 women
Employment	Total number of people employed in of project activities, ¹¹ expressed as number of full time employees ¹²	45 parkguards 52 CIMA staff 20 Communal parkguards	<ul style="list-style-type: none"> • Sec. 2.4.3 	45 parkguards 52 CIMA staff >20 Communal parkguards
	Number of women employed in project activities, expressed as number of full time employees	20 women	<ul style="list-style-type: none"> • Sec. 2.4.3 	18-20 women
Livelihoods	Total number of people with improved livelihoods ¹³ or income generated as a result of project activities	4,188 families from 44 villages and communities are supported to implement strategic plans (Quality of Life Plans and Action Plans)	<ul style="list-style-type: none"> • Sec. 4.1.2 • Appendix 1 	> 4,180 families

¹¹ 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.

¹² 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])

¹³ 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 4,188 families	• Sec. 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 ¹⁴ was improved as a result of project activities	More than 2 thousand community members (men, women and child), from 44 villages and communities, who had been developed or updated their Quality of Life Plans as well as to continue the process of Implementing.	• Sec. 4.1.2	> 20,900 community members from 44 communities implementing Quality of Life Plans and Action Plans
	Number of women whose well-being was improved as a result of project activities	300 women	• Sec. 4.1.2	500 women
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation, ¹⁵ measured against the without-project scenario	1,3 million of hectares conserved by the PNCAZ	• Sec. 2.1.7	Maintain the status of conservation of PNCAZ
	Number of globally Critically Endangered or Endangered species ¹⁶ benefiting from reduced threats as a result of project activities, ¹⁷ measured against the without-project scenario	10 Species IUCN (Critical, endangered and near threat) 120 species of importance for CITES I and II	• Sec. 7	Maintain number of species IN cites AND uicn, and discover 4 new species

¹⁴ 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.

¹⁵ 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.

¹⁶ Per IUCN's Red List of Threatened Species

¹⁷ 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 - implemented from period august 2016 to august 2018 - 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), application of the land-use zoning as a tool for managing territories and community conservation areas according to their interests, and developing/improving sustainable economic activities (i.e. cacao and coffee in agroforestry systems, women 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 (MUF 2016). 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, 2016 to August 7, 2018, no permanent anthropogenic deforestation (only limited natural landslide disturbance) nor forest degradation occurred in the project area and the net reduction was 9,576,449 tCO₂-e (when deductions for risk buffer were also included, the available verified carbon units were 8,618,804 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 were generated from 2012 to the present in 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)
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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
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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 VCU in the voluntary market; however, in November 2014 CIMA signed a Loan Agreement and Agency Agreement with Althelia Climate Fund¹⁸ (ACF), both are supported by the carbon credits that the PNCAZ REDD+ Project had generated in 2008-2012 and 2012-2014, as well as those that would generate during 2014-2015, 2015-2016, and during this last period 2016-2018.

For the first implementation period (August 2008 - August 2012), it was verified that the PNCAZ REDD Project avoided a total of net emissions of 6,413,412 tCO₂-e (deducting the risks due to non-permanence, 5,772,701 tCO₂-e were reached).

For the second implementation period (August 2012 - August 2014), the project verified a net reduction of GHG emissions of 4,606,143 tCO₂-e (deducting risks due to non-permanence, the 4,145,529 available tCO₂-e are reached).

For the third implementation period (August 2014 - August 2015), there has been no anthropogenic deforestation or forest degradation in the project area, and the net reduction of greenhouse gas emissions was 3,374,249 tCO₂-e (deducting risks due to non-permanence reached the 3,036,824 tCO₂-e available).

During the fourth monitoring period (August 2015 - August 2016), no deforestation or forest degradation occurred in the project area, and the net GHG reduction was 4,074,606 tCO₂-e (deducting risks due to non-permanence are reached the 3,667,145 tCO₂-e available).

During the fifth monitoring period (August 2016 - August 2018), no anthropogenic deforestation occurred, but the disturbance was mainly due to natural landslides and on river beaches; there

¹⁸ <https://althelia.com/> Althelia Climate Fund is investing in ecosystems conservation and sustainable agroforestry, applying best-in-class social, environmental and governance (ESG) criteria.

is very little degradation of the forest due to the use of firewood in the project area, and the net GHG reduction was 9,576,449 tCO₂-e (deducting risks due to non-permanence are reached the 8,618,804 tCO₂-e available).

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 2.1). 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).

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 government¹⁹ on 13 December 2001, covering 2,061,259.79 ha. In June of 2007 INRENA passed a resolution²⁰ amplifying the buffer zone to more than 2.3 million hectares and making official the limits proposed in the Master Plan 2003-2008²¹. Formerly, in 2011, through the resolution²² 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.

¹⁹ Resolución Jefatural N° 314-2001-INRENA

²⁰ Resolución Jefatural N° 144-2007-INRENA

²¹ Resolución Jefatural N° 245-2004-INRENA

²² Resolución Presidencial N° 064-2011-SERNANP

The figure 2.1 shows the map of the Cordillera Azul National Park 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 map shows the park's location in central Peru.

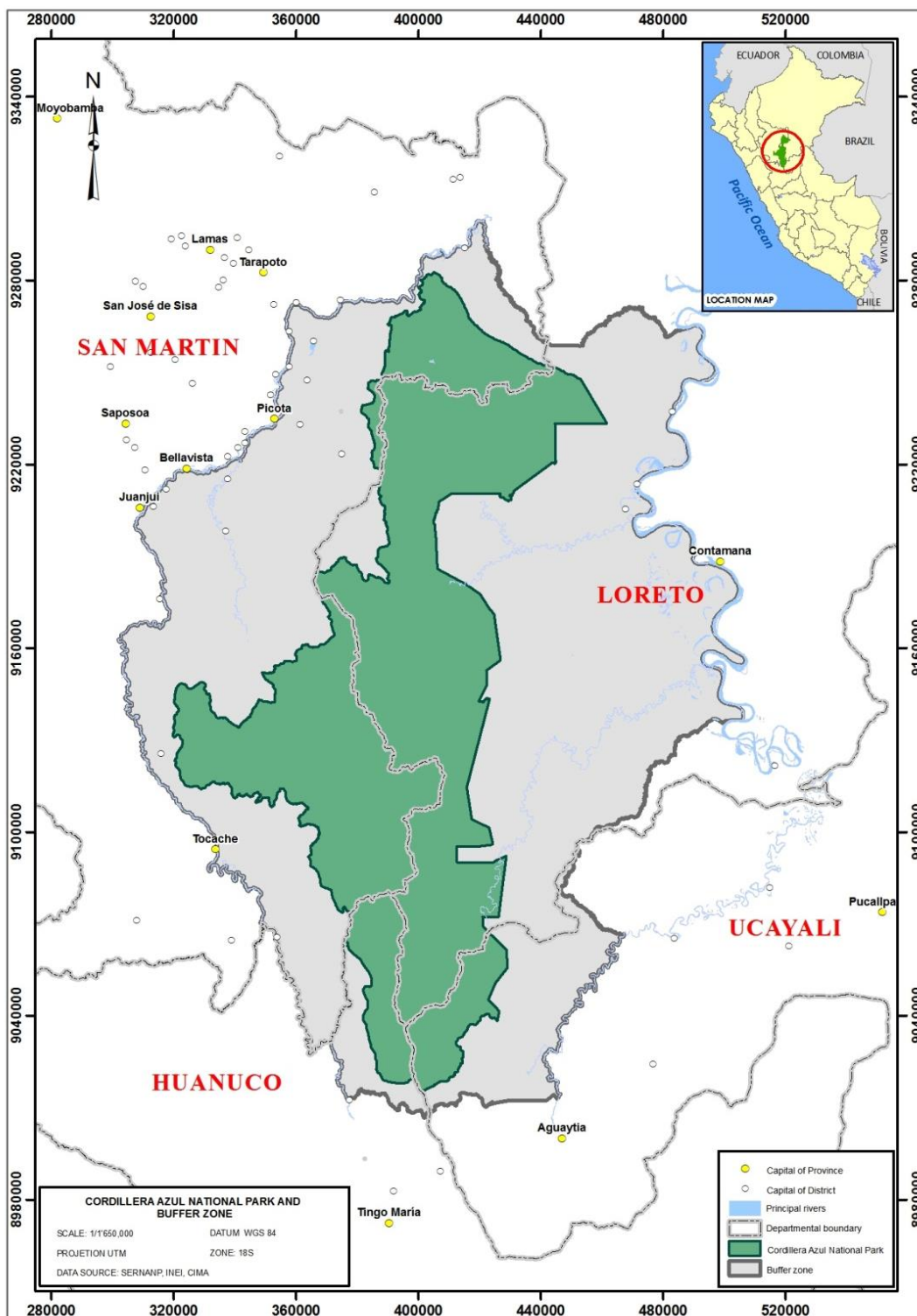


Figure 2.1: Project Map and Location

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 USCUS sector through eligible activities. In the other way, the National Forest and Climate Change Strategy (Estrategia Nacional De Bosques y Cambio 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, 2016 and August 7, 2018, 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)																												
May 21, 2014	Blue Agreements (<i>Acuerdos Azules</i>) or Communal Conservation Agreements signed between CIMA and 3 local villages:																												
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To renew the commitment for 10 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																													
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, comprising 8 million VCUs.																												
November 18, 2015	Blue Agreements (<i>Acuerdos Azules</i>) or Communal Conservation Agreements signed between CIMA and 3 local villages:																												
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	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 ²³ .															
December 2015	Through 2015, 17 plans Quality of Life Plans were well established.															
March 16, 2018	Blue Agreement (<i>Acuerdos Azules</i>) or Communal Conservation Agreements signed between CIMA and a local native community Yamino															
	<table border="1"> <thead> <tr> <th>Region</th> <th>Sector</th> <th>Village</th> <th>Population</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>Pucallpa</td> <td>Aguaytía</td> <td>Yamino</td> <td>163</td> <td>30,537</td> </tr> <tr> <td colspan="3">TOTAL</td> <td>163</td> <td>30,537</td> </tr> </tbody> </table>	Region	Sector	Village	Population	Area (ha)	Pucallpa	Aguaytía	Yamino	163	30,537	TOTAL			163	30,537
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TOTAL			163	30,537												
To renew the commitment for 2 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. A total of 7,677 beneficiaries are following from the Blue Agreements, corresponding to 08 villages and a (01) native community, covering a total area of 52,955 hectares.																
April 2018	<p>Until April 2018 a total of 31 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.</p> <p>Until August 2018 all those villages and communities ongoing implementing their Comunal Estrategic Planing (QLP and Action Plans).</p> <p>It is expected to reach 34 Quality of Life Plans during the last quarter of 2018.</p>															

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 were implemented during the time frame of this PIR. These activities were proposed by CIMA by submitting to SERNANP their annual work plans 2016, 2017 and 2018, 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

²³ <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>

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; Likewise, the effects of soil erosion can be increased, both in the parquet and in the buffer zone. An example of this was the phenomenon of heavy rains in november 2017, flooding the village of Shamboyacu, with social and economic losses²⁴ (INDECI 2017, SENAMHI 2017, GORESAM 2017) where the steep slope to the east of the area of interest and the change in land use made the marginal farms of the river more vulnerable (Lachi y Niquen 2017).

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 department²⁵.

- <http://www.fondoamericas.org.pe/se-crea-el-grupo-de-trabajo-sinergias-por-el-clima-ucayali/>

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). On the other hand, in the park there are areas of landslides fully identified that are also affected by the erosive action of heavy rains, but without affecting human populations, rather, the erosion of the soil provides nutrients for the lower areas of the basin.

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

²⁴ According to INDECI in the districts of Shamboyacu and Tres Unidos there were more than 2 thousand affected; and more than 5 thousand in all Picota.

²⁵ 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. Additionally, the temperature rises 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.

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. During 2017 and 2018 a Project of Ecological Restoration of the Landscape under a context of scalability of the model, implemented in San Juan (Tres Unidos) and Lejía (Shamboayacu), with the development of field and restoration schools under a model of connectivity networks (Watanabe et al. 2017); this as a way to recover ecosystem services from the forest, please see the Project from FERI-CBD and FONDAM, from table 2 in Seccion 2.4.6:

- <http://www.cima.org.pe/files/pdf/CIMA-2017-Folleto-Restauracion.pdf>
- http://www.cima.org.pe/files/images/publicaciones/pdf/Folleto_Restauracion_2018.pdf
- <https://www.facebook.com/notes/cima-cordillera-azul/sembrando-compromisos-en-la-produccion-comunal-de-plantas-en-los-viveros-locales/1096688797174020/>

Also see Appendix 1, section 2.3.1: Training of the team (CIMA and Park rangers) by the Field schools, as part of the restoration project.

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 to 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.

Ronda campesina from the Indigenous community of Chambira

During 2017 and 2018, CIMA has been development a project with Technoserve, in the context of the GDA Althelia – USAID, to work since September 2018 with coffee farmers in coffee

without deforestation and agroforestry systems, even with those who have farms with overlap to other rights, to stop deforestation and the restoration of some sites.

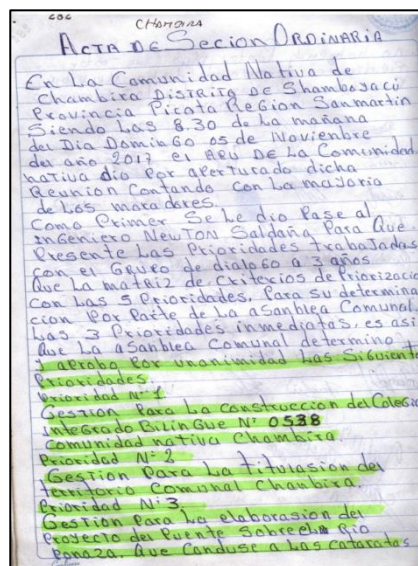
- **Lack of land tenure in the buffer zone:** As discussed several times in the PD, most people living in the buffer zone do not own their land. This results in immigrants having only weak ties to a specific location and no motivation to remain there as erosion and soil depletion occurs. Instead, they 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.

An example of this is the currently recognition of the territory of the native community of Chambira (Shambojacu); which was one of the priorities in its Quality of Life Plan defined in November 2017 (see Documentos Goal 2 → 4.2 Normas de Convivencia y Planificación).

This also includes the promotion of the conservation of sites in the buffer zone of the PNCAZ, such as the kakatibo indigenous reserve for ensuring the welfare of the uncontacted population in the Aguaytia sector; in coordination with the *Ministerio de Cultura* (MINCU).

- <https://www.facebook.com/notes/cima-cordillera-azul/consultor%C3%ADa-para-elaboraci%C3%B3n-de-los-estudios-adicionales-de-categorizaci%C3%B3n-para-913486562160912/>



- **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 continues awareness of laws and regulations in the communities (Figure 2.2) 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 2.2: 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.

For more detail about all the activities developed by the Project, including the ones mentioned in this section, see Appendix 1 and the supporting documents in Goals 1, 2 and 3.

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 (more information in Section 5.1.1). 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), Likewise, the PNCAZ fulfills its function of protecting these vulnerable species (Pizarro 2016 and Moncrieff et al. 2018). 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.

During 2018²⁶, SERNANP postulated the PNCAZ²⁷ - along with four other ANPs - to the IUCN Green List²⁸, this will generate an additional commitment to maintain the high standards of governance for the conservation of these areas in the future, once these are recognized by the standard.

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. In addition, SERNANP maintains REDD Projects in ANP, including PNCAZ, on its website: <http://www.sernanp.gob.pe/proyectos-redd->

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

²⁶ <https://www.iucn.org/es/news/américa-del-sur/201807/se-implementa-la-lista-verde-de-áreas-protegidas-en-perú>

²⁷ <http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/areas-naturales-protegidas-de-peru-en-camino-a-integrar-443703>

²⁸ <https://www.iucn.org/theme/protected-areas/our-work/iucn-green-list>

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. The PNCAZ REDD Project was kept on the web for at least one month, as required by the CCB, waiting for public comments. In this period, no comments were received, neither by technical institutions, academics, or institutions involved with human / community rights. We understand from our field experience and as members of several inter-institutional working groups that it is difficult to get comments on documents (not only posted on the web, but even delivered directly), so that our work input with local population (training, decision making, news, coordination, awareness, etc.) at the community level, are given in the space of community assemblies²⁹, as the main space for citizen participation.

Likewise, the technical details of the PNCAZ REDD Project are very complex, so it is very difficult to explain beyond the basic principles of Climate Change, generalities of REDD and details of the program at the local level (main components of work in the ZA), making it as simple as possible; as when working on the PNCAZ Master Plan, where the PNCAZ REDD Project is also incorporated in its environmental objective (SERNANP 2017). The technical details are very difficult to explain at a level of everyday language, especially in the case of the Shipibo communities (where CIMA has a Shipibo technician) because many of the words in the detail of the PDD and the PIR have no translation into this language; but it is worth emphasizing that local people understand very well the relationship between the forest, climate and other benefits that must be maintained to ensure their quality of life.

Considering that it is very difficult for the local population to make public comments under the system currently maintained by the VCS / CCB or VERRA. On the contrary, CIMA suggests making adjustments in the public comment section, where it would be more realistic than any authority, technical-social entity, project observer, etc. that was eventually witness or take notice of any irregularity in the projects, contact and make the respective comments, providing the appropriate evidence.

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.

To make this process more dynamic, it was decided to make direct presentations to the different stakeholders, some of these presentations have resulted in discussion groups regarding the parameters used, results obtained, opportunities and future REDD options in the country.

On the web page of CIMA and Ecosphere +, information about the PNCAZ, the work of SERNANP and CIMA, and the impacts of the PNCAZ program are also presented (see more in section 4.33 Dissemination of Monitoring Plan and Results):

²⁹ In the case of the native communities and local population in the PNCAZ buffer zone, it would be a lack of courtesy on the part of CIMA to inform the population and local authorities (either orally or by letters) that they are expected to make public comments on the standard website, with documents based on English guides; being in addition that none of these populations counts on service of Internet, and a very low percentage counts on telephony and electrical light, at least not those that are nearer to the park.

- <https://www.youtube.com/watch?v=B18mdEL6tKo&t=77s>
- <https://ecosphere.plus/blog/2018-impact-report-launched/>

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; if the CIMA technician is not present in the area, the ranger can do that function or call an *ad hoc* meeting to solve the problem; the community can also request additional information and unveil doubts corresponding to the program or about the intervention model. 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 2.3). 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 SIG Area 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.

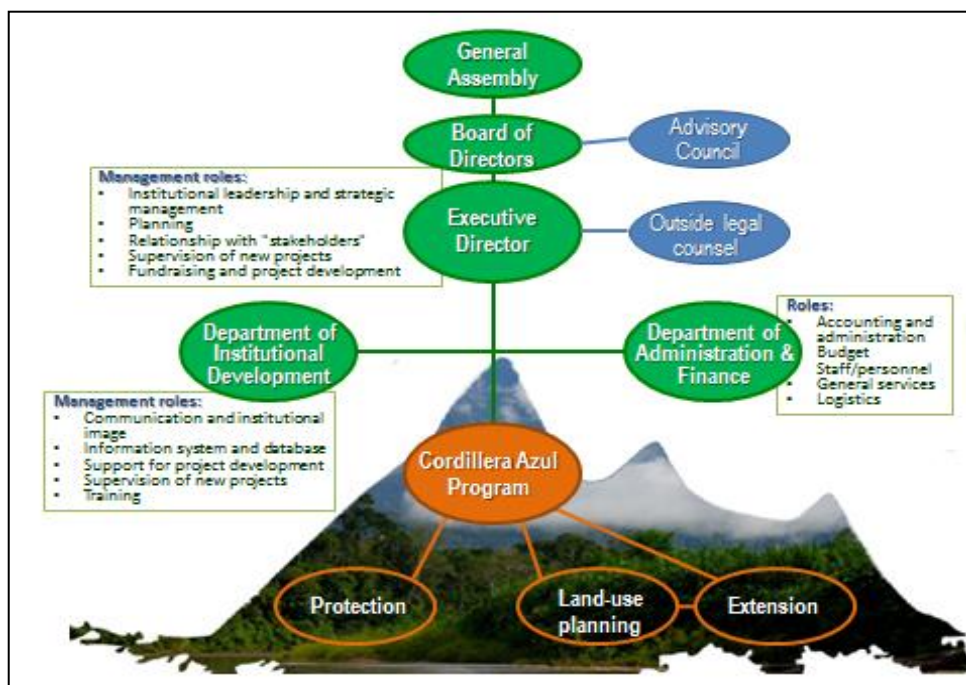


Figure 2.3. The governance structure and organization of the PNCAZ REDD Project

The only change in key personnel since the last verification period was in the Program Director and the Director of Institutional Development, without change in the organigram; therefore, CIMA's management team, and their advisors, maintain their 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 – Tatiana Pequeño

- 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; Implements activities supporting the park management contract.
- 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;
- Manages programs supporting the REDD project reviewing the schedule, budget and effectiveness of the programs;
- Ensures that project field activities operate in accordance with all applicable regulations.

Director of Institutional Development – Lily Rodriguez

- Oversees collection, mapping, analysis and storage of project data including project monitoring;
- Manages programs supporting the projects 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 (Germany), University of Duke, University of Texas (USA), Universidad de Cambridge (UK), University of Hamburg (Ger) with several other academic institutions and non-governmental organizations in Latin America.
- **Schools and training centers:** Administrative educational units (Unidades de Gestión Educativa Locales-UGEL), Centro Los Tacarpos (Maronilla) 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:

2016:

- **Leadership and Survivor Course for Parkguards**; were 2 parkguards attended the field course
- **Course Climate Change, Adaptation and Mitigation on Protected Areas**; were 2 parkguards attended the field course in Pucallpa
- **Workshop-course about Climate Change and the Protected Areas**, a were 4 parkguards attended the course
- **Applicative Management of SMART capacitation**, were 4 parkguards attended the course in Tocache

2017:

- **First Course of Camera Traps for PNCAZ Parkguards and CIMA technicians in Aspuzana valley** where 7 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.
- **Workshop-course for Geographic Information System (GIS) Management** attended by the PNCAZ specialist of SERNANP and CIMA technical team, in Tarapoto.
- PNCAZ parkguards participated in the **IV Encounter of Peruvian Parkguards** and in the **Provincial Platform for Civil Defense – Aguaytía**.

2018:

- **Second Course of Camera Traps for PNCAZ Parkguards in Tarapoto**, were 16 parkguards attended, as well as the Urku's technical team. This course was to refine the knowledge generated in the first course of trap cameras for park rangers, and to generate a schedule and route of installation of the equipment. Details on the application of this monitoring methods are detailed in section 5.1.1.

- **Field Capitations for Restauration Project**, in San Juan and Lejia villages (Tarapoto sector), were 3 parkguards from sectors of Shamboyacu and Tres Unidos are participating in *field schools*.

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 2.1). Staff turnover is relatively low; CIMA has technicians and parkguards who have spent more than 15 years in the institution. However, when new staff is needed, open calls are made particularly in the area where the personnel is required.

Table 2.1. PNCAZ Project staff by offices in Lima, Tarapoto, Tocache, Contamana and Aguaytía.

Headquarters		PNCAZ Project Staff	
		Total	women
CIMA staff	Lima	12	7
	Tarapoto field office	23	5
	Tocache field office	7	3
	Contamana field office	7	2
	Aguaytía field office	3	2
SERNANP	PNCAZ Chief and specialists	(1+3)	
	Parkguards (PNCAZ boundaries)	45	1
Total staff paid by CIMA (REDD Project)		52+45	19+1

Park management activities are led from field offices in Tarapoto, Tocache, Contamana and Aguaytía. 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 N° 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; 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.

The last PNCAZ Master Plan - updated for second time in 2017 – identifies, as part of the environmental objective, the PNCAZ REDD project as a means by which the financial sustainability of the park is assured for less until 2018, using the first period of the PNCAZ REDD project baseline.

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 2.2 lists CIMA's funding sources for the period 2017-2018, 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 2016-August 2018

Funding source	Time period	Project name and objectives
Althelia Climate Fund	Nov 2014 – Nov. 2018	<p>“Proyecto REDD+ del PNCAZ”</p> <ul style="list-style-type: none"> 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	<p>“PNCAZ’s expanding, supporting sustainability and improving management of its buffer zone”</p> <ul style="list-style-type: none"> 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	<p>“Red Regional de Observación del Clima for the Monitoring of Climate Change and its Impacts on the Ecosystems of Ucayali”</p> <ul style="list-style-type: none"> 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
ISA – REP	Sept. 2017 - Sept. 2019	<p>“Cordillera Azul REP Project”:</p> <ol style="list-style-type: none"> Jaguar connection Support for sustainable cocoa Route to <i>Otorongo</i> Waterfall
IUCN Incubator	2018	<p>“Incubator for Nature Conservation”:</p> <p>Technical assistance to develop innovative financing instruments from a team of specialists hired by IUCN</p>
Andes Amazon Fund	Nov. 2017 – Nov. 2018	<p>“Promoting legal protection for high biodiversity, culturally important areas around Cordillera Azul National Park”, promoting:</p> <ul style="list-style-type: none"> - Concession for conservation on Pauya-Cushabatay - Conservation area for the Yamino native community - Indigenous Reserve for Isolated Indigenous Kakatiabo People
FERI - CBD FONDAM	Dic. 2017 – Feb. 2019	<p>“Scalable strategies for landscape conservation ecological restoration activities in the buffer zone of the Cordillera Azul National Park”</p>

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 and 2016 financial audit received a favorable report, while the financial audit for the 2017 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. N° 018-2015-MINAGRI).
- Reglamento para la Gestión de Fauna Silvestre (D.S. N° 019-2015-MINAGRI).
- Reglamento para la Gestión e las Plantaciones Forestales y los Sistemas Agroforestales (D.S. N° 020-2015-MINAGRI).
- Reglamento para la Gestión Forestal y de Fauna Silvestre en Comunidades Nativas y Comunidades Campesinas (D.S. N° 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 2014³⁰. Establishes procedures for the marketing of carbon credits from REDD projects in protected areas.
- Resolución Presidencial N° 150-2015-SERNANP, published on Julio 2015, where SERNANP establishes the principles of participatory management in protected natural areas
- Resolución Directoral N° 045 -2017-SERNANP-DGANP, published on June 28 2017, were SERNANP approves the Terms of Reference for the Quarterly, Annual and Five-Year Evaluation, Work Plan and Annual Budget; and format of the minutes of the Session of the Commissions for monitoring the Administration Contracts in Natural Protected Areas of the national administration.

³⁰ <http://legislacionanp.org.pe/wp-content/uploads/2014/03/SERNANP-norma2.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 Kakataibo³¹ 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 zone³². 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 N° 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 N° 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 N° 189-2013-VMI / MC which gives "favorable qualification for the recognition of indigenous people Kakataibo in situation of isolation, and the categorization of Indigenous Reserve Kakataibo Sur and Indigenous Reserve Kakataibo Norte"³³; 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.

³¹ <http://www.cultura.gob.pe/es/interculturalidad/dpiaci/registro/piaci>

³² <http://www.cultura.gob.pe/sites/default/files/paginternas/tablaarchivos/2014/03/07-solicituddereservaindigenacacataibosurycacataibonorte.pdf>

³³ <http://www.cultura.gob.pe/sites/default/files/paginternas/tablaarchivos/2014/03/12-pueblocacataibo.pdf>

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 N° 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.

Titled land and other rights in the buffer zone

Sections 4.1 and 4.2 of this document make extensive mention of the positive impacts of the Project in the communities of the buffer zone (ZA) of the PNCAZ, and in addition to the non-generation of negative impacts on these same communities.

Regarding the treatment of rights beyond the Project area, that is, in the ZA of the PNCAZ:

- a. Indigenous peoples: The delimitation of the PNCAZ has respected the recognized indigenous territories, including those areas that were considered as proposals for titling or expansion at the time of the creation of the park. i.e. the area corresponding to the native community of Nuevo Eden, where the park shows a clearly cut silhouette, which corresponds to the proposed area of expansion to the native community of the Shipibo ethnic group.

It is worth mentioning that CIMA has been supporting processes of expansion and titling of native communities long before the Project began its implementation, through funds from the Spanish Agency for International Cooperation for Development - AECID; and subsequently with the Project, it has supported other indigenous communities and indigenous peoples in isolation according to the national legislation and OIT on the matter (section 2.4.6, 2.5.2, 4.1.1).

Consistent with its support to indigenous peoples, during 2017 and 2018, CIMA invested great efforts tratando de asegurar los derechos de indigenas en aislamiento native communities in the Aguaytía sector (more details in section 4.1.1 and Appendix 1).

- b. Settlers in the ZA: Through the REDD project, CIMA has been supporting many population centers to achieve formalization of tenure or their titling, as part of their Quality of Life Plans (PCV). For example, categorization of villages like Fernando Belaúnde, San Juan, El Paraíso, Maronilla, Nuevo Jaen, Vista Alegre, among others; CIMA supports in the generation of its dossiers and bring help with the procedures with the respective authorities.
- c. Forest concessions and other rights of use: During the process of establishing the PNCAZ and to define its limits, previously existing rights were respected, as required by the Law. Since their first master plan, these rights have been recognized, although many these concessions were outdated or abandoned.

In this context, it should be mentioned that the REDD Project not only respect, but also promote rights both within the Project area and in the Project zone, which corresponds at the same time to its wide ZA of the 2.3 million hectares. In addition, given the large area of the ZA and a large number of local population and population centers, since 2015 CIMA has a protocol for the identification and prioritization of the populations with which it will work, by identifying those areas that are critical to comply with the objectives of forest conservation.

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 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).

Its important to hightligt that in August 25, 2016, the Mixed Court of Bellavista of the Superior Court of Justice of San Martín passed judgment No. 37 in which Mr. Suarez and others were ordered to evict the lands located in PNCAZ.

All the cows were removed and parkguards install a perimeter fence; so, this activity is finished, parkguards only make routine patrols to the site.

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:	4,642,225 t CO ₂ -e (2017) 5,362,137 t CO ₂ -e (2018)
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:	19,330,323.63 t CO ₂ -e (2017) 20,062,507.39 t CO ₂ -e (2018)
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), <i>humedales-vegetacion inundable</i> and <i>tierra firme</i> (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 <i>j</i> 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. <i>Oecologia</i> 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 N° 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	<i>R</i>
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. <i>Oecologia</i> 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 N° 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 <i>Mauritia flexuosa</i> 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	<i>Regional Forest Cover / Non-Forest Cover Benchmark Map</i>
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	<i>Project Forest Cover Benchmark Map</i>
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	<i>Leakage Belt Forest Cover Benchmark Map</i>
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:	1,805,519.9 ha (at beginning of 2017 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>i</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 2017 – 2018 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 ₂ O).
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:	Period	t CO ₂ -e (all strata)
	2017	9,291.9
	2018	9,291.9
	Total 2017 - 2018	18,583.8
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>i</i> at time <i>t</i>	
Source of data	Calculated	
Description of measurement methods and procedures to be applied		
Frequency of monitoring/recording	Every ≤ 5 years	
Value monitored:	Period	t CO ₂ -e (all strata)
	2017	4,038,983.70
	2018	4,038,983.70
	Total 2017 - 2018	8,077,967.41
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>i</i> at time <i>t</i>	
Source of data	Calculated	
Description of measurement methods and procedures to be applied		
Frequency of monitoring/recording	Every ≤ 5 years	
Value monitored:	Period	t CO ₂ -e (all strata)
	2017	3,231.9

	2018	3,231.9
	Total 2017 - 2018	6,463.8
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:	Period	ha (all strata, all land uses)
	2017	10.21
	2018	10.21
	Total 2017 - 2018	20.43
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 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:	Period	ha (all strata, all land uses)
	2017	8,807.8
	2018	8,807.8
	Total 2017 - 2018	17,615.61
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 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:	Period	ha (all strata, all land uses)
	2017	8.41
	2018	8.41
	Total 2017 - 2018	16.83
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 2018

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>i</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 <i>u</i> in stratum <i>i</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 <i>q</i> in stratum <i>i</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>i</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 ≤ 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>i</i> at time <i>t</i>
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. Emissions from degradation de minimis.
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>i</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. Emissions from degradation de minimis.
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	
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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>i</i> in the project area at time <i>t</i>
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. Emissions from degradation de minimis.
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 \leq 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 \leq 5 years
Value monitored:	0
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of the data	Calculation of leakage emissions
Calculation method	
Comments	<p>May be conservatively set to zero A demonstration is required that areas will be protected against deforestation. Such a demonstration shall include either:</p> <ol style="list-style-type: none"> 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	<i>TOTFOR</i>
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	<i>PROP_{RES}</i>
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	<i>N</i>
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	<i>DBH</i>
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	<i>Dia_{n,i,t}</i>
Data unit	cm
Description	Diameter of piece <i>n</i> of dead wood along the transect in stratum <i>i</i> , at time <i>t</i> in <i>cm</i>
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	<i>BD_{dia}</i>
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 \leq 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	<i>TD_{SDW}</i>
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)
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Data / Parameter	<i>H_{SDW}</i>
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	<i>Project Forest Cover Monitoring Map</i>
Data unit	ha
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period (= updated <i>Project Forest Cover Benchmark Map</i>).
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:	1,347,548.0ha (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	<i>Leakage Belt Forest Cover Monitoring Map</i>
Data unit	ha
Description	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period (= updated <i>Leakage Belt Forest Cover Benchmark Map</i>).
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:	1,787,904.3 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 (2017 - 2018, 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 $\Delta CP, Enh, i, t$ 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 ($\dot{A}C_{P, Def, i, t}$ and $\dot{A}C_{P, DistPA, i, t}$ 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 $\dot{A}C_{P, Dist, q, i, t}$ and $\dot{A}C_{Pools, Def, u, i, t} = C_{BSL, i}$). 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 be 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 3.1.

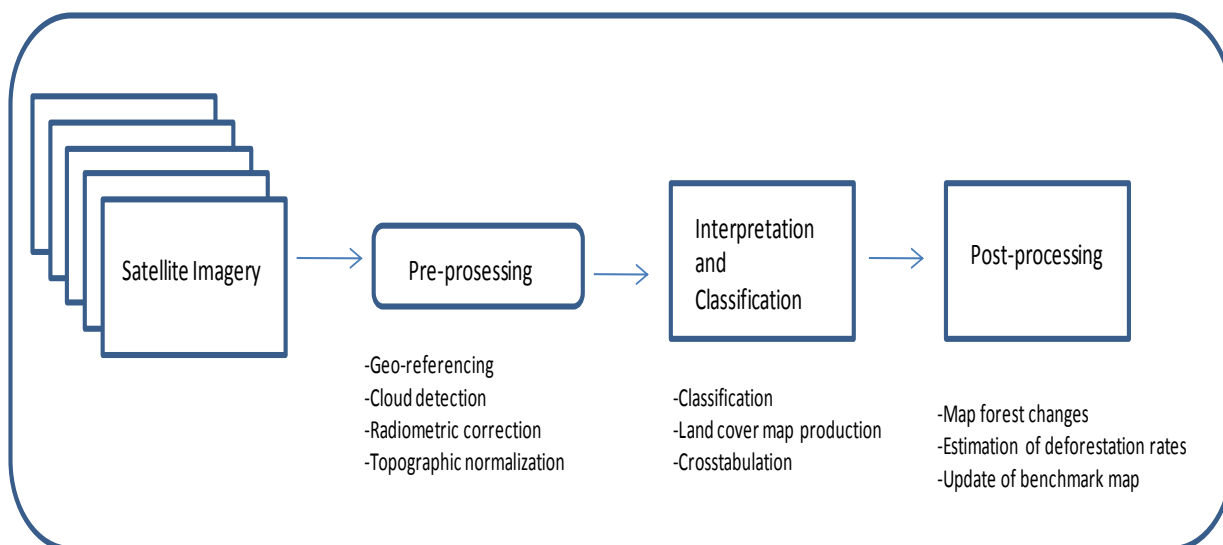


Figure 3.1. General workflow for monitoring forest cover change in the project area and leakage belt

The forest cover benchmark map for the project in August 2016 (Figure 3.2) establishes the extent and location of forest and non-forest at the beginning of the crediting period and the first verification interval.

Figure 3.2: Forest cover benchmark map for project area, August 2016



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 NASA³⁴.

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 applied 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

³⁴ <http://landsathandbook.gsfc.nasa.gov/level/>

clouds and cloud shadow. Other imagery from within 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 3.1), 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 3.1. Example accuracy assessment results

Land-use class as determined from ground-truth points	Classification		Total	Accuracy (%) <i>User's accuracy</i> (# 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 (%) <i>Producer's accuracy</i> (# 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 3.1.3.8.

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 3.2.

Table 3.2. Communities to be surveyed

Reference region (District)	Population center
Huimbayoc	Pongo Isla
Huimbayoc	Pucallpa
Chazuta	Ricardo Palma
Chazuta	Callanayacu
Shamboayacu	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.* $\geq 10\%$ 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 ($\dot{A}C_{P,DegW,i,t}$) are estimated by multiplying area ($A_{DegW,i}$) by average biomass carbon of trees cut and removed per unit area ($C_{DegW,i,t} / AP$).

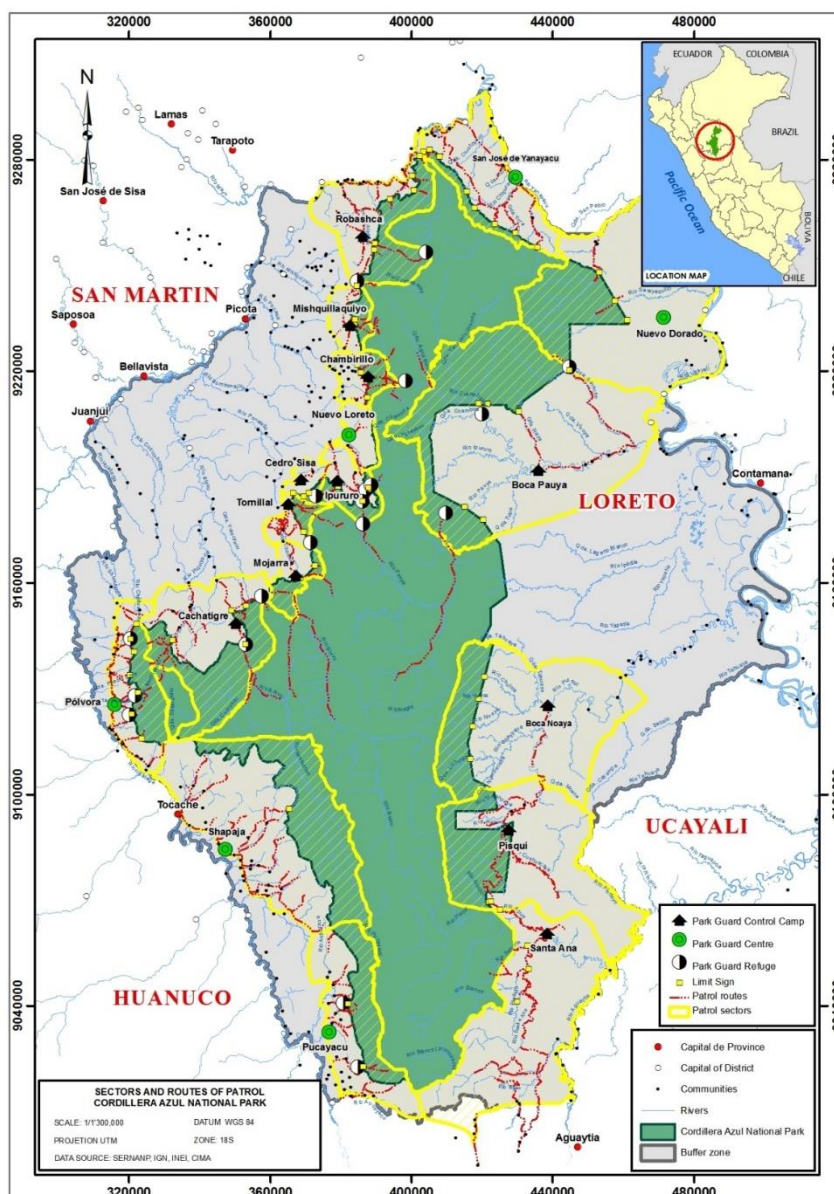
The more intensive 3% sample will be carried out once every 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area to produce an estimate of emissions resulting from illegal logging ($\dot{A}C_{P,DegW,i}$). Estimates of emissions will be

annualized (to produce estimates in t CO₂-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 km². The location of patrol areas and park control posts are shown in Figure 3.3.

Figure 3.3. 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 2016 forest cover benchmark map for the leakage belt (Figure 3.4). 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.

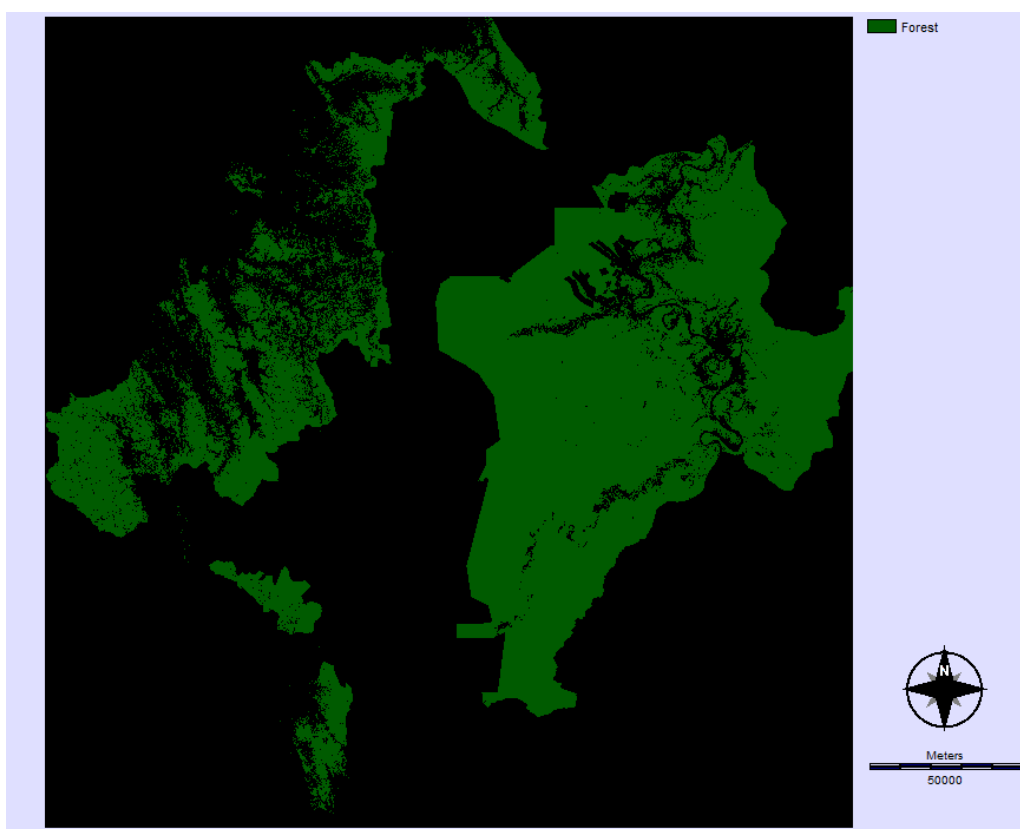


Figure 3.4. Benchmark map of forest cover in 2016 in the leakage belt

shape: 2018_PA_benchmark

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 ≤ 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 ($\Delta C_{LK-ASU-LB}$).

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 2015, 2016, and current (2017 - 2018) 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 ≤ 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 VCU will be calculated entering data into the table format (Table 3.5, 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 3.3. 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	$\Delta C_{P,DefLB,t}$ t CO ₂	$\Delta C_{LK-ASU-LB}$ t CO ₂
2009	6,910,840.7				
2010	7,497,174.1				
2011	9,658,074.5				
Etc...	Etc...				

Table 3.4. 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	$A_{LK-IMM,t}$ ha	$A_{DefPA,i,t}$ ha	$A_{DefLB,i,t}$ ha	$A_{LK-ACT-IMM,t}$ ha	$A_{LK-OLB,t}$ ha	$PROP_{CS}$	$\Delta C_{LK-ASU,OLB}$ 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 3.5 Calculation format for estimates of GHG credits eligible for issuance as VCUs

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Risk buffer (%)	Deductions for AFOLU pooled buffer account	Estimated net GHG emission reductions or removals (tCO ₂ e)
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.

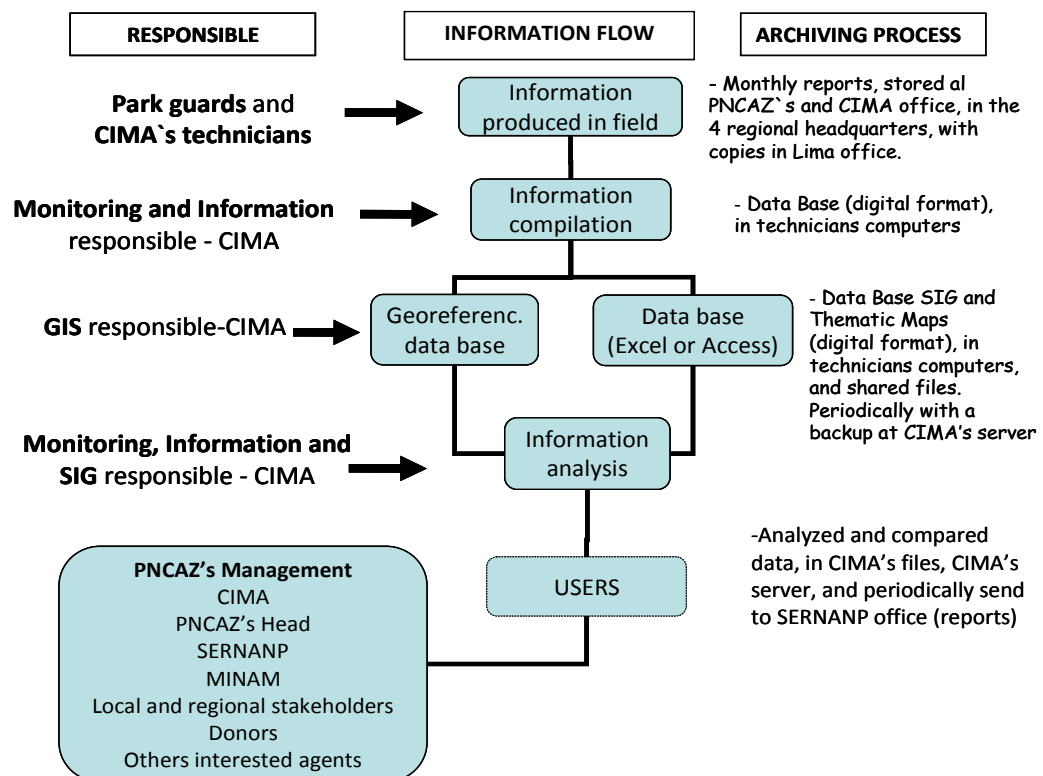
Remote sensing image analysis is conducted by CIMA's GIS team periodically according to the procedures discussed in PD Appendix 4.

Field data is the result of CIMA technicians' trips and the parkguards 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 3.5).

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 sent 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 3.5. 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 2017 - 2018 period, have been reported during the last quarter of 2018 to SERNANP and the team of PNCAZ, once they were finalized. The information has also disseminated in different meetings in the framework of the REDD board of the San Martin region.

For the Communications between CIMA and the communities neighboring the park, the best space for continuous and massive participation is the community assemblies (*Asambleas comunales*), where the technicians monthly participate according to their calendar of visits in coordination with each village. The assemblies are communal spaces where CIMA takes the chance to hold awareness sessions, trainings, take communal decisions, provide and exchange news, make work coordination, and inform of events, information, complaints, requirements, etc. from both sides. For this, CIMA has developed a series of informative materials, so that technicians can have the basis on which they explain the REDD project, linked to the Program and its expected results.

CIMA has a Non-Formal Environmental Education program, which includes a series of 11 modules or sessions and their respective work material; among these modules is Session N ° 2 corresponding to Ecosystem Services (see section 4.1.3; Figure 4.3 y 4.5), which take place in the space that the community provides to CIMA within the framework of the communal assembly. These non-formal environmental education events in communities are permanent, massive and represent the most basic level of intervention, to include populations where CIMA has little intervention; In very remote villages where CIMA cannot reach, it is the park rangers who directly implement these sessions under the advice of CIMA.

Eventually, CIMA can arrange general meetings outside of the communities, as was done during the Master Plan process in 2016 and 2017, where all stakeholders were required to contribute and validate simultaneously on PNCAZ management issues; These processes of mobilization of people are very expensive and take a long time (as confirmed by verifiers in field), so this mechanism is not ideal; although, the advantage is that we can get the minutes or agreements with almost everyone involved in the process. The Master Plan process was an ideal and exceptional scenario (it takes place every 5 years) where it was used to talk massively about conservation and management issues of the PNCAZ, including the REDD issue as an essential part of the *Environmental Objective* (Objective 1 of PNCAZ Master Plan), and as a mechanism to achieve economic sustainability until 2018.

Beyond the buffer zone, considering a national level, information on REDD projects in protected areas and in particular that of Cordillera Azul used varied mechanisms, such as the written press and media on the web. For example, in June 2018, articles about purchase of carbon credits by *Corporación Financiera de Desarrollo* (COFIDE) mention amounts related to forests and GHG emissions in a manner accessible to the general public, mentioning that the funds obtained by the carbon credits are destined to the areas that generated them, which brings improvements for its population. Other spaces are the website of SERNANP and Althelia:

- <https://andina.pe/agencia/noticia-cofide-compensa-huella-carbono-corporativa-proyecto-parque-nacional-cordillera-azul-714742.aspx>

- <http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/cofide-compensa-huella-de-carbono-con-proyecto-redd-del-421417>
- <https://althelia.com/investment/cordillera-azul-national-park-redd-project/>

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 Azulín: 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://theforestdialogue.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 Martín – 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 years 2017 - 2018 is shown in Table 3.6 below (derived from Section 3.1 of the VCS PD; Table 3.21). 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 2017 is 8 August 2016 to 7 August 2017.

Table 3.6. Calculation of baseline emissions

Year	C_{TOTPA}	C_{TOTLB}
2017	4,642,224.5	19,330,323.6
2018	5,362,137.3	20,062,507.4
Total 2017 - 2018	10,004,361.8	39,392,831.0

3.2.2 Project Emissions

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

Table 3.7. Parameters used to calculate $\Delta CP, DefPA, i, t$

$A_{DefPA, u, i, t}$ (ha)	Area of recorded deforestation in the project area stratum <i>i</i> converted to land use <i>u</i> at time <i>t</i> , ha	Calculated in imagery analysis
$\Delta C_{pools, Def, u, i, t}$	Net carbon stock changes in all pools in the project case in land use <i>u</i> in stratum <i>i</i> at time <i>t</i> , 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 3.8. Components of $A_{DefPA, u, i, t}$ (ha)

Year	$A_{DefPA, u, i, t}$ (ha)				TOTAL
	Alluvial	Collinsos (Hill forest)	Montanosos	Humedales (Aguajal)	
2017	0.27	1.35	8.59	0.00	10.21
2018	0.27	1.35	8.59	0.00	10.21
Total 2017 - 2018	0.54	2.70	17.19	0.00	20.43

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 3.9. 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,l}	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 3.10. Components of $\Delta CP,DefPA,i,t$

Year	$\Delta CP,DefPA,i,t$ (tCO ₂)				Total
	Alluvial	Collinsos (Hill forest)	Montanosos	Humedales (Aguajal)	$\Delta CP,DefPA,i,t$
2017	68.53	574.24	5,417.25	0.00	6,060.01
2018	68.53	574.24	5,417.25	0.00	6,060.01
Total 2017 - 2018	137.05	1,148.48	10,834.50	0.00	12,120.03

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 3.11. Components of $ADistPA,q,i,t$ (ha)

Year	$ADistPA,q,i,t$ (ha)				
	Alluvial	Collinosos (Hill forest)	Montanosos	Humedales (Aguajal)	TOTAL
2017	6.25	0.31	1.84	0.00	8.41
2018	6.25	0.31	1.84	0.00	8.41
Total 2017 - 2018	12.51	0.63	3.69	0.00	16.83

Shape: 2018_PA_AllClasses

Table 3.12. Parameters used to calculate $\Delta CP,Dist,q,i,t$

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-natural disturbance stratum q , in stratum i ; t CO ₂ -e ha ⁻¹	0

Table 3.13. Components of $\Delta CP,Dist,q,i,t$

Stratum	CBSL _i	CP,Dist,q,i	CDist, WP,q,i	$\Delta CP,Dist,q,i,t$
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 3.14. Components of $\Delta CP,DistPA,i,t$

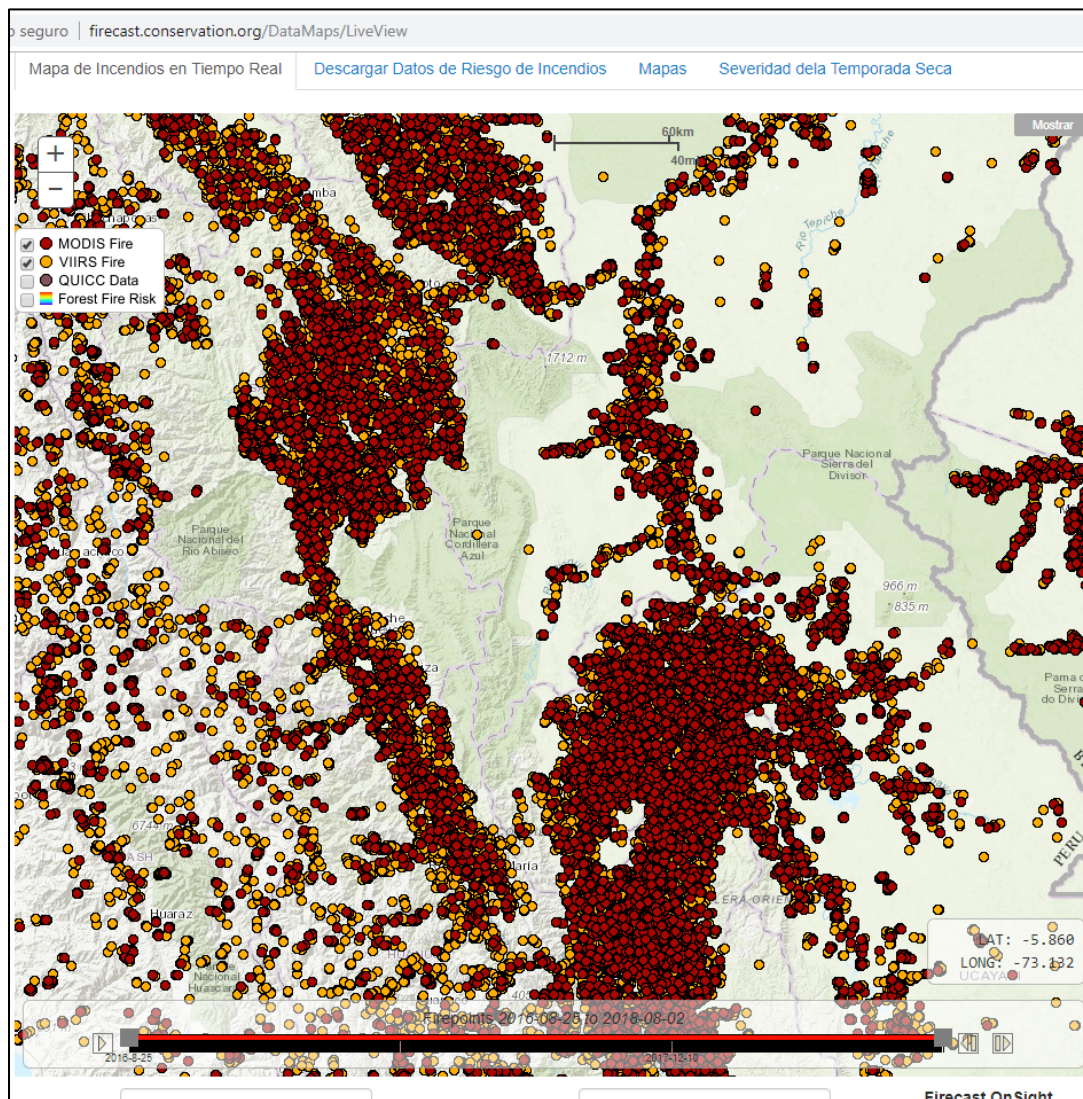
Year	$\Delta CP,DistPA,i,t$				
	Alluvial	Collinosos (Hill forest)	Montanosos	Humedales (Aguajal)	Total
2017	1,845.8	147.0	1,239.1	0.0	3,231.9
2018	1,845.8	147.0	1,239.1	0.0	3,231.9
Total 2017 - 2018	3,691.7	294.0	2,478.1	0.0	6,463.8

Monitoring biomass burning

Parkguards reported no forest fires during the monitoring period from August 2016 to August 2018.

Likewise, Firecast detected few fires in the project area during the same period (Figure 10). Firecast³⁵ is a MODIS-based fire monitoring system developed by Conservation International, NASA and ESRI, with highly precise detection of fires $\geq 50m^2$. Two apparent fires were detected in the northern area of PNCAZ, however, in the classification process, no evidence of fire scars was detected (i.e. no visible loss of forest cover or structural loss), and therefore $A_{burn,it}$ was set equal to 0.

Figure 3.6. Firecast report for the monitoring period August 2016 to August 2018.



Source: <http://firecast.conservation.org>

³⁵ <http://firecast.conservation.org>

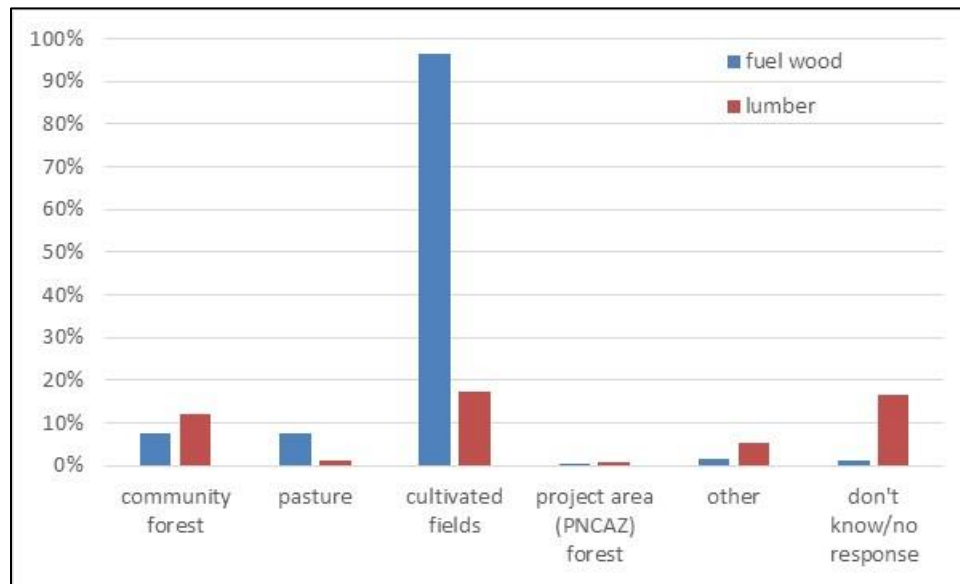
Monitoring illegal logging

From May to June 2018, 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, 10 to 30 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 311 persons were interviewed. Most of the wood was collected from within community forests, and from remnant timber in cultivated fields outside the project area. Among those respondents, one mentioned sourcing fuelwood from within the project area, and three mentioned sourcing lumber from the project area. However, emissions from fuelwood and lumber collection within the project area were de *minimis*³⁶, and therefore not accounted.

Detail of results of 2018 wood collection surveys and source areas of wood collection by respondents are showed in the following graphic (Figure 3.7); the 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

Figure 3.7. Results of 2018 wood collection surveys showing source areas of wood collection by respondents

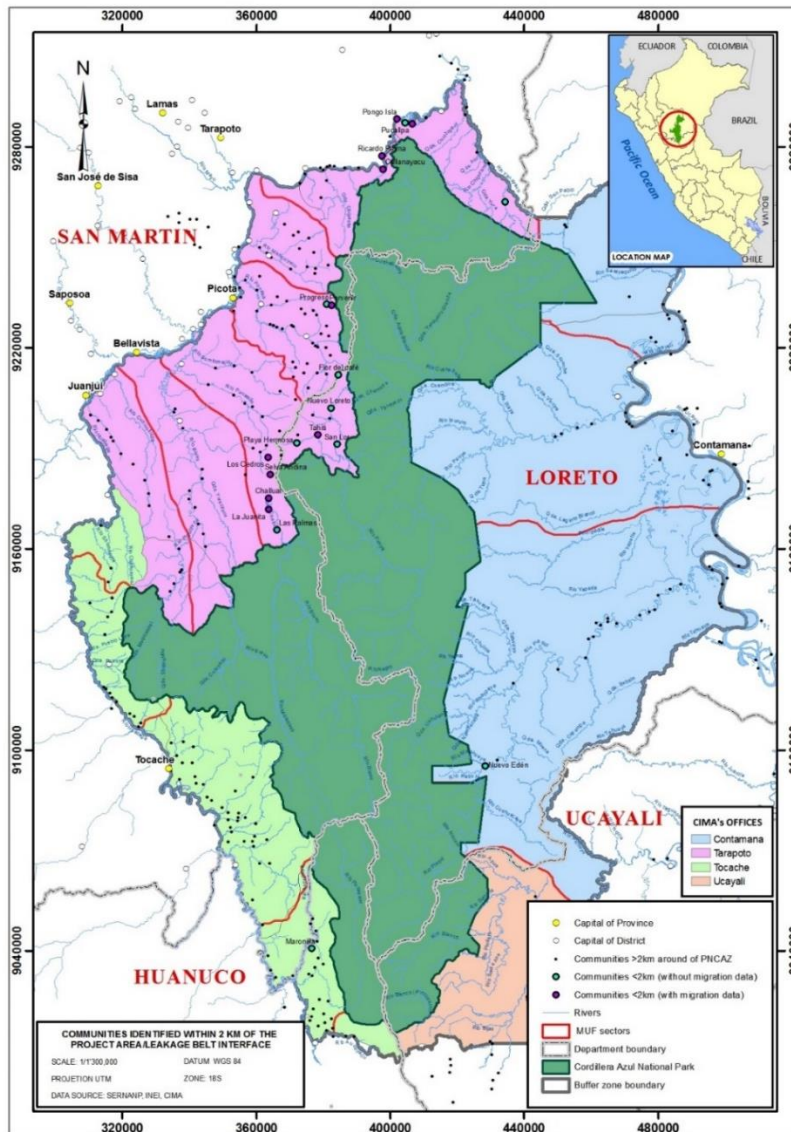


The methodology module M-MON requires that “If $\geq 10\%$ of those interviewed/surveyed believe that degradation may be occurring within the project boundary then the limited on-the-ground degradation survey shall be triggered.” Since less than 10% of respondents reported collecting either fuelwood or lumber from the project area, no further surveys are warranted.

³⁶ PNCAZ Deg De Minimis Calc 2016_2018 – 31Oct2018.xlsx

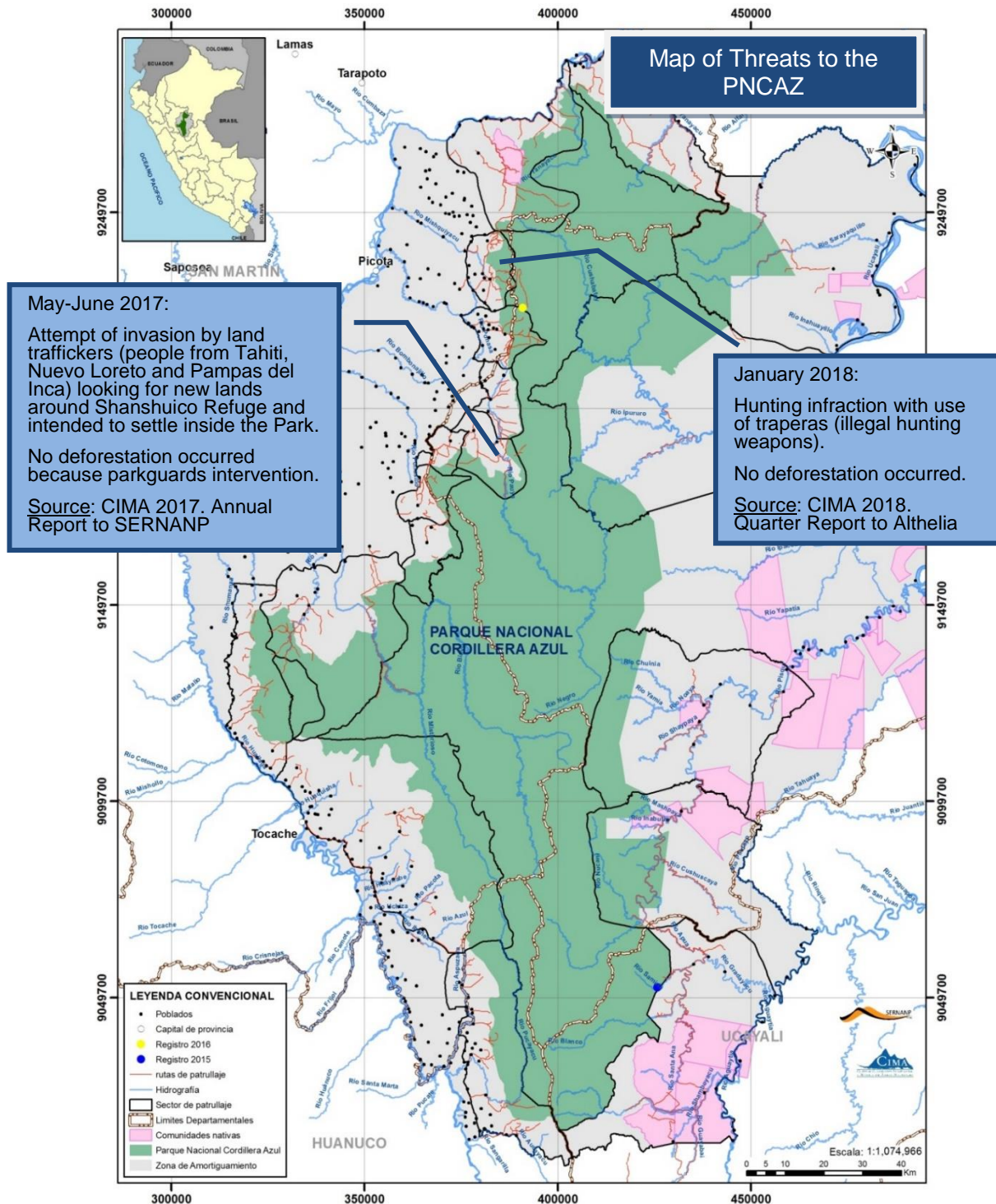
Among respondents giving information on the maximum distance travelled to collect wood, the average maximum distance stated was 1.7 km for fuel wood (min: 0.01 km, max: 8 km) and 2.9 km for lumber (min: 0.1 km, max: 12 km). There are only 20 communities located within 2 km of the project area (Figure 3.8), 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 3.8. Communities identified within 2 km of the project area/leakage belt interface



Further, the results of the degradation surveys are supported by PNCAZ park guard reports from the 2017-2018 monitoring period. PNCAZ guards detected no incidences of deforestation or timber extraction during the monitoring period.

Figure 3.9. Map showing sites of the illegal intrusions, 2017 - 2018



In this context, the results of the degradation surveys are supported by reports from PNCAZ park guards during August 2016 – August 2018 monitoring period, with a total of 1,202 control patrols (see Appendix 1) focused on the boundaries between the PNCAZ and its buffer zone, which mention only two instances of illegal intrusions - but without any deforestation event - reported and resolved; occurred in Tarapoto sector in the patrol areas of the Control Points Shanshuico and Chimbadillo (Table 3.15).

Table 3.15. 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 ³⁷
2016 (Aug-Dec)	302 patrols from 21 Control Points	---	0 ha
2017	614 patrols from 21 Control Points	1 attempt of invasion to PA in the patrol area of Control Point Shanshuico (Tarapoto sector)	0 ha
2017 (Jan-Aug)	286 patrols from 21 Control Points	1 infraction by illegal hunting in the patrol area from Control Point Chimbadillo (Tarapoto sector)	0 ha

Source: Reports to SERNANP and Althelia

Net project emissions within the project area calculated in Table 3.16 are based on the change in carbon stocks during the 2017 - 2018 monitoring period.

Table 3.16. Net project emissions with the project area ΔCP (t CO₂-e)

Year	$\Delta CP, DefPA, i, t$	$\Delta CP, Deg, i, t$	$\Delta CP, DistPA, i, t$	ΔCP
2017	6,060.0	0	3,231.9	9,291.9
2018	6,060.0	0	3,231.9	9,291.9
Total 2017 - 2018	12,120.0	0	6,463.8	18,583.8

³⁷ 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.

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 2017 - 2018.

Table 3.17. Area deforested in the leakage belt in 2017 - 2018 $A_{DefLB,u,i,t}$ (ha)

Year	$A_{DefLB,u,i,t}$ (ha)			Total
	Anthropogenic (forest)	Humedales – wetlands	Terra firme	
2017	2,743.92	1,932.93	4,130.96	8,807.8
2018	2,743.92	1,932.93	4,130.96	8,807.8
Total 2017 - 2018	5,487.84	3,865.86	8,261.91	17,615.61

Shape: 2018_LB_NonForestall_strata

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

Table 3.18. Emissions from deforestation in the leakage belt in 2017 - 2018 (t CO₂e)

Year	$\Delta CP, DefLB, i, t$ (tCO ₂)			Total $\Delta CP, DefLB, i, t$
	Anthropogenic (forest)	Humedales – wetlands	Terra firme	
2017	1,226,803.02	1,088,886.15	1,723,294.53	4,038,983.70
2018	1,226,803.02	1,088,886.15	1,723,294.53	4,038,983.70
Total 2017 - 2018	2,453,606.05	2,177,772.29	3,446,589.07	8,077,967.41

The net greenhouse gas emission in the project case for the leakage belt, parameter $\Delta CP, LB$, is equal to the sum of stock changes due to deforestation in 2017 - 2018, equal to 3,955,201.4 t CO₂e. Calculations of activity shifting leakage occurring in the leakage belt in the with-project case ($\Delta C_{LK-ASU-LB}$) are consolidated in Table 21 below.

Table 3.19. 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	$\Delta C_{LK-ASU-LB}$ t CO ₂
2017	19,330,323.63	8,807.81	Varies by strata	4,038,983.70	0.00
2018	20,062,507.39	8,807.81	Varies by strata	4,038,983.70	0.00
Total 2017 - 2018	39,392,831.02	17,615.61		8,077,967.41	0.00

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 3.20. The resulting $PROP_{IMM}$ parameter is 19.7%, which is the average percent recent immigrant (potential deforestation agents) among the survey participants.

Table 3.20. 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%
Shamboyac	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 3.21. 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	2010 FAO FRA Peru Country Report	LK-ASU 11
Year	$PROP_{IMM}$	$A_{BSL,PA,unplanned,t}$ ha	$A_{LK-IMM,t}$ ha	$A_{DefPA,i,t}$ ha	$A_{DefLB,i,t}$ ha	$A_{LK-ACT-IMM,t}$ ha	$A_{LK-OLB,t}$ ha	C_{OLB}	$\Delta C_{LK-ASU,OLB}$ t CO ₂
2017	0.197	10,748.3	2,117.4	10.2	8,807.8	1,737.1	380.3	376.3	143,096.9
2018	0.197	12,409.4	2,444.6	10.2	8,807.8	1,737.1	707.5	376.3	266,231.6
Total 2017 - 2018									409,328.6

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 3.22).

Table 3.22. 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%

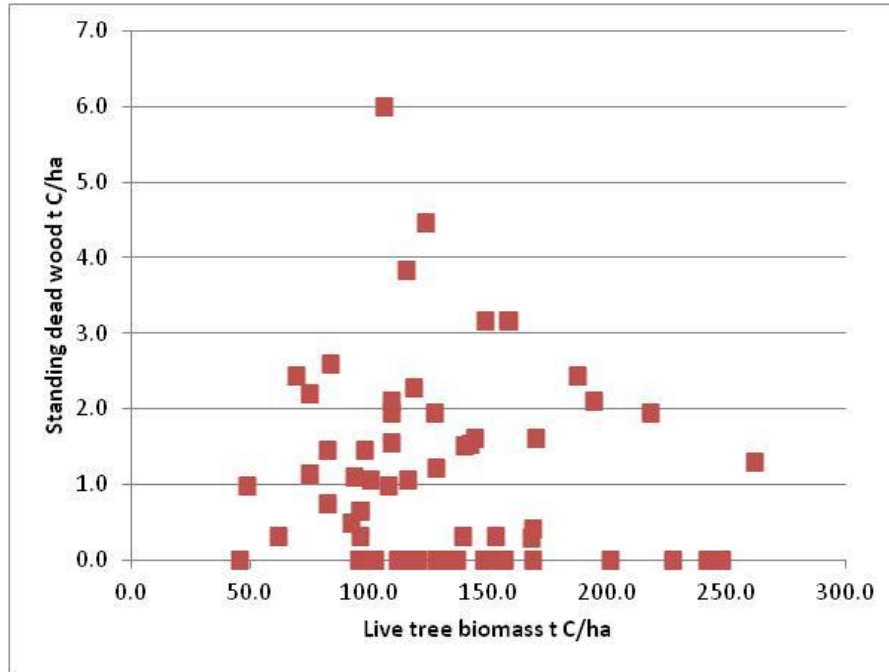
Source: Shoch et al. 2009 *Forest biomass carbon inventory of the Parque Nacional Cordillera Azul (PNCAZ)*

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 3.10), 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 3.11).

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 3.23 that follows the figures.

Figure 3.10. 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 3.11. The 95% confidence interval (dashed lines) of predicted deforestation rate

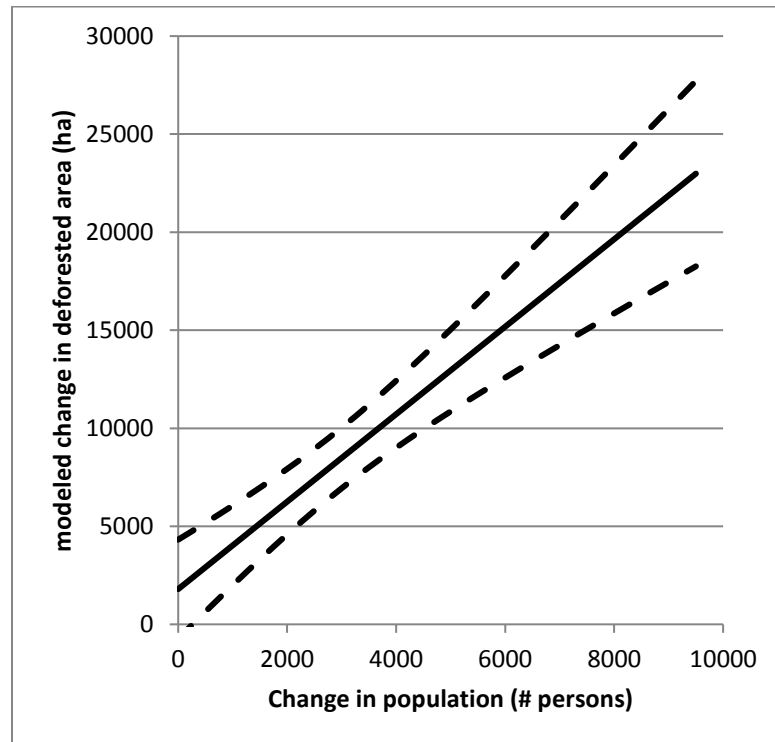


Table 3.23. Summary of uncertainty calculations

X-UNC eq #	5	Derived in PD Section 3	Regression model	1	3	6	10	11
Year	$Uncertainty_{YBSL,SS}$	Total population change	Modelled deforestation (ha)	$Uncertainty_{YBSL,RATE,t}$	$Uncertainty_{YBSL,RATE,t^*}$	$Uncertainty_{YBSL,t^*}$	$C_{REDD_ER ROR,t^*}$	Adjustment factor applied to C_{REDD,t^*}
2017	7.5%	30,800	70,493	27%	9%	12%	12%	100%
2018	7.5%	36,030	82,159	27%	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 3.24. Table of estimated net GHG emission reductions or removals during this monitoring period (8 August 2016 to 7 August 2018)

Year	Baseline emissions or removals (tCO _{2e})	Project emissions or removals (tCO _{2e})	Leakage emissions (tCO _{2e})	Risk buffer (%)	Deductions for AFOLU pooled buffer account	Available VCUs
2017	4,642,225	9,292	143,097	10%	448,984	4,040,852
2018	5,362,137	9,292	266,232	10%	508,661	4,577,952
Total 2017-2018	10,004,362	18,584	409,329	10%	957,645	8,618,804

Table 3.25: Table of estimated total net GHG emission reductions or removals considering vintage since 2009, and currently emission reductions

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)	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
2017	4,642,225	9,292	143,097	4,489,836	4,040,852
2018	5,362,137	9,292	266,232	5,086,613	4,577,952
Total	28,970,973	516,784	409,329	28,044,858	25,240,372

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 and concern for these human populations, and encourage the best possible information is taken without generating any impacts. For this reason, CIMA generated a Project with Amazon Andes Fund (see section 2.4.6) to develop complementary studies that allow the categorization of the area destined to be a reserve for uncontacted Kakatibos populations that exists in the southeastern part of PNCAZ and its buffer zone. As part of its agreement with the *Instituto del Bien Común* (IBC), CIMA finances during 2017 and 2018 the research conducted by anthropologists to update the diagnosis of the Kakataibo population in isolation; and facilitates field entries to the study area, conducted in 2018 for the collection of information based on local testimonies:

- Abril: Informative field trip by the MINCU
- Mayo: first field trip by IBC team
- Agosto: second field trip by IBC team

Populations visited for the taking of testimonies - in the PNCAZ's buffer zone – were the following table 4.1:

Basin	Local populations
Pisqui	<ul style="list-style-type: none"> • Nuevo Edén • La Cumbre • Túpac Amaru • San Luis de Charasmaná • Manco Capac • Vencedor
Aguaytía (low part of the river)	<ul style="list-style-type: none"> • Yamino • Mariscal Cáceres • Santa Rosa De Aguaytía • Santa Rosita de Apua • Libertad de Samiria (mestizos)

So, CIMA has been contributing to the process of recognition of Indigenous Peoples in Isolation (PIA) in the Aguaytia-Pisqui sector for the Ministry of Culture (MINCUL)³⁸, and its territories.

³⁸ This **recognition of the Kakataibo people in isolation** occurred 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. <http://www.andina.com.pe/agencia/noticia-ministerio-cultura-garantiza-derechos-del-pueblo-indigena-kakataibo-678171.aspx>

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.

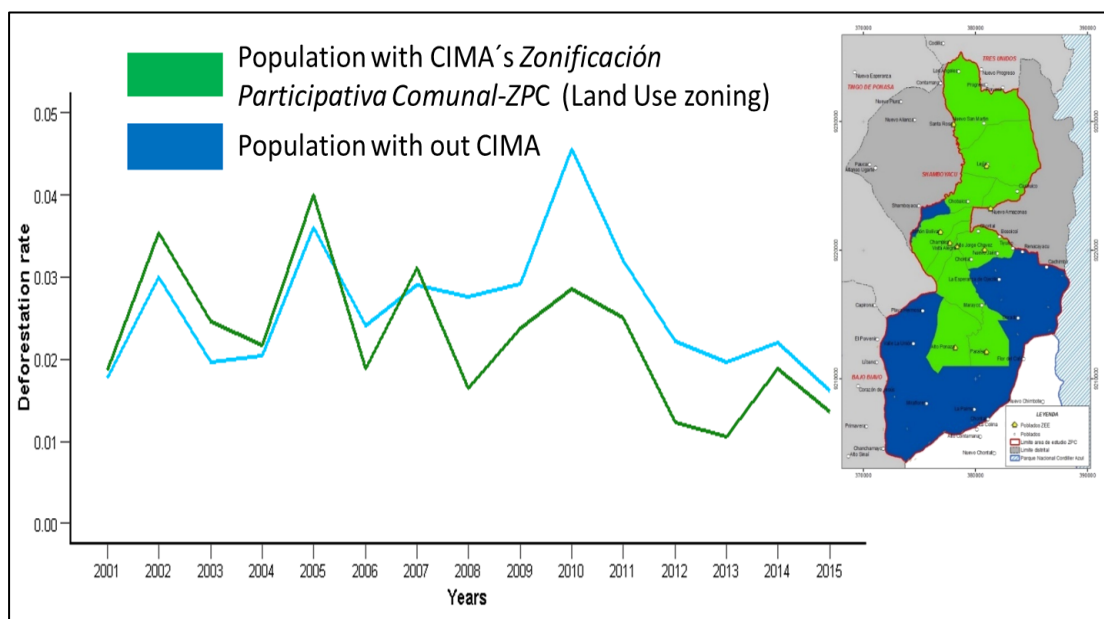
Human Communities in the Project Zone

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 2008-2018 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.

A recent study (Rodriguez et al. 2018³⁹) has shown additional benefits of the processes that CIMA develops with the population of the buffer zone; Specifically, thanks to the Zonal Participatory Communal ZPC (Community-participatory Zoning) there is less deforestation in villages with ZPC, as shown in the following Figure 4.1.

Figure 4.1 Reduction of deforestation in populations with ZPC, study for Shamboyacu sector



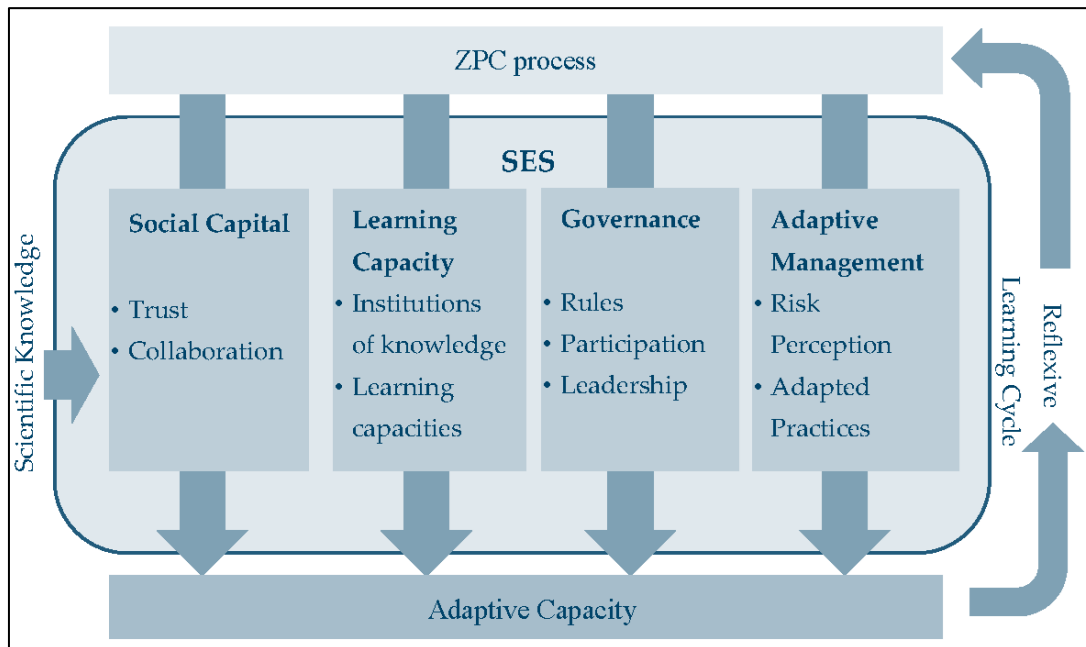
Source: Rodríguez, L., E. Cisneros, T. Pequeño, M. Fuentes and Y. Zinggrebe. 2018.

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https://www.researchgate.net/publication/323174937_Building_Adaptive_Capacity_in_Changing_Social-Ecological_Systems_Integrating_Knowledge_in_Communal_Land-Use_Planning_in_the_Peruvian_Amazon

This work is based on incorporating to the scientific knowledge the local knowledge as an inherent part for the social-ecological systems (SES) and is reflected and inserted into a continuous learning cycle, as exposed in Figure 4.2.

Figure 4.2. Conceptual framework for developing adaptive capacity in communities at the buffer zone of Cordillera Azul NP.



Source: Rodríguez, L., E. Cisneros, T. Pequeño, M. Fuentes and Y. Zingrebe. 2018.

In this context, the ZPC makes it possible to strengthen communal reclusion, since it reduces the use of risk areas and natural disasters promoted by poor territorial management. Additionally, participatory processes where local knowledge is incorporated into spatial diagnostic documents and their use for local decision-making is promoted, has generated according to this study:

- Inclusion and validation of knowledge in the zoning process
- Improvement of the structure of the decision-making process (rules of coexistence)
- Empowerment of local populations to face external threats (I.e. with their *rondas campesinas*)
- Generating leadership in conservation activities (new local PA)
- Provide technical guidance for Quality of Life Plans (Blue Agreements, conservation agreements)

In the previous validation periods (2012-2014, 2014-2015, 2015-2016) and during the current (2016-2018), 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. As was previously mentioned, CIMA improve the selection process for the intervention with local communities and populations, developing a methodology to prioritize communities, considering variables of closeness to park, governance, threats, among others, as part of a toolkit that is being constructed.

Considering this prioritization and due to budgetary constraints, CIMA decide to phase out 2 sectors in 2017-2018: Huimbayoc and Chazuta; Both sectors were of the least threatened, because they are eminently indigenous Kechua-lamist populations. This could generate some complaints from the population, so that technicians and park rangers have a greater presence in their areas, in order to avoid some conflicts in the use of resources and territorial; those that are occurring, mainly with the communities of Callanayacu (improper use of methods of hunting) and Santa Rosillo (spatial conflicts between migrant and indigenous population). Currently CIMA maintain constant communication with those communities and frequently visits, even without a designated technician for those sites.

Despite the setbacks, the management work of CIMA in the PNCAZ shows positive results and has been recognized internationally, so SERNANP postulated Cordillera Azul with 4 more PA to the UICN - Green List⁴⁰. Currently, CIMA is about to consolidate the PNCAZ's candidacy this 2018.



Source: Agencia Andina de noticias⁴¹

The selection criteria for this standard are about management efficiency: (1) Successful results of governance, (2) Successful results of planning, (3) Successful results of conservation, and (4) Sustainability and impacts for conservation.

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**

⁴⁰ <https://www.iucn.org/es/content/uicn-afina-la-lista-verde-de-%C3%A1reas-protegidas>

⁴¹ <https://andina.pe/agencia/noticia-cordillera-azul-y-reserva-amarakarei-a-un-paso-integrar-lista-verde-programa-mundial-725455.aspx>

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, 2016 and 2017-2018).

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

Table 4.2. Comparative quantitative results of community project activities by indicator since the Baseline of the project, to the currently period August 2016 – August 2018

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
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 Pólvara), 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 .	Since 2017 CIMA began the process of ensuring the conservation of 81 thousand hectares of forests in the Cushabatay sector (in light of the delays of SERNANP to expand the PNCAZ). In 2018, the ARA-GOREL considered this area as an Important Ecosystem for Conservation , including field evaluation and local-regional process of training and consultation.
		21,094 ha with land use zoning (ZEE)	86,991 ha with land use zoning (ZEE) + hectares of Tocache district with meso ZEE (GOESAM)	117,066 ha with land use zoning (ZEE) + hectares of Tres Unidos district with meso ZEE (GOESAM)	246,192 ha with land use zoning (ZEE) + hectares of Picota district with meso ZEE (GOESAM)	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.	
Social Capital	# of communities implementing quality-of-life	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.	17 villages and communities have developed their Quality of Life Plans	Until August 2016, a total of 21 villages and communities had been developed their Quality	Until August 2016, a total of 31 villages and communities had been developed their Quality

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
	plans and sharing experiences with neighbors				as well as to continue the process of Implementing.	of Life Plans as well as to continue the process of Implementing.	of Life Plans as well as to continue the process of Implementing. It is expected to reach 34 Quality of Life Plans in 2018.
	# 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	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).	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),	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),	At least 8 villages/communities have organization exclusively conformed by women , directly and actively participating in formal associations strengthened and supported by CIMA: - Asociación de Artesanas Shipibas del Río Pisqui AASHRIPIS - Club de Madres Sarita Colonia - Club de Madres Las Samaritanas" - Club de Madres Virgen de las Mercedes

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
			and are participating in the development of Community Rules and Quality of Life Plans.	Numerous women actively participated in development processes in >50 villages/ communities: ZEE, Community Rules, Strategic planning and implementation.	<ul style="list-style-type: none"> - Club de Madres “Virgen de las Mercedes” (12), - Asociación de Artesanas “Kari Isa Xanu” (18). Additionally, women participating from different <i>Instituciones educativas</i> (> 150), and permanent and actively participated in development processes in >50 villages/ communities: ZEE application, Community Rules, Strategic planning and implementation.	<ul style="list-style-type: none"> - Asociación de Artesanas “Kari Isa Xanu” (18). - Women health for Lejía (>100) Additionally, women participating from different <i>Instituciones educativas</i> and permanent and actively participated in development processes in villages/ communities: ZEE application, Community Rules, Strategic planning and implementation.	<ul style="list-style-type: none"> - Asociación de Artesanas Kari Isa Xanu - > 150 Women actively participate from different <i>Instituciones educativas</i> and rondas campesinas Women participate permanent and actively in development processes in >50 villages/ communities: Environmental education and reflection, 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	766 families (communal organization members) from 25 villages/communities are supported to implement strategic plans (Quality of Life Plans and ActionPlans)	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:	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	4,188 families from 44 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

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
			management plans. 30 families were involved in learning agroforestry and technical training relating to farming.	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; forestry and horticulture; plant nurseries; bee-keeping; recycling; boundary-marking and patrols; and others.	PIP, value chains; creation of local institutions such as cooperatives, committees, associations; development and updating action plans; tourism; handicrafts; forestry and horticulture; plant nurseries; bee-keeping; recycling; boundary-marking and patrols; and others.	(producers' cooperatives and committees), handicrafts and tourism associations, infrastructure, forestry, bee-keeping, recycling, boundary-marking and patrols, etc.	(producers' cooperatives and committees), handicrafts and tourism associations, infrastructure, forestry, bee-keeping, recycling, boundary-marking and patrols, etc.
Physical Capital	# of communities with Economic Capital infrastructure improvements and mechanisms	Zero. Most communities had only basic and often insufficient infrastructure	1 community, Yamino, where infrastructure was built to provide local artisans a market to sell goods.	8 communities identified infrastructure improvements as a priority issue in their Life Plans and CIMA actively supported actions	17 communities identify infrastructure improvements as a priority in their life plans and develops CIMA aimed at implementing these priorities actions, such as:	15 communities identify infrastructure improvements as a priority in their life plans: ✓ Infrastructure projects water and sewage (4 communities), ✓ access roads (4 communities),	30 communities identify infrastructure improvements as a priority in their life plans: ✓ Infrastructure projects water and sewage (13 communities),

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
	for maintaining them sustainably	<p>e to fulfill basic needs.</p> <p>Many had infrastructure needing repairs which the communities could not do due to the types of technology or materials needed to repair the infrastructure.</p>	<p>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.</p> <p>The construction of the infrastructure uses local workers and materials to ensure the long-term viability of the structures.</p>	<p>to implement these priorities such as:</p> <p>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</p>	<p>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 defense (1 community) among others.</p> <p>Among the actions developed by CIMA is linking with local governments, sub-national, sectoral organizations to promote public</p>	<ul style="list-style-type: none"> ✓ communication services (2 communities), ✓ construction of health infrastructure (2 communities), ✓ construction education infrastructure (1 communities), ✓ categorization (2 communities). <p>Additionally, 13 populations include plans for:</p> <ul style="list-style-type: none"> ✓ reforestation and forest conservation (10 communities), ✓ proper management of solid waste (3 communities), among others. <p>Among the actions developed by CIMA is linking with local governments, sub-national, sectoral organizations to promote public infrastructure projects.</p>	<ul style="list-style-type: none"> ✓ access roads and bridges (10 communities), ✓ communication services (4 communities), ✓ construction of health infrastructure (17 communities), ✓ construction education infrastructure (7 communities), ✓ categorization & titling (14 communities). <p>Additionally, 16 populations include plans for:</p> <ul style="list-style-type: none"> ✓ reforestation and forest conservation (8 communities), ✓ proper management of solid waste (9 communities), among others. <p>CIMA continues developing actions to linking with local governments, sub-national, sectoral organizations to promote public investment for the</p>

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
				plans (PIGARS ⁴²) and businesses (INCORP, Electro Oriente).	investment for the development of these infrastructure projects.		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. 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.	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.	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 vigilance groups	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 Aguaytia), San Luis de Charashmana, La Cumbre, Manco Cápac, Nuevo Dorado De Insaya, Fernando Belaunde Terry, Nuevo San	23 communities, 20 community organizations Action plans linked to value chains and infrastructure for connection had been development with local institutions (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	23 communities, 20 community organizations: - Producers organized by associations (16), mainly cocoa AFS: Chambira (ALLIMA SACHA), Santa Rosa (Selva Verde), Nuevo Jaén (Ronda Campesina), Maronilla (Planta Aspuzana), Belaúnde, Nuevo San Martin, Isolaya (ADECACAVACU), San Lorenzo, Nuevo Dorado (Asoc. de Cacaoteros San Pedro de Nuevo Dorado), Mariscal Cáceres (Asoc. Agrop. Nukan Apatai Unicama), Santa Rosa de Aguaytia, Yamino

⁴² 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	2016-2018
			Several communities were started the process and defining new opportunities.	(<i>rondas campesinas</i>),	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.	(Comité de 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 Restoration and resource	(Asoc. Cacaot. Valle de Yamino), Nuevo Arica (Rayos del Sol), Vista Alegre (Comité Alto Biavo), Cachiyacu (Nueva Visión) and Orellana (AREMPU); - Tourism and handicraft (4): San Luis de Charashmaná, La Cumbre, Manco Cápac (AASHPIRIS) and Yamino (Asoc. Turismo y Asoc. Artesanas) - Restoration (2): San Juan and Lejia. - Honey (1): Shapaja (ronda campesina) Note 1: in native communities of Aguaytía and Contamana the forest management is included Note 2: Several farmers receive technical assistance for cacao and coffee, CIMA also works with “ <i>Clubes de madres</i> ” from San Juan,

Parameter	Indicator	Baseline Conditions	Project Conditions: Implementation period				
		2008	2008-2012	2012-2014	2014-2015	2015-2016	2016-2018
							<p>management/conservation (2): Chipaota, Cachiyacu (Nueva vision).</p> <p>Note 3: roads are also improvement as part of the QLP, getting better conditions for market access.</p>

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 (Figures 4.3-a and b). 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 4.3-a:
Howe 2017.
Banner about soil conservation as an ecosystemic service

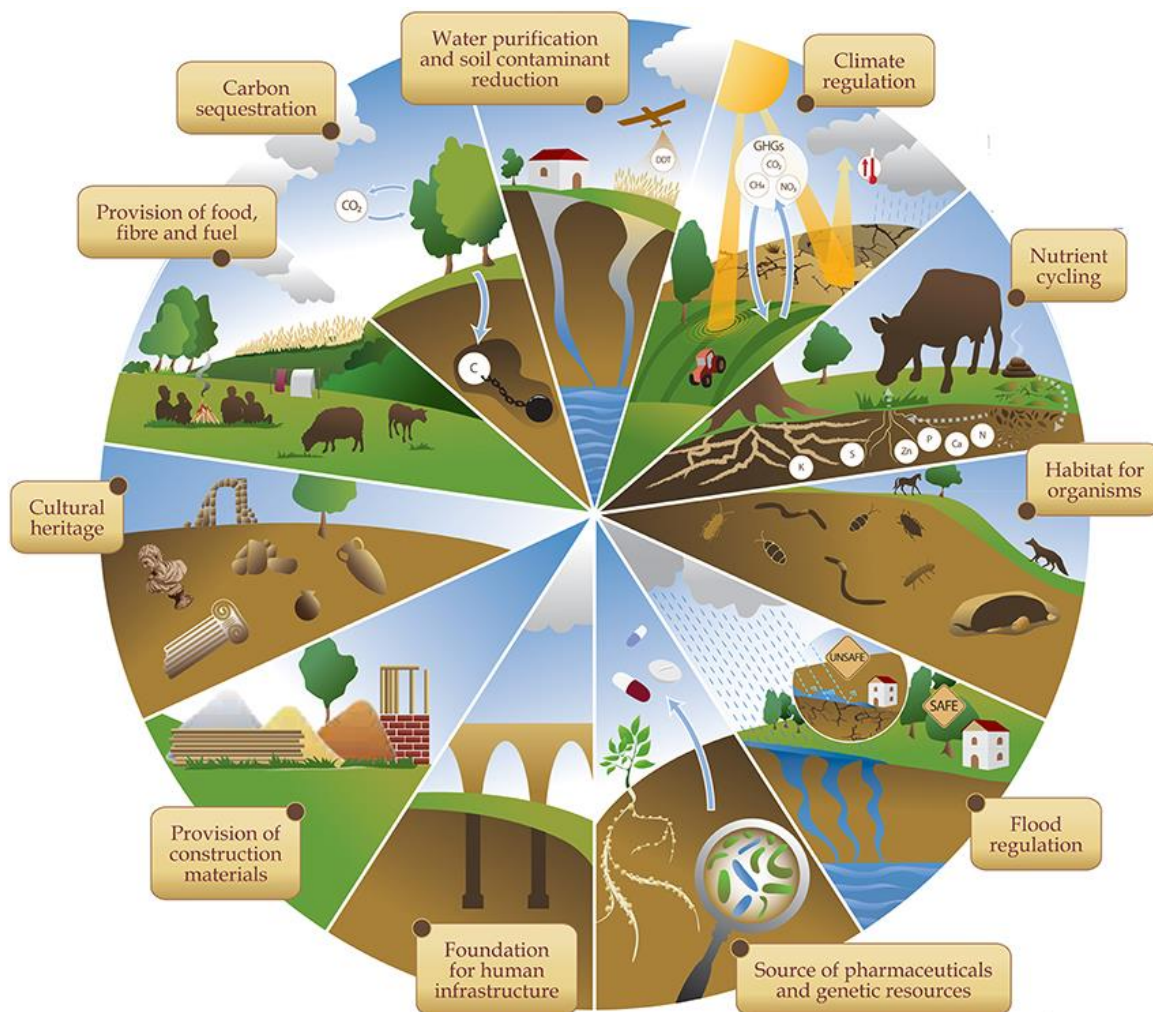
Also: https://issuu.com/charleshowe/docs/cima_erosion_y_conservacion_de_suelo



Figure 4.3-b:
CIMA 2016.
Banner Ecosystem services

A study carried out in the Shamboyacu sector, in the middle and upper section of the Ponasa valley, found that forest patches effectively reduce surface runoff by favoring greater infiltration of water into the soil. The protection of forests upstream of agricultural plots, as well as in areas with long slopes, reduces the amount of runoff, and therefore plays an important role in preventing soil losses⁴³. Recommending the conservation and recovery of forest fragments, which should be considered both in territorial planning (Howe 2017).

Part of this study was to show that the role of soil is extremely important in terms of the ecosystem services it provides to local populations, as evidenced in the following graph.



Source: FAO 2015

⁴³ https://issuu.com/charleshowe/docs/cima_erosion_y_conservacion_de_suel

Specifically, for the sector evaluated in Shamboyacu, the following images are shown where it is visualized by three-dimensional models that vulnerability to erosion is closely related to the lack of vegetation cover (Howe 2017), as shown in the following three-dimensional modeling (figures 4.4-a and b) of the forest and vegetation cover and the loss of soil generated along the Ponasa Basin, sector Shamboyacu, buffer zone of PNCAZ:



Figure 4.4-a. Vegetable cover, 3D view: 2010 image EEZ. Image generated by Rhino3D software (Howe 2017).

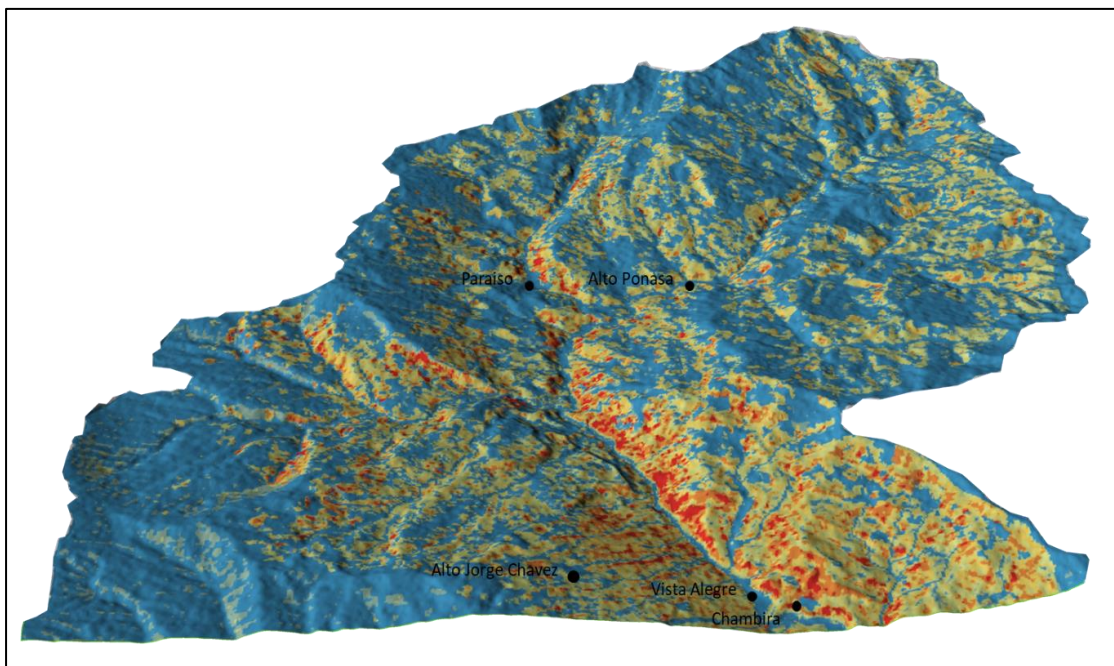


Figure 4.4-b. Lost ground, 3D view: Results of RUSLE. Image generated by the Rhino3D software (Howe 2017).

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 4.5) 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 4.5: CIMA 2016. Banner #2 Environmental Education

During 2016, SERNANP 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 and have been clearly identified in the 2017-2021 Master Plan of the PNCAZ (SERNANP 2017).

These elements of diversity at the landscape and species level are represented in the vision of the Master Plan, approved in 2017-2022 of the PNCAZ.

This is very important since at least 41% of the population that CIMA works with speaks another language besides Spanish (Figure 4.6).

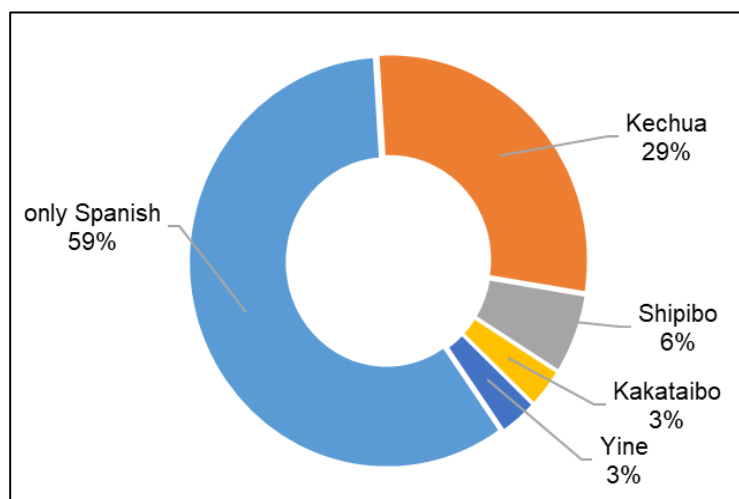
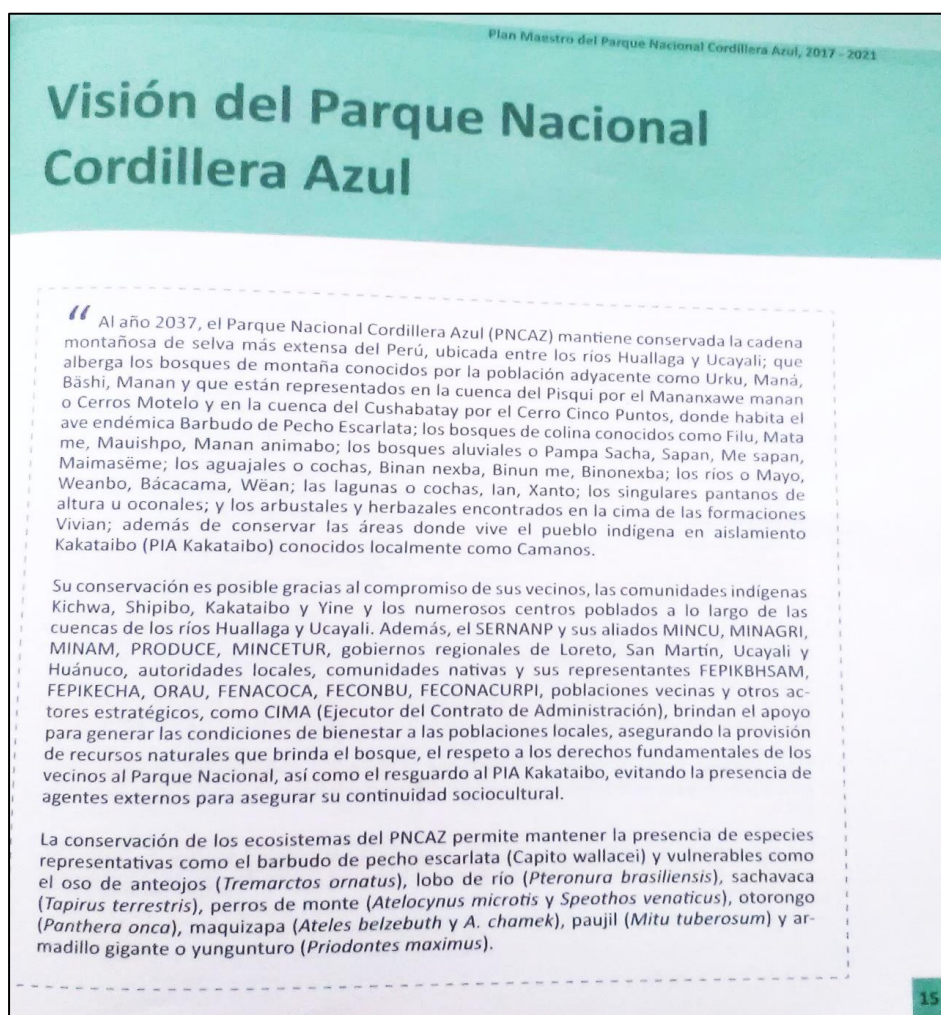


Figure 4.6. Proportion of population that speaks only Spanish versus bilingual population.

Vision of the Cordillera Azul National Park, on published Master Plan 2017 – 2021, including native languages for the conservation objects.



Source: Plan Maestro del Parque Nacional Cordillera Azul 2017 - 2021 (SERNANP 2017).

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>). Additional information may be collected eventually, such as specific data on the use of wood and firewood, use of wildlife, or data on cocoa and coffee production, for the generation of potential new projects.

MUF and other field 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 4.7), this participatory process is implemented every 3 years. These aspects are constantly reviewed with the local actors.



Figure 4.7: CIMA 2016. Banner #9 Quality of Life

This information is returned to the local populations with whom it has been worked; and it is retaken and remembered when CIMA works in the construction of its Quality of Life Plan or in the implementation of the activities prioritized in the plan.

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 apply 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.
- Additionally, during 2017 and 2018 some researchers have been developing specific analyzes on social and economic issues, the results of which will contribute to knowing in greater detail and precision the program's impacts, among these are:
 - PhD. Elma Gely, specialist in economic issues, is a **Peace Corps volunteer**, to support CIMA's actions on sustainable business issues, through the generation and evaluation of business plans and / or actions to value resources and ecosystem services, linked to the management of the PNCAZ and the opportunities for neighboring populations. In addition, support to generate a model for evaluating some economic benefits that may arise from the management of PNCAZ.
 - Joel Collao from the Hamburg University (Germany), with a master research on Integrated Climate System Science. His research **Assessment of impacts of REDD+ on livelihoods of local people in Peru**, is development in populations of Shamboyacu, Tocache and Aguaytía; and focuses on the development of REDD processes in Peru, seeking to evaluate the impacts of projects on livelihoods of local communities using

'DFID Livelihood Assessment and Resource-Input-Outputs-Outcomes-Impacts frameworks'. According to the available data, it will apply 'Before-After (BA) -Control-Intervention (CI) or BA strategies' models. The study aims to answer: 1) What are the impacts (mainly the outcomes) of REDD + activities on the five capital assets of the local population? and, 2) What are the achievements of the REDD + project in terms of outputs (outputs) and outcomes?

- Allison Kendra, from the Stanford University, doctoral researcher in anthropology, whose research is development around Tocache; her research project ***Change of land use in Tocache Sector populations*** includes three aspects: (1) Everyday life of people who are participating in alternative development programs and the way in which these processes are being implemented in daily life, with attention to the environment. This is relevant because of its influence on the landscape; (2) cocoa and coffee production, as 'post-coca' crops, inclusive of human-to-human relations that are important to this production (for example, cocoa pollinators, soil, fertilizer, etc.); as well as 'the production' of these crops, including the processes of cultivating, harvesting, processing, and distributing (locally) cocoa and coffee; and, (3) combination of daily life and production, with attention to the social conjuncture and power relations.

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.

As mentioned in previous report, 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 Luis 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):

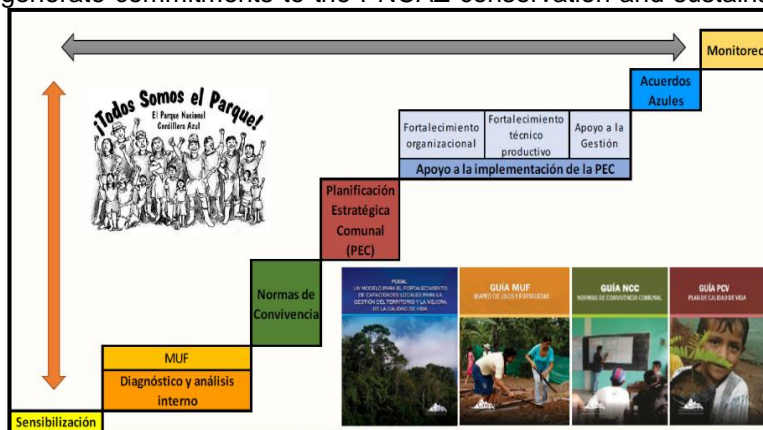
- 02 native communities perceive PNCAZ as positive and 01 perceive it in a very positive way (Yamino).
- All 03 native communities feel that the PNCAZ directly benefits them.
- All 03 native communities feel that the PNCAZ directly benefits them, know what the *Environmental Services* means, and also 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 4.8).

Figure 4.8: FOCAL process scheme, developed at the level of communities and villages.

In the context of reviewing the impact of its actions, CIMA published ***Building Adaptive Capacity in Changing Social-Ecological Systems: Integrating Knowledge in Communal Land-Use Planning in the Peruvian Amazon*** ⁴⁴(Rodríguez, et al., 2018), to disseminate the study that seeks to understand if it is possible to build or improve adaptive capacities in the communities of Shamboyacu with participatory community land-use zoning.

The study focuses on evaluating the rate of deforestation in Shamboyacu populations, between 2008 and 2013, comparing those areas where CIMA worked directly with the population in processes of Communal Participatory Zoning (green) and those where it does not do so indirectly (blue), finding that deforestation is higher where it is not directly influenced.

Among the main findings are:

- Although the forest is still being lost, it occurs at a lower rate in the places where CIMAS has been carrying out zoning participatory processes, such as the Simón Bolívar, Chambira, Lejía, Alto Ponaza, Paraíso and Vista Alegre (Shamboyacu) communities.
- These impact scales are related to demographic development (migration) and production dynamics (booms), which have continued to grow at an accelerated pace.
- CIMA by basing the intervention on the will of the communities facilitates managing expectations and generating local leadership, but with limited success in stopping deforestation
- In learning circles (dialogue groups) the “comuneros” are generating, validating and adapting different knowledge in an ecosystem approach
- Conservation can be integrated in the management of communities, moving agricultural activities to designated areas.

⁴⁴ <http://www.mdpi.com/2071-1050/10/2/511>

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.

The details of the activities are shown in table 4.2 of section 4.1.2, and Appendix 1.

The climax of 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>



Source: SERVINDI <https://www.servindi.org/actualidad-noticias/02/04/2018/firman-acuerdo-para-conservar-parque-nacional-cordillera-azul>

The specific tool to raise social information is the MUF⁴⁵, which is published on the CIMA website, ensuring its availability not only for communities but also for the general public:

⁴⁵ 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.

<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.

It is important to highlight 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; so, SERNANP, announced the neutralization of UICN World Conservation Congress with the PNCAZ REDD Project, and the postulation of PNCAZ for the Green List of UICN.

Source: SERNANP Bulletin

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>

During this period 2017-2018, CIMA has been more active in terms of disseminating the results of the work that is being promoted and carried out by the population neighboring the PNCAZ, some of those diffusion mechanisms are:

Reports and publications:

- CIMA publications, like the scientific studies about the impacts on land-use planning to improve adaptative capacities (Rodriguez et al. 2018).

Published on Sustainability, 2018.

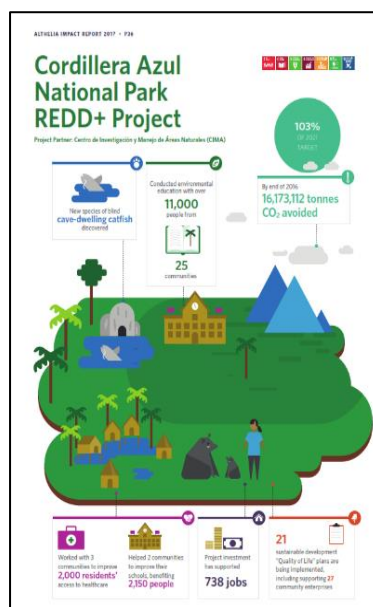
Building Adaptive Capacity in Changing Social-Ecological Systems: Integrating Knowledge in Communal Land-Use Planning in the Peruvian Amazon

Lily O. Rodriguez ¹, Elias Cisneros ¹, Tatiana Pequeño ², Maria T. Fuentes ² and Yves Zinngrebe ^{3,*}

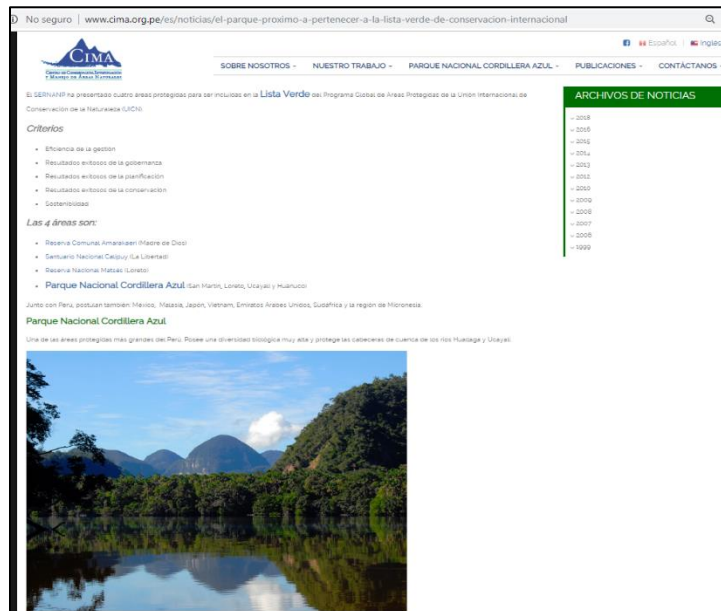
Abstract: Building resilient sustainable social-ecological systems (SES) requires communities to enhance their adaptive capacities. Communal participative land-use planning (Zonificación Participativa Comunal—ZPC) is a tool designed for communities to integrating local and scientific knowledge to sustainably organize and manage their SES. Between 2006 and 2011, a ZPC was developed with communities in the buffer zone of Cordillera Azul National Park (Peru), where rapid demographic changes are converting pre-montane seasonally dry forest into agricultural land. Herein, we analyse how the ZPC enhanced adaptive capacity, enabling the SES to cope with environmental, political and economic changes. Based on qualitative, semi-structured interviews, communities are analysed along their capacities in the dimensions social capital, learning, adaptive management and governance. An analysis of yearly high-resolution forest cover data supports our findings. Deforestation activities in biologically sensitive zones decreased rapidly during the time of the ZPC implementation. We find that particularly the long-term presence of the bridging institution and the continuous testing and reflection of the integrated “hybrid knowledge” enabled communities to develop adaptive capacities. The analysis of ZPC our results reveals the enabling conditions for promoting the learning process to develop a sustainable land-use management in the context of migration and rapid changes.

Keywords: adaptive learning; co-management; bridging organization; participation; resilience; governance; institutions; local knowledge

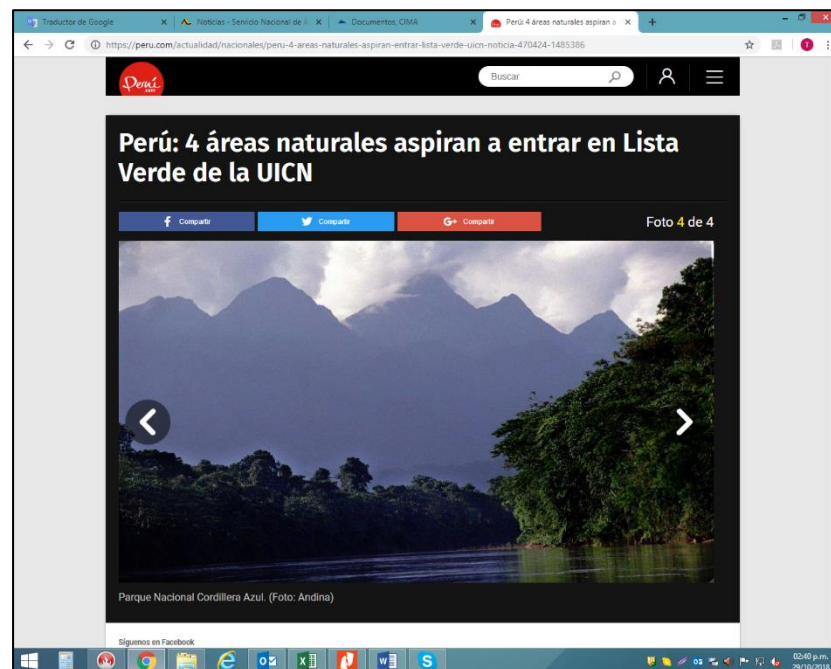
- News reports about the progress of PNCAZ management through the news portal on the CIMA website: <http://www.cima.org.pe/es/noticias>
- Althelia Climate Fund - ACF annual Impact Reports, published in their public and international access web site: <https://althelia.com/althelia-climate-fund/>



- Restoration brochure for **Scalable strategies of Ecological Restoration of the landscape: models in San Martín, Peru, Buffer Zone of the Cordillera Azul National Park** <http://www.cima.org.pe/files/pdf/CIMA-2017-Folleto-Restauracion.pdf>
- Presentations in academic contexts: congresses and universities (see section 2.2 Diffusion of research results, on the Appendix from Goal 2)
- Postulation of the PNCAZ and its management to the Green List of UICN



Source CIMA <http://www.cima.org.pe/es/noticias/el-parque-proximo-a-pertenecer-a-la-lista-verde-de-conservacion-internacional>



Source: Peru. Actualidad - Nacionales <https://peru.com/actualidad/nacionales/peru-4-areas-naturales-aspiran-entrar-lista-verde-uicn-noticia-470424-1485386>

Videos:

- **Rondas campesinas** from 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=5VIPiTrndgw>
- **Kakataibos Hombres de Hierro** (Men of steel), it is a production of the national television TV Peru, promoted by CIMA to publicize the customs and conservation work that is carried out in the native community of Yamino, of Kakatiabo origin, in Aguaytía. <http://www.cima.org.pe/es/videos/tv-peru-costumbres-comunidad-nativa-yamino-en-la-za-del-pncaz>

- **Especial Parque Nacional Cordillera Azul** (PNCAZ Especial program), for the national television program **Costumbres**



<http://www.cima.org.pe/es/videos/tv-peru-costumbres-especial-parque-nacional-cordillera-azul>

- **Ecosystem Services: Reduce Erosion:** in order to disseminate the importance of forest ecosystem services and its contribution to reducing erosion, banners were prepared for the local population (see section 4.3.1); and additionally, a video to explain the erosion process and the function of the vegetation cover, as well as a design of farm friendlier with soil conservation.

<https://www.facebook.com/472901212886118/videos/890853464424222/>

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.

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 2017 and 2018 in Table 5.1.

Table 5.1. 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	Implem. 2017-2018	2008	2008-2012	2012-2014	2015	2016	2017-2018
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)	99.98 % of primary forest (Intact Forest)	3	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)	10 key spp. (Intact Forest, low hunting activities)	4	4	4	4	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: 11 (High Abundance)	# individuals/patrol: 15 (High Abundance)	# individuals/patrol: 15 (High Abundance)	# individuals/patrol: 13 (High Abundance)	# individuals/patrol: 15 (High Abundance)	2	3	4	4	4	4

Parameter	Indicator	Project Phase/Time period						Ranking					
		Baseline 2008	Implem. 2008-2012	Implem. 2012-2014	Implem. 2015	Implem. 2016	Implem. 2017-2018	2008	2008-2012	2012-2014	2015	2016	2017-2018
Number 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	0	1	1 infraction by hunter	-3	-3	0	0	-1	-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	0	0	-3	-1	-1	0	0	0
	# exotic animal or plant species introduced to the PNCAZ	3 infractions	0	0	0	0	0	-2	0	0	0	0	0
Index evolution								1	6	10	11	10	10

Natural vegetation cover: The analysis of the 2016 - 2018 satellite imagery for the project area shows 99.98% intact primary forest inside the PNCAZ. No anthropic deforestation was observed by satellite imageries and parkguards; however, it was required parkguards interventions in the patrol sector of PV Shanshuico, because intents of illegal incursion for lands; fortunately, because a timely action of surveillance and control none of them generation new deforestation, more details in section 3 Climate.

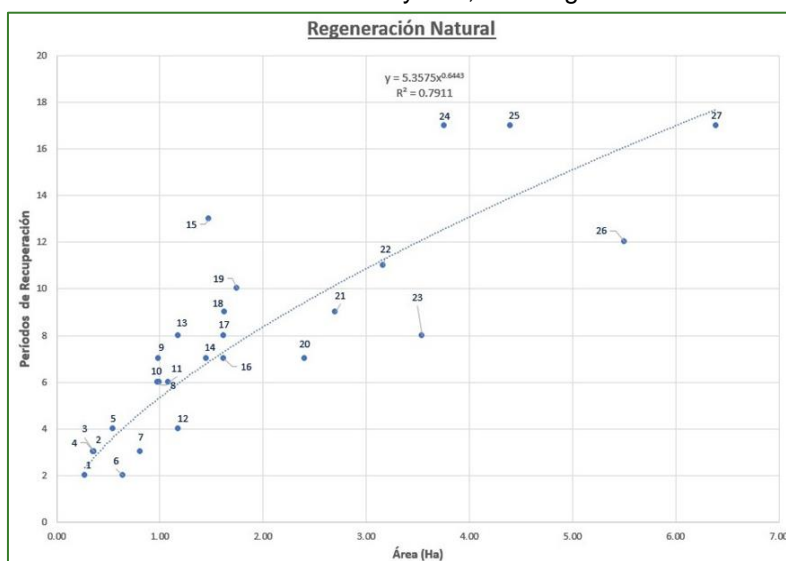
Table 5.2 Deforestation vs Restauration inside PNCAZ, for period 2017 - 2018

Year	Deforestation	Restauration
2016	No forests were lost due to anthropogenic causes	There are 171 hectares in natural forest recovery. Additionally, of the 142 ha (256 ha in 2008) that correspond to the breeder Suarez, 71 ha are in the process of going back up due to the fact that the pasture is not being maintained, while another 71 (50%) still continue as pasture.
2017	No forests were lost due to anthropogenic causes. However, a risk event occurred near PV Shanshuico, where intruders from Pampas del Inca intent to take lands into the PNCAZ. The parkguards intervention managed to reverse the situation without generating deforestation.	The institutionality of the Park in the sector of livestock Suarez was recovered: This represents some 250 hectares of montane forests that were converted into pastures for cattle and that have gradually gone back to purma and forest, of which there are currently about 75 ha.
2018	No forests were lost due to anthropogenic causes	The pacific and definitive remove of the cows within the PNCAZ was carried out, this process has taken 10 years since the prosecution began by SERNANP. Also, recovery reports on little patches of forest (Figure 5.1).

Source: CIMA’s Annual Reports to SERNANP: 2016, 2017 and 2018

Several areas inside the PNCAZ were recovering its forest cover. Areas under 1 ha were recovered in less than 4 years, areas of 1-3.5 have taken to recover from 6 to 8 years, and larger areas take at least 10 years, in the case of the study conducted in the sector Tornillal (Figure 5.2). This can be considered both for medium-term planning (actuation of the Master plan every 5 years) and for the long term, as in the case of reformulating the conditions in a REDD project.

Figure 5.1 Rate of recovering time in diferents sizes of forest loss inside PNCAZ (Vergaray et al. 2018).



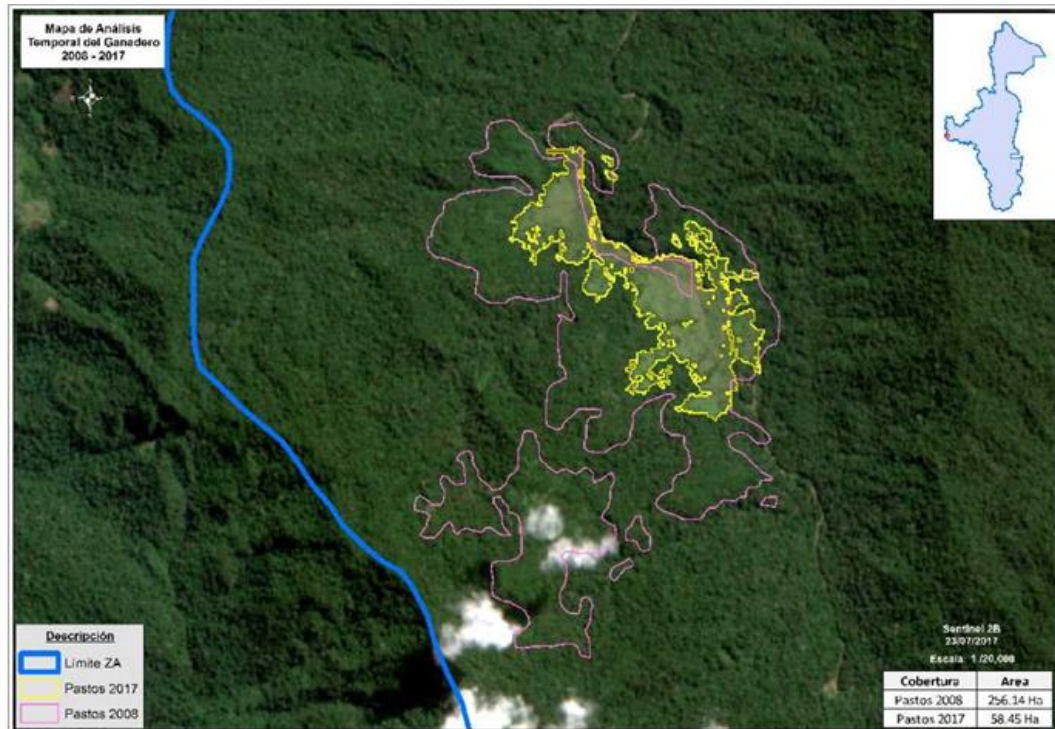


Figure 5.2 Map that represents the area of pastures in process of natural regeneration, since the maximum grassland expansion in 2006 – Pólvora sector

Presence and abundance of species locally threatened by hunting: During the evaluation period 2017- 2018, the parkguards obtained data on the frequency (number of wildlife encountered, groups of individuals counted as one encounter) and abundance (number of individuals by species, for flocks or grouped individuals) during a total of 470 routine patrols. Park guards focused on *key indicator species* defined as those sensitive to hunting:

- Big herbivores (02): Red deer/Venado rojo (*Mazama americana*), and Tapir/Sachavaca (*Tapirus terrestris*)
- Big endangered bird (01): Curasaw/Paujil común (*Mitu tuberosum*)
- Primates (11): Squirrel monkey/Fraile (*Saimiri boliviensis*⁴⁶), Red howler monkey/Aullador (*Allouatta seniculus*), Marañón white-fronted capuchin/Machín blanco (*Cebus yuracus*⁴⁷), Machín negro (*Cebus apella*), Woolly monkey/Choro (*Lagothrix lagotricha*), Saki monkey/Huapo negro (*Pithecia inusta*⁴⁸), Illiger’s saddle-back tamarin/Pichico común (*Leontocebus illigeri*⁴⁹), Moustached tamarin/Pichico barba blanca (*Saguinus mystax*), White-bellied pygmy marmoset/Leoncito (*Cebuella pygmaea*), Black spider monkey/Maquisapa (*Ateles chamek*), Titi monkey/Tocón colorado (*Callicebus discolor*⁵⁰)

⁴⁶ Previously: *Saimiri sciureus*

⁴⁷ Previously: *Cebus albifrons*

⁴⁸ Previously: *Pithecia monachus*

⁴⁹ Previously: *Saguinus fuscicollis*

⁵⁰ Previously: *Callicebus discolor*

- Big carnivores (04): Jaguar/Otorongo (*Panthera onca*), Cougar/Puma (*Puma concolor*), Spectacle beard/Oso anteojos (*Tremarctos ornatus*), Giant otter/Lobo de rio (*Pteronura brasiliensis*)

A total of 6,891 individual animals were registered from a total of 18 indicator species. These numbers are especially impressive in that they compare favorably with the baseline in 2008, and even during 2008 - 2012 period data; It is important to highlight that these records are largely made within the limits of PNCAZ and buffer zone, those areas have the greatest pressure; even so the registers remains more constant.

Graph of data collected by park rangers from their Surveillance Posts show that the presence of species is maintained over time (Figure 5.3), but the trends of annual abundance by surveillance sectors are variable (DS = 37% -123%); On the other hand, census data with transects require a lot of effort, they cover very small areas and they also have high variability (DS = 35% -225%), an inaccuracy that would be reduced by intensifying the effort. The data of park rangers in the long term give us idea of presence and relative abundance of species of interest for each Control post.

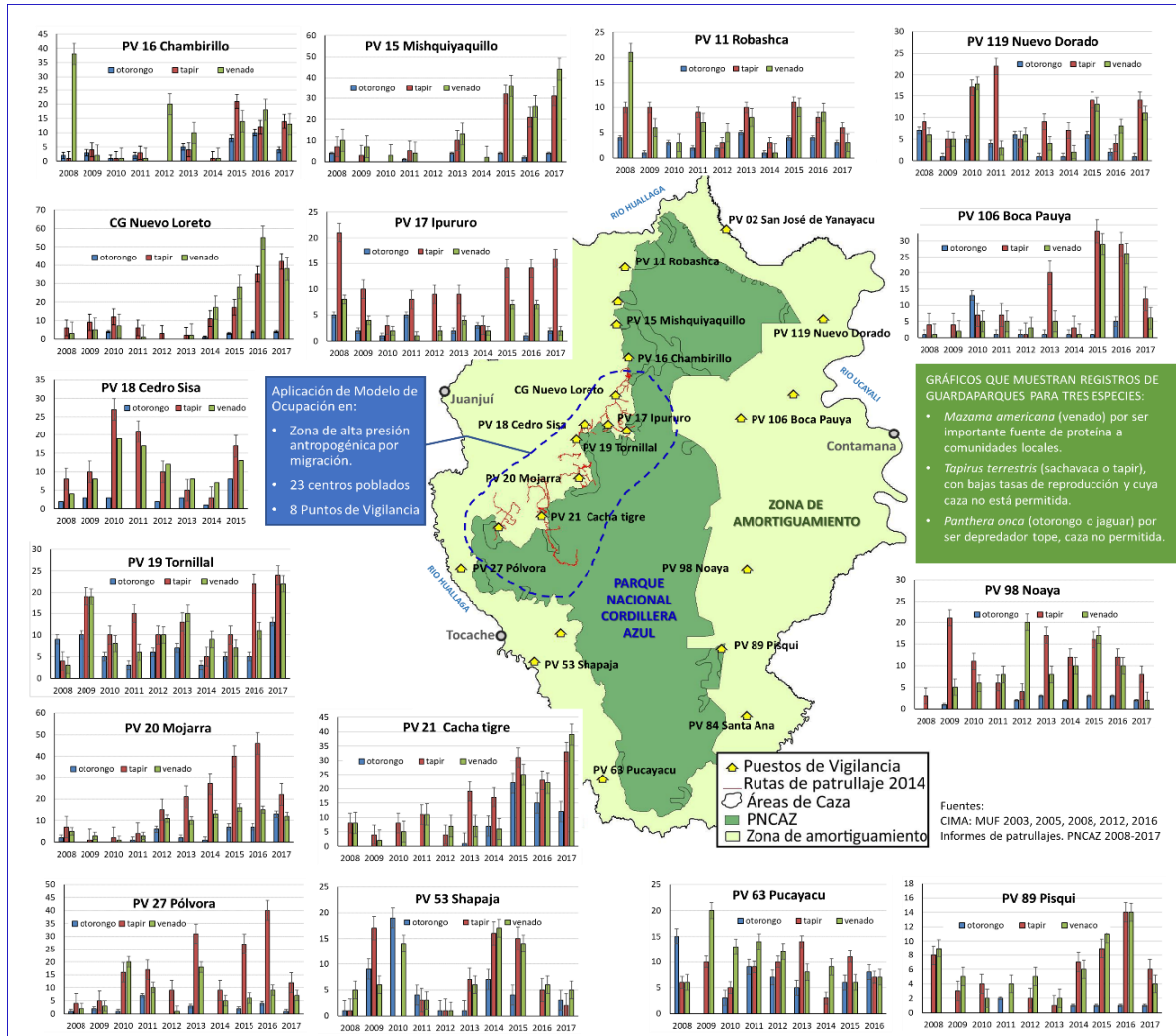


Figure 5.3 Pequeño and Pizarro 2018. Bar charts showing trends of species registration by Guardapques during patrols around PNCAZ.

In 2016, the researcher Alejandra Pizarro, presented her thesis were evaluating the effectiveness of parkguard's wildlife reports, using all georeferenced fauna records. The selected species were: *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 opportunistic⁵¹, the sampling effort and data are sufficient to detect a difference between seasons with a significance of 80% to 90%⁵² (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 turtles has enhanced⁵³. On the Cushabatay and Pauya Rivers, where CIMA has worked in the buffer zone the sensitization on the use of resources and repopulation with taricayas, it was possible to observe individuals sunning themselves and a good amount of wildlife fauna. This was evidenced during the ocular field verification work done by SERFOR (ARA-GOREL/SERFOR 2018), the Loreto Regional Government (GOREL), carried out as part of the proposal for Concession for conservation Pauya Cushabatay area (previously proposed to PNCAZ expansion), as a strategy to conserve this important and threatened area in the ZA; currently this area is being proposed as a Priority Ecosystem for Conservation in Loreto, by GOREL (Table 5.3).



⁵¹ 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.

⁵² 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.

⁵³ 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.

Table 5.3. River turtles (*Podocnemis unifilis*) observed during the ocular field verification work done by SERFOR (ARA-GOREL/SERFOR 2018) at Pauya - Cushabatay rivers

Pt	Este	Norte	Altitud	Descripción
6	427454	9190021	168 msnm	Se observaron varios individuos de la especie <i>Podocnemis unifilis</i> "Taricaya" en el curso del río Pauya.

Source: Ficha de Verificación de Ecosistemas Priorizados para la Conservación de la Biodiversidad, marzo 2018 (ARA-GOREL / SERFOR 2018)

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 attempts of illegal actions were detected during the implementation period august 2016 to august 2018, with the described actions taken:

- During May and June 2017 an attempt of invasion of land traffickers looking for new lands took place. These people come from communities of Tahiti, Nuevo Loreto and Pampas del Inca (neighboring the Shanshuico Refuge) intended to settle inside the Park. Happily, no deforestation occurred, but they opened trails and marked (paint) trees in order to demarcate some parcels. Once this incident was reported, the control and surveillance team constituted by park guards and under the leadership of the Park's Head responded very fast. In this sector, people has been encouraged by the Pampa Hermosa Major from Contamana Sector (please refer to the map).

- During January 2018 some hunting infractions were reported, the most serious corresponded to what happened in the Shansuico sector, due to the use of *tramperas* (illegal hunting weapons), which resulted in a human loss. The respective complaint was made by the Head of the PNCAZ immediately for the respective investigations.

In the Project area - around PNCAZ - there are numerous drivers of deforestation, mainly livestock and shifting agriculture (including lands traffic); however, in recent years the illegal activities such as drug trafficking has returned to proliferate in the forest. CIMA made coordination with SERNANP and relevant institutions to stay informed about any danger to the park, always prioritizing the security of parkguards and CIMA's technicians, to reduce any exposure to this risk.

During this period successful exit livestock occurred; the only permanent illegal activity within the PNCAZ was the 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. The 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 during 2016 with the final eviction order declared in August 26th (Appendix Biodiversity); a year later the cattle were no longer inside the PNCAZ, it was evicted peacefully and it was simply verified that it did not return to the park (Appendix Biodiversity).

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 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 and 2016, throw a project with the Duke University and CIMA.

As mentioned previously, 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 (Figure 5.4), founding healthy populations of animals, including several species in couples and other species with young descendants.

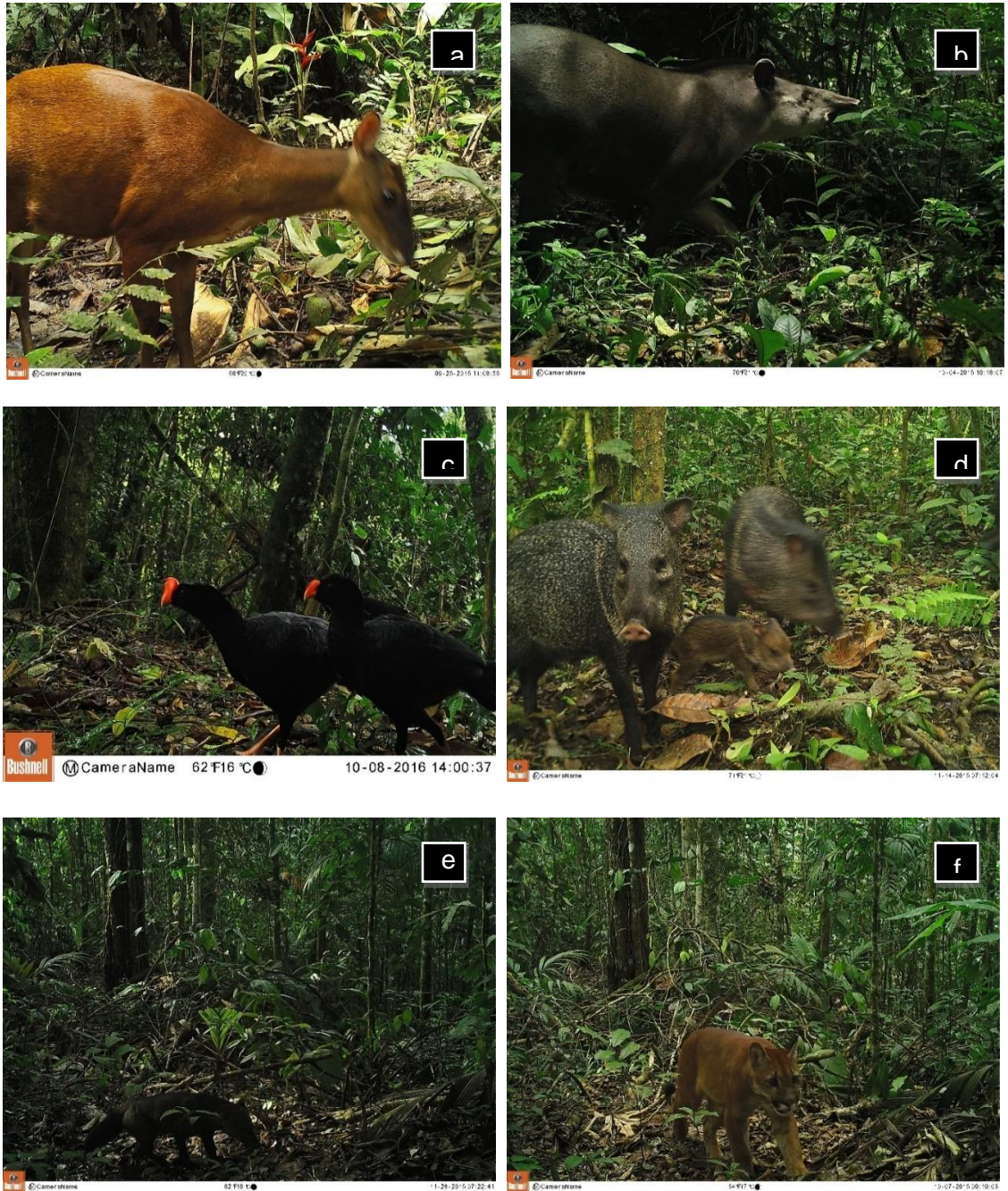
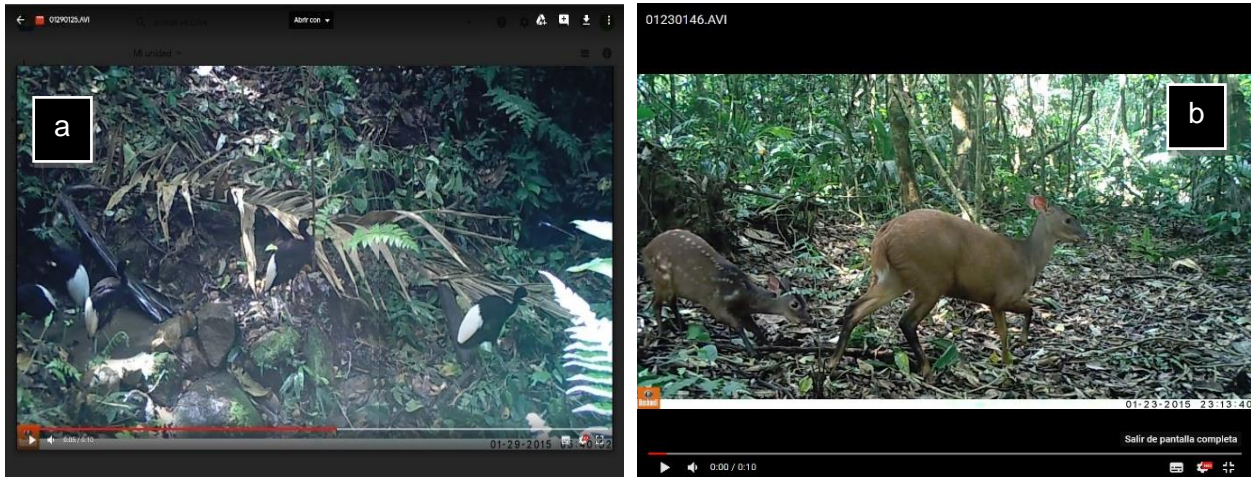


Figure 5.4. Images captured by the camera trap in 2016: (a) adult deer, (b) adult tapir, (c) couple of curassows, (d) family of peccaries, (e) adult bush dog, and (f) young puma.

In 2017 and 2018, CIMA developed two (02) parkguards training courses, in order to generate field capacities for the SERNANP personnel and generate a guide for the installation of cameras, as well as to incorporate this monitoring function and the planning of the ANP. In August 2018, the first cameras were installed, obtaining the first images placed directly by the PNCAZ staff, in an attempt to make the information more independent and sustainable. Videos and pictures were obtained from these first cameras setting exclusively by parkguards (Figure 5.5).

Videos taken by camera traps setting by parkguards in Nuevo Loreto control point



Pictures taken by camera traps setting by parkguards in Nuevo Loreto control point



Figure 5.5. Images captured by three camera traps in 2018: (a) group of Pale-winged Trumpeter, (b) adult Deer and its baby, (c) Common curassows, (d) nocturnal picture of Tapir, (e) nocturnal picture of Jaguar, and (f) Short eared adult bush dog

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 caves⁵⁴ (Figure 5.6) or other troglophile species (Ñahuicopa *et al.* 2016 and Hidalgo *et al.* 2017). More details about this fishes in section 7.

Figure 5.6. 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/>

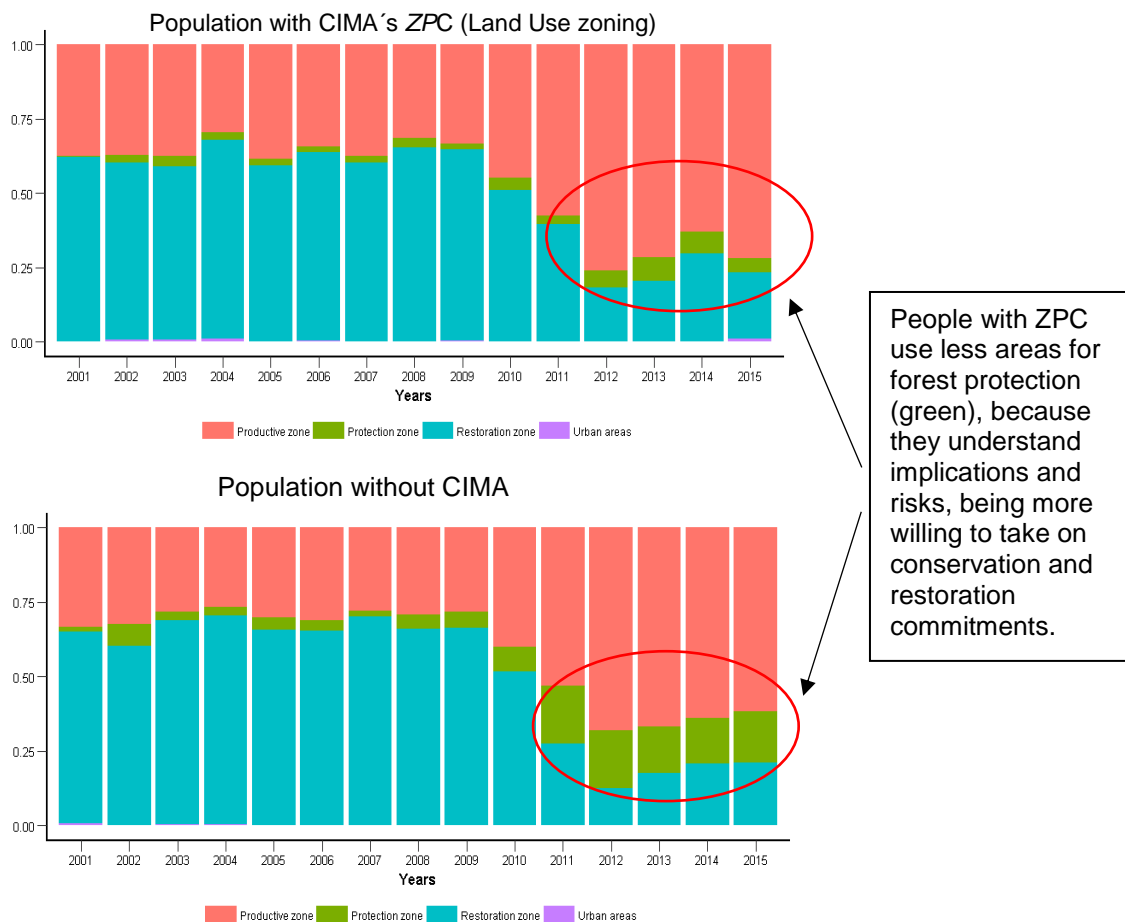
The fact that PNCAZ encompasses the headwaters of two major Amazon tributaries - Huallaga and Ucayali rivers - deserves special mention, as the impacts of deforestation in this region under the baseline scenario would be exported to downstream areas. It is well known that ecological processes occurring 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.

⁵⁴ <http://www.unmsm.edu.pe/noticias/ver/Investigadores-sanmarquinos-descubren-nueva-especie-de-pez>

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.

As mentioned in section 4.1.1, an analysis of yearly high-resolution forest cover data supports the fact that deforestation activities in biologically sensitive zones decreased rapidly during the time of the land zoning activities implemented by CIMA (Zonificación Participativa Comunal – ZPC); case study was in Shamboyacu sector (Rodríguez et al. 2018). We find that particularly the long-term presence of the bridging institution and the continuous testing and reflection of the integrated “hybrid knowledge” enabled communities to develop adaptive capacities, to carry out more friendly activities with the territory. From the analysis of the ZPC, our results reveal the enabling conditions for promoting the learning process to develop a sustainable land-use management in the context of migration and rapid changes (Figure 5.6).

Figure 5.6. Comparison between area with and without participatory land-use zoning



Source: Rodríguez, L., E. Cisneros, T. Pequeño, M. Fuentes and Y. Zinngrebe. 2018.

So, even if the reduction in deforestation is not as impressive (although the population has continued to increase) as the capacity of the population to choose the best areas for carrying out their economic activities. Meaning that conservation can be integrated into the spatial management of local populations, allowing a better decision on where to develop their agricultural activities, according to the zones designated for this purpose or areas that will be avoided favoring conservation.

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 since 2008, even some small forest gaps have been recovered (see previous section 5.1.1). Thus, the overall Index Score jumped from a 1 in 2008 to 10 in 2014 and maintain these standards in the following years; 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; also, within the PNCAZ hunting is subsistence only and covers between 3.5-6% of PNCAZ area (MUF 2003, Pequeño and Pizarro 2018). 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, Pizarro 2016), as well as amphibians endangered and sensitive to diseases such as those believed to occur by changes in weather conditions (Hörnes 2016), even, new species discovered for the PNCAZ (see section 7 Additional Project Impact Information: Exceptional Biodiversity Benefit).

Biodiversity has therefore remained about the same over the monitoring period 2017 - 2018 with a small number of infractions for illegal use of the park area, without negative impacts (see section 5.1.1). 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.

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

5.2.2 Net Offsite Biodiversity Benefits (B2.3)

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 that travel or migrate. This benefit both the animals and the communities in the buffer zone. As discussed in 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.

The park rangers monthly register the villagers who enter the park to carry out subsistence hunting, the provision of nutrients by wildlife is one of the ecosystem services provided by the PNCAZ as mentioned in the PD (Table 1.6 of the section 1.13.5.1 Ecosystem Services).

CIMA systematizes the monthly park ranger records on the number of subsistence hunters that enter the park for each sector (Table 5.4) carried out in the control posts for the evaluated period: (1) Tarapoto sector: entry records from 6 control posts and 3 shelters; (2) Contama: entry records from 2 Control posts and (3) Aguaytía: entry receipts from a single control station.

Table 5.4. Number of beneficiaries by hunting (subsistence) from different fronts around the PNCAZ, and who are registered at the checkpoints.

SECTORES		Tarapoto	Contamana	Aguaytía	Total
Ámbito		CP: 11, 15, 16, 19, 20, 21 Refugios: Pikiyacu, Sanja Seca, Shanshuico	CP 89, 106	CP 84	
2016	Ago	59	0	4	63
	Sep	58	36	16	110
	Oct	15	15	23	53
	Nov	34	11	7	52
	Dic	46	26	11	83
2017	Ene	13	8	6	27
	Feb	0	11	3	14
	Ene	17	20	6	43
	Feb		24	3	27
	Mar	21	34		55
	Abr	20			20
	May				0
	Jun	21	23		44
	Jul	109	21		130
	Ago	79	20	6	105
	Sep		15		15
	Oct	6			6
	Nov				0
Dic	28	7	13	48	
2018	Ene	24			24
	Feb	34	21		55
	Mar	16	23	5	44
	Abr	16	4		20
	May	12	19	8	39
	May	5	19	8	39
	Jun	26	17	4	47
	Jul	37	16	0	53
	Ago	29	5	3	37

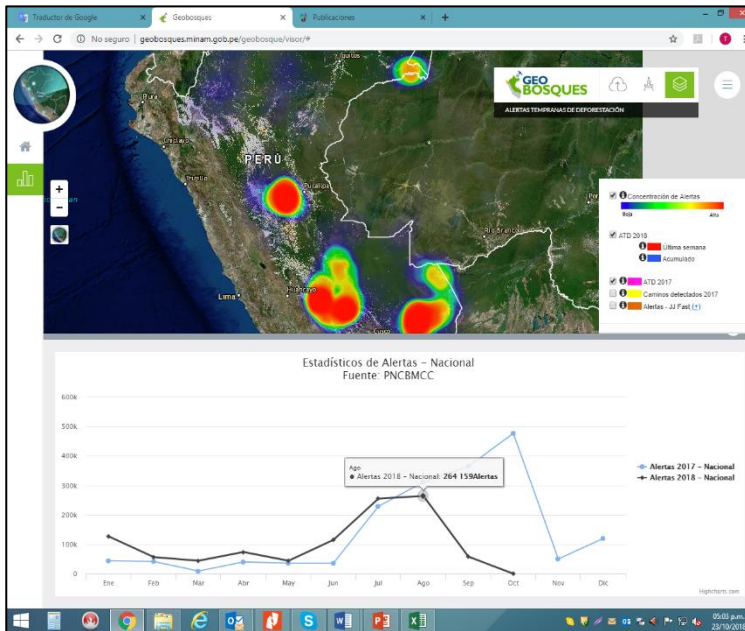
Source: elaborated by CIMA, based on hunter registry information by PNCAZ Control Point.

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 (i.e overflight of June, 2017), to confirm that there is no deforestation inside the park; during the last years the availability of satellite images is better, so the analysis has been 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.



In addition to the constant monitoring carried out by CIMA and park rangers following the monitoring plan, CIMA checks out the MINAM’s Geobosques platform for the national level of forest loss monitoring; CIMA also interacts with SERNANP and MINAM based on the alerts that may occur in the Project area.

Source: Geobosques <http://geobosques.minam.gob.pe/geobosque/visor/#>

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 (more details in section 5.1.1 and 5.3.3).

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 (Pequeño and Kuroiwa 2007, Pizarro 2016, Pequeño y Pizarro 2018). 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 this report. 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 (map of control and surveillance areas).
- 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 parkguards, 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 5.5. New research Conducted During the monitoring period Aug 2016-Aug 2018) 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 strengthen the wildlife monitoring efforts, 2 courses for parkguards offered by CIMA was carried out in 2017 and 2018 for the set up and use of camera traps, and also the design of the installation model. Those courses were an opportunity to return back to the staff the main wildlife monitoring results, protocols and recommendations, and ensure the 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 2017-2018 (Table 5.5) show improvements in the conditions to find wildlife in the patrol routes.

Table 5.5. 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. 2017 - 2018	2008	2017-2018
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: 15 (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 courses for parkguards was carried out in August 2017 and March 2018, 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. Both courses were theoretical – practical (Figure 5.7-a and b), 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); and in the Center URKU and forest around, Tarapoto (San Martín).



Figure 5.7-a. 1st Course for Parkguards 2017, 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 used⁵⁵; 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 5.7-b. 2nd Course for Parkguards 2018, to setup and install Camera Trap (Theory part)

⁵⁵ Research from the *Universidad Peruana Cayetano Heredia* used 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 2017-2018 at least 25 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 5.6).

Table 5.6. New research conducted during the monitoring period Aug 2016-Aug 2018

Institution		Research Title	Year		
			2016	2017	2018
1	Area SIG -CIMA	Análisis de deforestación en PNCAZ, periodo 2016	X		
2	Terra Carbon	2015 Climate Monitoring Report - Cordillera Azul National Park REDD Project: Report of deforestation in PNCAZ and its buffer zone	X		
3	University of Texas, Austin (USA)	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/	X		
4	Universidad Peruana Cayetano Heredia (Lima)	Utilizando estimaciones de ocupación para el monitoreo de la biodiversidad en áreas naturales protegidas: el caso del Parque Nacional Cordillera Azul”, Submitted thesis. http://repositorio.upch.edu.pe/handle/upch/485	X		
5	University of Bonn (Germany)	Amphibian community of north-western Parque Nacional Cordillera Azul, Peru. Thesis submitted in 2016, Master of Science.	X		
6	Universidad de Cambridge (UK)	Análisis de estrategias de intervención social y ecológico, San Martín	X		
7	Duke University (USA)/ Jefatura PNCAZ	Cámaras trampa instaladas para estudio de ecología y conservación del Perro de Monte (<i>Speothos venaticus</i>) y del yungunturo (<i>Priodontes maximus</i>) en el Parque Nacional Cordillera Azul	X		

Institution		Research Title	Year		
			2016	2017	2018
8	Universidad Nacional Agraria La Molina	Evaluación desde el enfoque de ciclo adaptativo del manejo de quelonios acuáticos en la Cuenca del Río Cushabatay, Loreto. http://repositorio.lamolina.edu.pe/handle/UNALM/3607	X		
9	CIMA	Mapeo de Usos y Fortalezas 2016	X		
10	Cuerpo de Paz	Servicios ecosistémicos y restauración ecológica	X	X	
11	CIMA / Museo de Historia Natural-UNMSM	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	X	X	X
12	Museo de Historia Natural - UNMSM	AmazonFish Project en Huallaga – Biavo y Ponasa-Mishquiyaquillo		X	
13	Museo de Historia Natural - UNMSM	Descripción de especie nueva de sapo: Sapo picudo de Lily Rodriguez (<i>Rhinella lilyrodriguezae</i>) https://doi.org/10.3897/zookeys.673.13050		X	
14	LSU Museum of Natural Science	Descripción de especie nueva: Saltarín rayado (<i>Machaeropterus regulus</i>) https://doi.org/10.11646/zootaxa.4320.2.11		X	
15	Universidad Autónoma de Madrid (España)	Evaluación del estado de conservación de la Zona de Amortiguamiento de Cordillera Azul del territorio de la Comunidad Nativa de Yamino		X	X
16	Stanford University	Cambio de uso de suelos en poblaciones de Sector Tocache		X	X
17	ONG Jardín Botánico de Missouri, Oxapampa-Pasco	Diversidad de la flora y sus relaciones con el suelo, en la Zona Silvestre del Parque Nacional Cordillera Azul		X	X
18	Museo de Historia Natural - UNMSM	AmazonFish Project en Ucayali - Cushabatay			X
19	LSU Museum of Natural Science	Descripción de especie nueva de ave: Hormiguero de la Cordillera Azul (<i>Myrmoderus eowilsoni</i>) The Auk 135, 2018, pp. 114-126. DOI: 10.1642 / ABRIL 17-97.1			X
20	Universidad de Hamburgo (Alemania)	Assessment of impacts of REDD+ on livelihoods of local people in Peru			X

Institution	Research Title	Year		
		2016	2017	2018
21	Autoridad Nacional del Agua			X
22	U. Bonn, CIMA y U. Gottingen			X
23	U. Leeds			X
24	Terra Carbon			X
25	Terra Carbon / CIMA			X

Fuente: CIMA, Informes 2016, 2017 y 2018

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 restoration 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.
- To make the PNCAZ better known at international and national level in diverse topics, such as its biological and social diversity, customs, threats and opportunities, management, governance, etc.

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:

Diffusion in workshops, courses and scientific platforms:

- **Wildlife Monitoring Workshops** for parkguards and CIMA technicians, to improve wildlife monitoring protocols, the use of new technology and review the main results were reviewed.
- **"Wildlife Insights" Platform** (26 - 28 June, Atibaia, Brasil), Centro Nacional de Investigación y Conservación de Mamíferos (CENAP). It is a global wildlife monitoring platform that will make use of the latest conservation technology to provide advanced analysis capabilities and wildlife status indicators at an accelerated pace. This participation is framed in the postulation of the PNCAZ to the IUCN Green List and the monitoring work that is expected to be carried out with the park rangers from the third quarter of 2018. The presentation on the **Application of the trap cameras in the PNCAZ** was made and its potential for management decision making under the Green List.
- **Foro: Gestión Ambiental y Desarrollo Sostenible** (May 2018), organized by the Museo de Historia Natural - UNMSM and the **Institut de recherche pour le développement** (IRD). CIMA made the presentation: **La Investigación y gestión de la información para el manejo del paisaje. Caso: Parque Nacional Cordillera Azul**; within the framework of the exhibition: "La investigación al servicio del desarrollo, 17 objetivos para un futuro sostenible".
- Presentations at Peruvian universities, such as the Universidad Peruana Cayateno Heredia – UPCH and Universidad Agraria La Molina – UNALM, in the Masters of Biology of Conservation and Management of Natural Resources, respectively. With some cases of studies about PNCAZ, both in management, investigation and monitoring issues.
- Scientific meetings organized by the Institute of Biological Sciences Antonio Raimondi (ICBAR) of the UNMSM (August 2017), where the progress of the study **Hallazgo de peces troglomórficos en zona de amortiguamiento del PNCAZ** was presented
- **Conversatorio sobre sostenibilidad financiera en las Áreas Naturales Protegidas**, organized by Administration Contract Executor (CIMA, AIDER and CI) and Althelia, with SERNANP and IUCN, showing the importance of biological diversity and the management of protected areas, with a focus on their financial sustainability.



Publications and papers

- Description of a new species of bird: Hormiguerito de Cordillera Azul **Moncrieff, A.E., O. Johnson, D. F. Lane, J. R. Beck, F. Angulo and J. Fagan. 2018. A new species of antbird (Passeriformes: Thamnophilidae) from the Cordillera Azul, San Martín, Peru. The Auk. Volume 135, pp. 114–126**

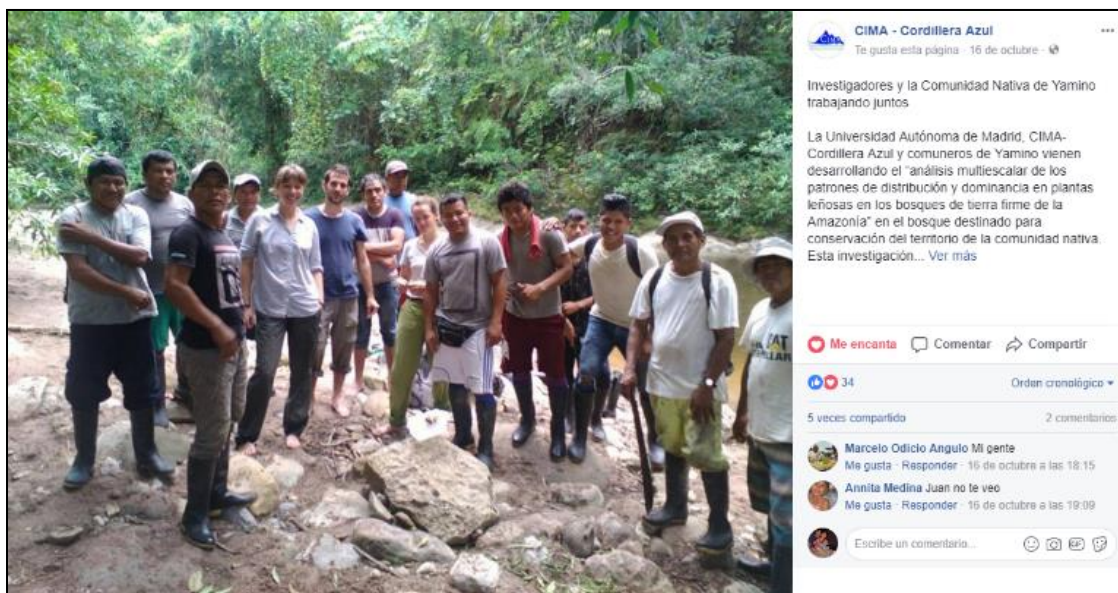
- Description of a new species of bird: Saltarin rayado D. F. Lane, A. W. Kratter and J. P. O'Neill. 1A new species of manakin (Aves: Pipridae; *Machaeropterus*) from Peru with a taxonomic reassessment of the Striped Manakin (*M. regulus*) complex. *Zootaxa* 4320 (2): 379–390 <http://www.mapress.com/j/zt/>
- Description of a new species of frog: Sapo de Lily Rodriguez Cusi, J.C., J. Moravec, E. Lehr3, V. Gvoždik. 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>
- Documento final de una investigación climática realizada en 4 ANP: CIMA 2017. UCAYALI: SINERGIAS POR EL CLIMA. Lima, Peru. 28 pp
- Paper that demonstrates the benefits in improving resilience in populations with Zonificación Participativa Comunal (ZPC): Rodríguez, L., E. Cisneros, T. Pequeño, M. Fuentes and Y. Zingrebe. 2018. Building Adaptive Capacity in Changing Social-Ecological Systems: Integrating Knowledge in Communal Land-Use Planning in the Peruvian Amazon. *Sustainability*. <https://www.mdpi.com/2071-1050/10/2/511/html>

News posted on social networks from CIMA (facebook), SERNANP, Ecosphere+, and others:

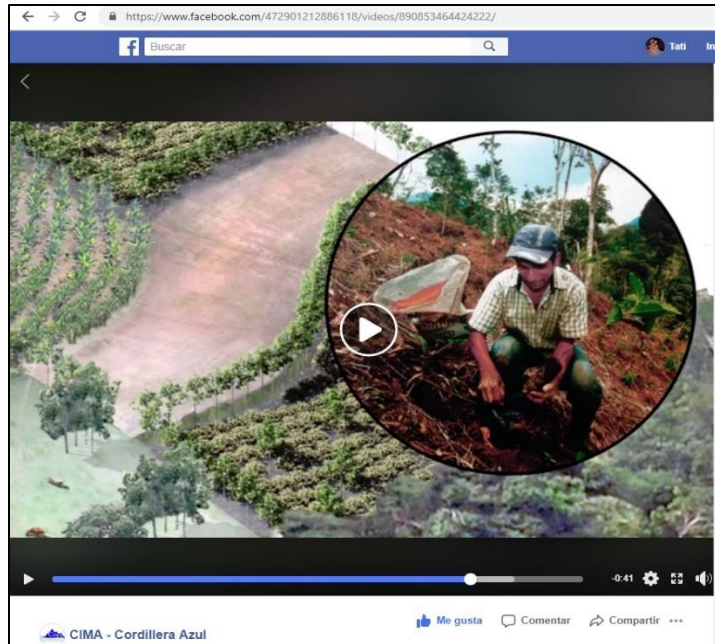
- *CIMA's Facebook:*

CIMA shows the work of the Universidad Autónoma de Madrid, CIMA-Cordillera Azul and Yamino comuneros in the research project "multiscalar analysis of patterns of distribution and dominance in woody plants in the forests of the Amazonian mainland" in the forest destined for conservation of the territory of the native community

<https://www.facebook.com/472901212886118/photos/a.482758881900351/888947001281535/?type=3&theater>



CIMA shows a didactic video to highlight the importance of conserving the soil, taking into account the characteristics of the land surface, soil and the best agricultural practices.



<https://www.facebook.com/472901212886118/videos/890853464424222/>

- **Noticias del SERNANP** (december 2017):

CIMA has provided the relevant information so that the new species discovered in the PNCAZ and surrounding areas can be disseminated in local, national and international media. The texts on the new species have been prepared in different levels of complexity, according to the target audience, and both in Spanish and English; and thanks to the support of SERNANP and Ecosphere + the news has repercution in different media.

<http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/san-martin-descubren-una-nueva-especie-de-ave-endemica-364343>

- **Ecosphere+** (october 2017), posted by Daniel Fisher:



<https://www.ecosphere.plus/blog/two-new-species-found-cordillera-azul-peru/>

- **Perú 21** (diciembre 2017):

<https://peru21.pe/peru/san-martin-hormiguero-cordillera-azul-nueva-especie-ave-endemica-389312>

- **Andina Agencia Peruana de Noticia**, (december 2017)
<http://www.andina.com.pe/agencia/noticia-san-martin-descubren-nueva-especie-ave-endemica-hormiguero-de-cordillera-azul-693600.aspx>
- **Redacción Peru.com**, (december 2017)
<https://peru.com/actualidad/nacionales/peru-descubren-nueva-especie-ave-endemica-region-san-martin-noticia-547400>
- 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>
- 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-peze-registrada-en-ambito-del-parque-220671>
<http://www.cima.org.pe/es/noticias/encuentran-posible-nueva-especie-de-peze-gato-blanco>
<http://munitocache.gob.pe/tocache-tours-para-el-peru-y-el-mundo/>
<http://rpp.pe/blog/mongabay/hallan-peze-ciego-cerca-del-parque-nacional-cordillera-azul-noticia-991766>
<http://elcomercio.pe/sociedad/san-martin/escubren-especie-peze-ciego-cordillera-azul-noticia-1928378#next>
- A guide Guide To Setting Up and Installing Trap Cameras (Alvarez y Pequeño 2017)

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.

Have to highpoint that 2016, 2017 and 2018 were exceptional years for scientific results around the remote mountains of Cordillera Azul, were new species of birds, a new species of toad and a new species of fish were discovered and newly named, highlighting the enormous diversity and singularity of nature inhabiting the area. This also demonstrates the value of dedicated efforts from scientific expeditions to Cordillera Azul NP and its surrounding buffer zone.

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	<p>There is no negative impact derived from the Project for these Critically Endangered (CR) and Endangered (EN) species, listed in Appendix 2 of the PD⁵⁶. On the contrary, this project prevents any event that might affect them.</p> <p>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.</p>
Species or individuals affected	<ul style="list-style-type: none"> • Amphibia: <i>Atelopus pulcher</i> (CR) • Bird: <i>Heliangelus regalis</i> (EN) • Mammal: <i>Pteronura brasiliensis</i> (EN) <p>None of the mentioned species is affected. These species are protected legally and effectively within the PNCAZ thanks to the parkguards patrols.</p> <p>They are species whose permanence and the health of their populations depend directly on the conservation of the forest.</p>
Impact aversion and mitigation	<p>Parkguards conduct continuous surveillance actions to ensure the following and respect the wildlife use rules in the park.</p> <p>Monitoring reports are made with the hunting data provided by parkguards, in order to ensure that no endangered species is being hunted.</p>

⁵⁶ 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*.

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

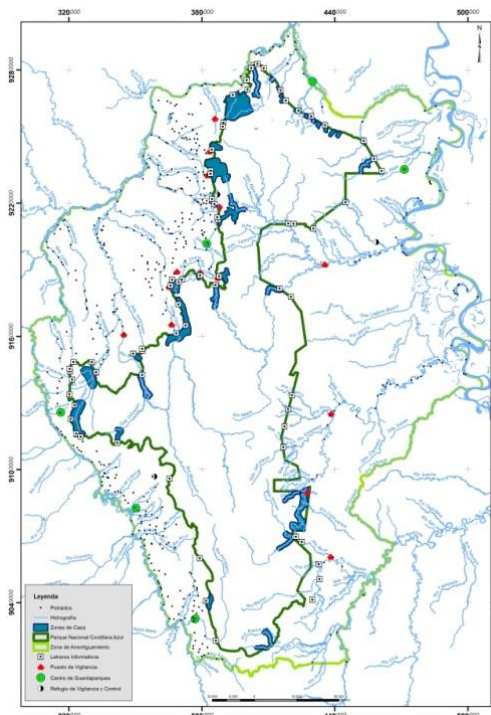
Potential negative impact	There is no negative impact derived from the Project for these Vulnerable species (VU), listed in Appendix 2 of the PD ⁵⁷ . On the contrary, this project prevents any event that might affect them.
Species or individuals affected	<ul style="list-style-type: none"> • Amphibia: <i>Epipedobates cainarachi</i> • Reptile: <i>Podocnemis unifilis</i>, <i>Podocnemis sextuberculata</i>, <i>Geochelone denticulata</i> • Bird: <i>Ara militaris</i>, <i>Capito wallacei</i> • Mammal: <i>Priodontes maximus</i>, <i>Calimico goeldii</i>, <i>Ateles chamek</i>, <i>Ateles belzebuth</i>, <i>Speothos venaticus</i>, <i>Tremarctos ornatus</i>, <i>Tapirus terrestris</i> <p>None of the mentioned species is affected. These species are protected legally and effectively within the PNCAZ thanks to the parkguards patrols.</p>
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.

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 (MUF 2003).

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.



⁵⁷ 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 species like the humimbrig *Helianthus regalis* and the great mammals *Myrmecophaga tridactyla*, *Cacajao calvus*, *Pteronura brasiliensis*, *Panthera onca* and *Puma concolor*.

- **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 5.7.

Table 5.7. 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 + 2 (2017, 2018)	3
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 poeppigii*), 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 and 2018, ornithologist describe new species of birds:

The *Saltarín pintado* (Striped 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 (Lane *et al.* 2017).

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. 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).



Andy Kratter, Florida Museum of Natural History

The Hormiguero de la Cordillera Azul (**Cordillera Azul Antbird**) called *Myrmoderus eowilsoni*, was discovered at a place called “Plataforma”, and is known to live in humid montane forests of the buffer zone of the park (between 1340 – 1670 m), very likely also present inside the Park. Named for E.O. Wilson, one of the most eminent living biodiversity specialists of the world, could be distinguished as a new species thanks to its characteristic whistled call and the help of digital sequence information (Moncrieff et al 2018). This represents a new genus for Peru, because its congener species are distributed only Brazil and Guyanas.



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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 aburni*), 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 Martín, 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 specimen 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 Martín. 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 *Enyallioides*, 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*, *Phyllomedusa* and *Scinax* (Figure 31), and two lizards from the genus *Stenocercus* and *Morunasaurus*, probably new to science (Mejia and Gagliardi 2015).



Chelonoidis carbonaria, turtle from the Huallaga Dry forests, at risk of extinction



Photo: Mejia and Gagliardi

Scinax sp. nov. frog from the Huallaga Dry forests, new to science



Photo credit: Kaitly Tasker

A remarkable discovery was the Sapo Picudo de Lily Rodriguez (Lily Rodriguez' Beaked Toad) 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, is currently known only from the Shapaja sector. This new species was founded at the border of the Park, in the Mysteriosus river basin, this beaked toad was also noticed to be new to science and described after analyzing morphological and DNA information (Cusi et al. 2017).

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, *Tahuantinsuyo macantatza* 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).

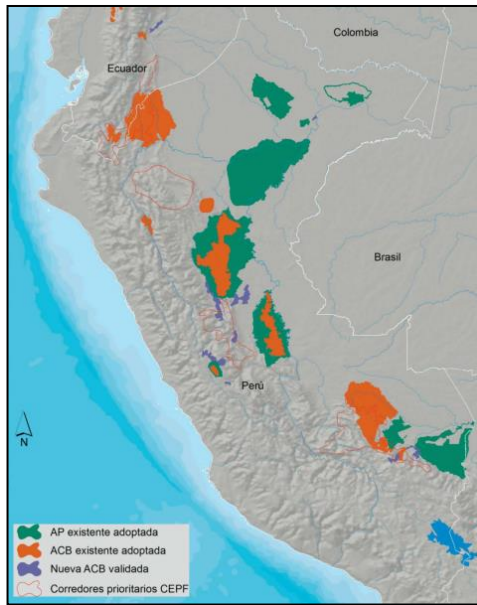
Fishes in headwater areas are adapted to life in shallow, fast-flowing water. Aquatic habitats in the park also provide spawning areas for migratory species, including large species consumed by riparian human communities: *Colossoma macropomum* (gamitana), *Piaractus brachypomus* (paco), *Prochilodus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

Since 2015, CIMA was informed about a fish that inhabiting a cave at 950 m of altitude in the buffer zone in Tocache sector (Ñahuicopa *et al.* 2016, Hidalgo *et al.* 2017). During 2016 a group of researchers from CIMA and the Museum of Natural History (MUSM) conducted an expedition confirming the discovery. This strange blind catfish is still being reviewed (morphologically and genetically) by scientists waiting for official description and name. In between, The "Milagrosa Cave" can become one of the attractions for ecotourist visitors and will be promoted by the local government of Tocache.

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



Photo credit: Max Hidalgo/UNMS



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 al.* 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 protected area. The conservation 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 5.8 Protected areas and ACB⁵⁸ of freshwater delimited in Peru. Red indicates the priority corridors identified by the Critical Ecosystem Partnership Fund (CEPF). <https://portals.iucn.org/library/node/46341>

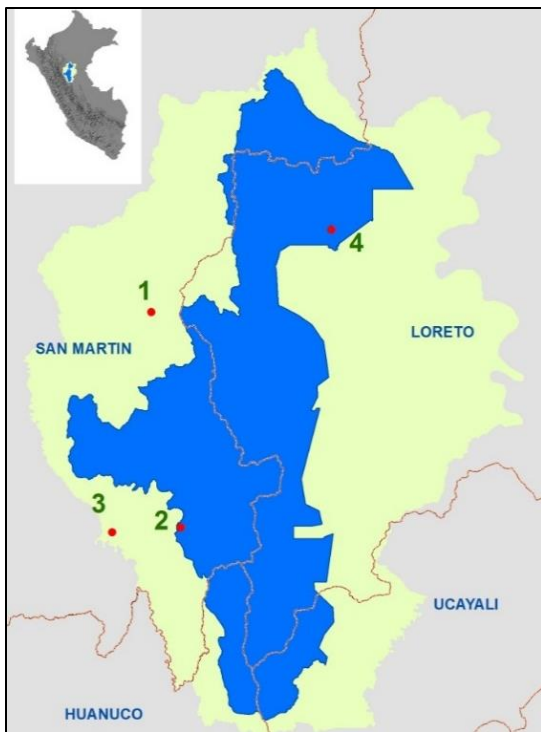


Figure 5.9. Map showing type localities for the four new species recently discovered: (1) “Cordillera Azul Antbird”, (2) “Lily Rodriguez’s Beaked Toad”, (3) “Tocache Blind Catfish” first discovered and (4) “Painted Manakin”.

⁵⁸ 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 2016-AUG 2018

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	Units	Outputs				Outcomes	Impacts
		Number					
		Year 9 (2017)		Year 10 (2018)			
		Aug-Dic 2016	Jan-Jul 2017	Aug-Dic 2017	Jan-Jul 2018		
1.1.1: Park Guards perform effective protection in PNCAZ	Patrols	177(T3) 125(T4)	211(T1) 146(T2)	152(T3) 105(T4)	135(T1) 151(T2)	Park Guard patrols were fully implemented met as per annual plans from 2016 to 2018.	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	It was expected to carry out at least 400 patrols / year, but a total of 1,202 patrols were done in two years; so, more than 600 patrols/year.	
	Control Posts	17(T3) 19(T4)	17(T1) 19(T2)	19(T3) 4(T4)	0(T1) 0(T2)	Park Guard patrols and infrastructure maintenance were fully implemented met as per annual plans until Third quarter 2017. From 2018 The PNCAZ head starts to update the protection diagnosis to elaborate a new Maintenance Plan.	
1.1.3: Training for Park Guards and technical staff	Courses and training events	3(T3) 1(T4)	1(T1) 1(T2)	1(T3) 1(T4)	1(T1) 1(T2)	<p><u>2016:</u></p> <p>(1) 2 parkguards attended to the Leadership and Survivor Course for Parkguards;</p> <p>(2) 2 parkguards attended to the Course Climate Change, Adaptation and Mitigation on Protected Areas;</p> <p>(3) 4 parkguards attended to the Workshop-course about Climate Change and the Protected Areas; and</p> <p>(4) 4 parkguards attended to the Applicative Management of SMART capacitation.</p> <p><u>2017:</u></p> <p>(5) A PNCAZ parkguard participated in the IV Encounter of Peruvian Parkguards</p>	

						<p>(6) A PNCAZ parkguard participated in the Provincial Platform for Civil Defense - Aguaytía</p> <p>(7) 7 parkguards attended to the First Course of Camera Traps for PNCAZ Parkguards and CIMA technicians in Aspuzana valley</p> <p>(8) PNCAZ specialist and CIMA technical team attended to the Workshop-course for Geographic Information System (GIS) Management</p> <p><u>2018:</u></p> <p>(9) 16 parkguards attended to the Second Course of Camera Traps for PNCAZ Parkguards and Urku´s technical team in Tarapoto</p> <p>(10) 3 parkguards participated in the Field Capitations for Restoration Project in San Juan and Lejia communities, Tarapoto sector.</p>	
1.1.4: Monitoring the vegetation cover of PNCAZ with GIS support	Annual Report	1	1			Permanent 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	2	2	<p>Monthly Park Guard reports were organized by staff as inputs for reports to SERNANP; sites patrolled by park rangers are recorded in quarterly reports.</p> <p><u>Note:</u> Since 2013, the indicator changed from counting monthly reports from each control post to consolidated quarterly or trimester reports prepared by the Program Director of the PNCAZ.</p>	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		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	236(T3) 163(T4)	176(T1) 68(T2)	184(T3) 21(T4)	127(T1) 103(T2)	<p>Data on hunting in the park was analyzed quarterly: 539/year beneficiaries from PNCAZ's wildlife</p> <p><u>Note:</u> The indicator used to evaluate hunting demand was changed to consider wildlife as a benefit from the park to buffer zone residents.</p>	

1.3.1 Legal proceedings to evict illegal cattle rancher in park	Legal Report	1	---	---	On August 25, 2016, the Mixed Court of Bellavista of the Superior Court of Justice of San Martín passed judgment No. 37 in which Mr. Suarez and others were ordered to evict the lands located in PNCAZ.
1.3.2: Court-ordered evacuation of livestock	Livestock removal report	---	1	---	All the cows were removed and parkguards install a perimeter fence; so, this activity is finished, parkguards only make routine patrols to the site.
1.3.3: Monitoring natural regeneration at disturbed sites	Disturbed site recovery report	1	1	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	Units	Outputs				Outcomes	Impacts
		Number					
		Year 9 (2017)		Year 10 (2018)			
		Aug-Dec 2016	Jan-Jul 2017	Aug-Dec 2017	Jan-Jul 2018		
2.1.1: Development of research involving the PNCAZ team	Research projects	12	12		10	<p>More than 10/year research projects were carried out during the period of this evaluation; including wildlife, landscapes and social researches.</p> <p>2016: 12 research projects, 8 of them are new, and 4 thesis or publications</p> <p>2017: 12 research projects, 9 of them are new, and 3 publications.</p> <p>2018: 10 research projects, 4 of them are new, and 2 publications</p> <p><u>Note:</u> The research goal of the initial contract was 2 projects/yr, but in 2014 this was increased to 5/yr.</p>	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	1	5	2	<ul style="list-style-type: none"> - Updating CIMA's web page. - CIMA signed agreements with academic or research institutions: WCS (2016) - CIMA is part of the <i>Red Climática de Ucayali</i> - CIMA shares research information with SERNANP, Althelia, several researchers, local people and other interested actors. - Meetings with the Territorial Organization Directorate (DGOTA) of MINAM to standardize parameters for forest cover and soil use analysis - Contacts with researcher from international Universities, especially from USA and Germany <p>Researches carried out in the PNCAZ were presented as case studies in Peruvian universities (UNALM, UPCH) courses at least once a year.</p>	

2.1.3 Development of a Research Strategy with the PNCAZ team (SERNANP, CIMA, PNCAZ's Management Committee).	Workshop and meetings	---	1	---	---	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. It was approved in January 31, 2017.	
2.2.1: Periodic update of social and environmental databases in the project area.	Database with updated records	2	1		1	Geo-referenced social and biological information is updated and available (2 databases: Fauna from parkguards 2016-2018 and MUF 2016) Information shared with SERNANP (feb 2018) for the SINANPE database.	
2.2.2 Research dissemination events	Meeting minutes	1	1	1	2	Participation in events and courses, with presentations on the REDD Project and the PNCAZ's management. 2016: Video with CEDRO about Shapaja 2016-2017: REDD Implementation Reports from 2015 and 2016, and results. REDD Project information 2016 (Technical & scientific) available on the web and accessed by local authorities. CIMA web pages and other:	2.2. Research topics respond to identified priorities, and results and recommendations are taken into account in decision making for PNCAZ management.
2.2.3: Information analysis is incorporated into management documents that are available to the technical team and communities.	Reports	1		1		<ul style="list-style-type: none"> • Ecosphere+ (post by Daniel Fisher): https://www.ecosphere.plus/blog/two-new-species-found-cordillera-azul-peru/ • Noticias del SERNANP (dic. 2017): http://www.sernanp.gob.pe/noticias-leer-mas/-/publicaciones/c/san-martin-descubren-una-nueva-especie-de-ave-endemica-364343 • Perú 21 (dic. 2017): https://peru21.pe/peru/san-martin-hormiguero-cordillera-azul-nueva-especie-ave-endemica-389312 • Andina Agencia Peruana de Noticia (dic. 2017) http://www.andina.com.pe/agencia/noticia-san-martin-descubren-nueva-especie-ave-endemica-hormiguero-de-cordillera-azul-693600.aspx • Redacción Peru.com (dic. 2017) https://peru.com/actualidad/nacionales/peru-descubren-nueva-especie-ave-endemica-region-san-martin-noticia-547400 	

2.3.1: Promote the participation of local people in research activities.	Events	1	1	1	<p>2016: Participation of local inhabitants in investigations, including their recognition in the credits of the findings made (p.e. Simposio Internacional del Carst Peru 2016).</p> <p>2017: Return of information, including training of local populations.</p> <p>2018: Training of the team (CIMA and Park rangers) by the Field schools, as part of the restoration project</p>	2.3 Residents of PNCAZ's buffer zone are involved in research activities and are informed of their results.
2.3.2: Analysis and dissemination of the results of participatory research.	Informative meetings	1	1	3	<p>2016: MUF 2016.</p> <p>2017: CIMA promotes the publication of news about new species in PNCAZ at SERNANP</p> <p>2018: Results of the information are shared in different academic spaces (forums, workshops, classes) such as UPCH, UNMSM Natural History Museum, Chico Mendes Institute, and park team</p>	

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						
		Year 9 (2017)		Year 10 (2018)				
		Aug-Dic 2016	Jan-Jul 2017	Aug-Dic 2017	Jan-Jul 2018			
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				1	This activity was successfully completed: the diagnosis (with land-use zoning project) identified tourism potential and work is being done with the Yamino native community. Tourism and Craftwork are priority activities on its Quality of Life Plan. Currently the Yamino Tourism organization maintain its tourist trails in accordance with the tourism action plan. Since 2018, CIMA identifies new option around Shamboyacu and Tres Unidos, with a tourism report and visits to local communities like Chambira.	3.1. Local people are organized and empowered to participate in the development of sustainable tourism in their area.	
	Population		1		1			
3.2.1: Sustainable tourism research.	Research projects				1			
3.2.1: Development of sustainable tourism plans.	Action Plans		2		2	Yearly Action Plans for both Tourism and Craftwork women associations have been developed, including strengthening and training actions for the Tourism and Craft Associations. CIMA promoted a visit of biology students of the Universidad Peruana Cayetano Heredia, so that both associations could offer their services to visitors, improve their attention with recommendation and biodiversity information. Also, they earned S/. 2,800 for their food and guidance services.	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	2	2	Yamino has had notable visitors: Universities, CEDRO, Sonaly Tuesta (Costumbres - TVPerú), etc. Women artisans from Yamino participated and were awarded in the "First Craft and Textile Contest" held by the Centro de Innovación Tecnológica (CITE) - Artesanía of Ucayali, from Mincetur.		

						CIMA supported the visit to Yamino for the production of the TV Peru program, Costumbres, conducted by Sonaly Tuesta; with the program Kakataibos: Men and Women of Iron , who participated the comuneros of the own native community, standing out that it belongs to the ZA of the PNCAZ	
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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	Units	Outputs				Outcomes	Impacts
		Number					
		Year 9 (2017)		Year 10 (2018)			
Aug-Dic 2016	Jan-Jul 2017	Aug-Dic 2017	Jan-Jul 2018				
4.1.1 Development of a local Land-use Zoning process (ZEE) in areas prioritized for intervention	Additional villages with ZEE	---	---	---	---	<p>This activity was successfully completed as local processes; so, CIMA has dedicated to following the process with the DGTO – MINAM until official approval; also, implementation of results, with sustainable economic activities like tourism, cocoa/coffee or restauration.</p> <p>No new processes have started the number of communities and villages with ZEE increased to 24.</p>	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	0	12	3	3	<p>Previously, 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.</p> <p>During 2017, 12 villages had developed and implemented Rules of Conduct/Coexistence, especially in villages from Tarapoto sector, were CIMA has the compromise of at least 8 new QLP, in order to reach 34 to 2018.</p>	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	21 (2 new QLP)	30 (9 new QLP)	31 (1 new QLP to	31	<p>Until August 2018 a total of 31 villages have developed their Quality of Life Plans (QLP) as well as to continue the process of Implementing.</p> <p>Twelve (12) new QLP has been development during the currently evaluating period:</p>	

				august 2018)	<ul style="list-style-type: none"> • 2016: 2 QLP to the end of the year • 2017: 9 new QLP • 2018: 1 new QLP <p>It is expected to reach 34 QLP at the end of 2018.</p>	
4.3.1 Priority activities are formalized with communities through signed agreements, roadmaps, minutes, etc.	Agreements	1	3	1	<p>CIMA is in permanent contact and coordination with local, regional and national authorities, upholding agreements with the environmental and forestry authority: MINAM and SERFOR, signed in 2016.</p> <ul style="list-style-type: none"> • 2016: signed an Inter-institutional Cooperation Agreement with the Gerencia Sub Regional de Padre Abad – Aguaytía • 2017: CIMA renewed their agreements with: Federación de Comunidades Nativas del Bajo Ucayali (FECONBU) and Federación de Comunidades Nativas de la Cuenca del Rio Pisqui (FECONACURPI), in order to develop processes articulately in prioritized communities. <p>CIMA also signs a Framework Agreement for Inter-institutional Cooperation with the Universidad Agraria de la Selva (UNAS).</p> <ul style="list-style-type: none"> • 2018: signed a MoU with the Autoridad Regional Ambiental (ARA) and the Gerencia de Desarrollo Económico, from GOREL. <p>CIMA continues working closely with local and regional authorities/governments, for mutual support for implement sustainable activities and implementing priorities in QLP.</p>	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					
		Year 9 (2017)		Year 10 (2018)			
		Aug-Dic 2016	Jan-Jul 2017	Aug-Dic 2017			Jan-Jul 2018
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)	29 local organizations, from a total of 42 communities and villages				<p>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.</p> <p>CIMA works in activities related to value chains with about 21 community organizations:</p> <ul style="list-style-type: none"> • Producer and associations/committees for cocoa and coffee (13 populations), and several populations with technical assistance for agricultural activities and for minor animals • Associations of women artisans (3 native communities): Charasmaná, Manco Capac and Yamino • Tourism association (1 native community): Yamino • Women organizations (3 populations): • Rural patrols like <i>rondas campesinas</i> for conservation and reforestation activities (9 populations): Chipaota, Ramon Castilla, Las Palmas, Nuevo Jaen, Nuevo San Martin, Santa Rosa de Shapaja and Villa Hermosa <p>But there are other non-economic activities that also contribute to improving their quality of life, described in the activity 5.1.3.</p> <p>Sustainable activities (economic and non-economic) are fully framed within strategic planning defined for each</p>	5.1 Local communities develop sustainable economic activities derived from ZEE and prioritized in their PCV.

					community in their Quality of Life Plans (QLP), and at the level of grassroots organizations in their Action Plans (AP). In addition, CIMA development a Cacao Business Plan and built a Cocoa factory in the Aspuzana Valley, for cocoa collection and processing with high quality standards.
5.1.2 Strategic partnerships to develop productive activities prioritized in the PCV.	Strategic partnerships	1	3	1	<p>CIMA signed an agreement with:</p> <ul style="list-style-type: none"> • 2016: signed an Inter-institutional Cooperation Agreement with the Gerencia Sub Regional de Padre Abad – Aguaytía • 2017: CIMA renewed their agreements with: Federación de Comunidades Nativas del Bajo Ucayali (FECONBU) and Federación de Comunidades Nativas de la Cuenca del Rio Pisqui (FECONACURPI), in order to develop processes articulately in prioritized communities. <p>CIMA also signs a Framework Agreement for Inter-institutional Cooperation with the Universidad Agraria de la Selva (UNAS).</p> <ul style="list-style-type: none"> • 2018: signed a MoU with the Autoridad Regional Ambiental (ARA) and the Gerencia de Desarrollo Económico, from GOREL.

<p>5.1.3 Development of actions linked to value chains to support economic activities that favor conservation.</p>	<p>Action plans (Focus on sustainable economic activities)</p>	<p>21 QLP X 3 priorities</p>	<p>30 QLP X 3 priorities</p>	<p>31 QLP X 3 priorities</p>	<p>Every population with a QLP have 3 priorities, and for every priority prepared an annual Action Plan (AP):</p> <p>Aguaytía: 8 AP focus on sustainable economic activities</p> <ol style="list-style-type: none"> Yamino → <u>Turism association</u>, <u>Women crafts association</u>, <u>Reforestation</u>, <u>banana and cocoa</u>, <u>conservation communal area</u>, and <u>Health center</u> Santa Rosa de Aguaytía → <u>Cacao Committee</u>, <u>banana production</u>, <u>water and sewer</u>, <u>riparian defense</u>, <u>Community Forest Management</u>. Mariscal Cáceres → <u>Cocoa producers</u>, <u>Community Forest Management</u>, <u>road from Mariscal Cáceres – Selva Turística</u>, <u>water and sewer</u> <p>Contamana: 5 AP focus on sustainable economic activ.</p> <ol style="list-style-type: none"> Isolaya → <u>cocoa Productive Association ADECAVACU</u> Fernando Belaunde Terry → <u>titling of the village</u>, <u>phone service</u>, <u>village recognition (done)</u>, <u>health infrastructure</u>, <u>Cocoa with ADECAVACU</u> Nuevo San Martín → <u>village recognition & Titling</u>, <u>cocoa with ADECAVACU</u> San Lorenzo → <u>Cocoa production</u>, <u>health infrastructure and water</u> Nuevo Dorado → <u>Cocoa Committee ND</u>, <u>health infrastructure and water</u> Orellana → <u>AREMPU association</u> Manco Capac → <u>Hight school education</u>, <u>Health infrastructure and reforestation and forest management with bolaina</u>, <u>women artisan AASHIRIPIS</u> Charasmana → <u>water</u>, <u>production of Amazonian fishes</u>, <u>reforestation</u>, <u>women artisan AASHIRIPIS</u> 	
<p>26 action plans focus on sustainable economic activities</p> <p>19 action plans related with activities to allowed or facilitated the economic activities: <u>road improving and bridges</u>, <u>titling and village categorization</u></p>						

			<p>Tocache: 5 AP focus on sustainable economic activities</p> <ol style="list-style-type: none"> 1. Santa Rosa de Shapaja → improve roads, communal multifunctional infrastructure and solid waste management; Municipalidad de CCPP and urban planning. <u>Work with the Ronda campesina</u> for management of bee hives (beekeeping). 2. Maronilla → village recognition, water and sewer (JASS), telephone, improve educational infrastructure, health infrastructure/services, urban planning, ronda campesina, Municipalidad de CCPP; <u>Post-harvest infrastructure</u>. 3. Nuevo Jaen → communal dining room, riparian defense, <u>technical assistance for cocoa</u>, waste management, health, titling. Conservation initiatives. 4. Cachiyacu → > <u>reforestation</u>, already have a post-harvest infrastructure. <u>Working with cacao association Nueva Vision</u> 5, 6 & 7. Villa Hermosa, Antonio de Alto Marona and Nuevo San Martin → starting QLP, with environmental education and sensibilization. Nuevo San Martin also with a conservation initiative 8. Pucayacu → great interest in <u>tourism for the valley</u>, and Environmental education 9, 10, 11, 12 & 13. Santa Rosa de la Cumbre, Sargento Lores, San José de Huaquisha, Cahuide, Nueva Esperanza → Environmental education and information, to maintain PNCAZ protection/conservation <p>Tarapoto: 8 AP focus on sustainable economic activities</p> <ol style="list-style-type: none"> 1. Pongo Isla → village categorization, waste management, water and sewer 2. Santa Rosillo → land titling, waste management, and water and sewer 3. Chipaota → water and sewer, Autodefence committee, bilingual school, waste management 	
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			<p>4. Ramón Castilla → waste management, health infrastructure, riverine defense; <u>Action Plan for Ronda campesina: reforestation</u></p> <p>5. Sangamayoc → AICON concession, Health, and village categorization.</p> <p>6. San Juan → school infrastructure, water and sewer, health infrastructure and restauration</p> <p>7. El Paraiso (Tres Unidos) → village categorizing, water and bridge</p> <p>8. Lejia → road Shamboyacu-Lejia, waste management, water and sewer, village categorization, communal center, and Health infrastructure. <u>Restauracion</u></p> <p>9. Vista Alegre → school, village categorization and communal infrastructure</p> <p>10. Paraiso → village categorization, health infrastructure, water and sewer, road / bridge, internet</p> <p>11. Alto Ponaza → health infrastructures, village categorizing and phone service</p> <p>12. Alto Jorge Chavez → village categorization, improve road, integrated school</p> <p>13. Chambira → education, titling, bridge, <u>Productive Association Comité de cacaoteros ALLIMA SACHA</u></p> <p>14. Santa Rosa → health, road, categorization. <u>Productive Association Comité de Productores Agropecuarios Selva Verde</u></p> <p>15. Challual → health infrastructures, village categorizing and road. Ronda campesina</p> <p>16. Las Palmas → working with Ronda campesina</p> <p>17. Nuevo Picota → health infrastructure, road Nuevo Loreto-Nuevo Picoita, high school</p> <p>18. Nuevo Loreto → working with Women Association: waste management and <u>horticulture</u></p>	
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					<p>19. Nuevo Trujillo--> health, solid waste management and improve village central square</p> <p>20. San Miguel → <u>cocoa and coffee production</u>, improve road to Jose Olaya, primary school.</p> <p>21. Nuevo Arica → Productive Association <u>Comité de cacaoteros “Rayos del Sol</u></p> <p>22. Siambal → auto defense committee</p> <p>23. Vista Alegre (Pikiyacu) → <u>Comité de Cacaoteros Valle del Alto Biavo</u></p> <p>24 - 35: La Union de Corotoyacu, Pucallpa, La Unión (Shambo), Porvenir de Cordillera Azul, Nuevo Amazonas, Flor de Café, Santa Rosa, Los Cedros, Flor de Selva, Playa Hermosa, Tahíti, La Conquista --> Environmental education</p> <p>CIMA supports and strength communal organizations to improve their productivity in a consistent way with PNCAZ conservation.</p> <p>Action plans linked to value chains had been development with agricultural associations and cooperatives (cocoa and coffee), tourism and handicraft associations.</p>	
5.2.1 Implementation of the <i>Monitoring and Impact Assessment (MUF)</i> 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, every 3 years.	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	2	3	5	Between 2016 and 2018 CIMA worked to support 6 conservation initiatives in the PNCAZ’s Buffer zone, in order to to strengthen the management of these spaces, with the planning or implementation of plans:	5.3 Based on the results of the ZEE, local communities manage

					<p>2016: CIMA works with Nuevo Jaén and Nuevo San Martín, in Tocache sector</p> <p>2017: CIMA includes Alto Marona, in Tocache sector</p> <p>2018: CIMA supports the creation of areas for conservation in the indigenous community of Yamino and the Conservation Concession of Pauya-Cushabatay</p> <p>Along this time CIMAS continues working with sites of interest for conservation by local populations; however, under the new Forestry Regulations and the Forest zoning, are still under evaluation, because over position with BPP, like: Challual, Las Palma, Nuevo Trujillo and San Juan, were CIMA addresses issues about forest conservation, control and surveillance, riparian protection, solid waste management, etc.</p>	conservation areas according to their interests.
5.4.1 Promotion and subscription of Conservation Agreements	Conservation Agreements (Acuerdos Azules)	---	---	1	<p>CIMA signed its first five Conservation Agreements in 2014 with villages in the Tarapoto sector, and three more in 2015 with villages in the Tocache sector.</p> <p>A total of 8 conservation agreements at the community level were the commitment with SERNANP; but in 2018 CIMA signed an extra Conservation Agreements with the native community of Yamino.</p> <p>Those 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; and CIMA has carried out the constant evaluation of compliance with previous Conservation Agreements.</p> <p><i>Note:</i> These agreements are different from other conservation agreements that were signed before activities began.</p>	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					
		Year 9 (2017)		Year 10 (2018)			
		Aug-Dic 2016	Jan-Jul 2017	Aug-Dic 2017	Jan-Jul 2018		
6.1.1 Update and implementation of the Financial Plan for PNCAZ.	Updated financial plan	---				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	4,096	10,944	551,195	In 2017 the most remarkable VCUs buyer was the International Union for Conservation of Nature and Natural Resources (IUCN), for the International Biodiversity Congress, celebrated in 2016, Hawaii-USA. During 2018 the most remarkable buyer was the Fundación Poseidon, with 550,000 VCUs. 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.	6.2 Ideas for sustainable management of the PNCAZ include a long-

			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.	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					
		Year 9 (2017)		Year 10 (2018)			
		Aug-Dic 2016	Jan-Jul 2017	Aug-Dic 2017			Jan-Jul 2018
7.1 Monitoring PNCAZ management	Decentralized coordination meetings	3	4	2	<p>This is the process of monitoring PNCAZ management conducted through financial, technical and administrative external audits:</p> <ul style="list-style-type: none"> (1) Internal supervision (CIMA) to ensure optimal management; at least one every quarter, with permanent coordination between CIMA's central office, head of PNCAZ and CIMA's field headquarters. (2) financial and administrative external audit: at least one/year. (3) supervision by the national government (SERNANP), with several meetings, but 2/year for the direct supervision of the management contract. <p>Supervision by the ESG team from Althelia (ACF)</p>	7.1 PNCAZ's management used tools for transparent and proactive monitoring of implemented strategies to assess impact.	
	Financial audits of CIMA	1/yr	1/yr	1/yr			
7.2: Monitoring the management contract with SERNANP	Meetings and supervision of performance	1	2	2		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	8	16	8	<p>More than the projected number of events. The main work platforms are:</p> <ul style="list-style-type: none"> - Commission <i>ad hoc</i> and committee of the Sierra del Divisor National Park (SDNP) - Land Use Planning Platform - REDD Group, and sub-technical groups, like Safeguards and reference level. - IUCN National Committee, with participation in the IUCN World Conservation Congress (Hawaii, sept 2016) 	7.3 Participation and interest in project activities at high level	

					<ul style="list-style-type: none"> - IUCN Green List for PNCAZ: High Level Event: Green List is an effective tool for ecoregional cooperation: a world tour of initiatives. - Meetings of the <i>Programa Nacional de Conservación de Bosques y Cambio Climático y Desertificación</i> (PNBCCD-MINAM), - 20X20 Initiative technical committee - Board of Directors on Fondo de las Américas – FONDAM - Water and ecosystem services 	
7.4: Follow-up on the dossier for proposed PNCAZ expansion	Follow-up report	---	1	1	<p>There was no great advance on the part of SERNANP despite the impulse that CIMA intended to give it. The strategy changed 2017 to provide protection to the Cushabatay Area through the installation of a conservation concession:</p> <ul style="list-style-type: none"> - 2017 a new financing was obtained, and the strategy was coordinated with the regional government of Loreto <p>2018: dossier for concession was presented, and the corresponding field work is carried out; the area is already defined as an ecosystem of importance for the conservation of Loreto</p>	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	5	1	0	<p>PNCAZ's Management Committee was created and achieve the SERNANP's Recognition of its Executive Commission (RD-028-2016-SERNANP-DGANP).</p> <p>In August 2016 were held 5 meetings to update the Master Plan, where participated members and representatives of the Management Committee; and the last meeting por Master Plan was in December 2016.</p> <p>During 2017, only one meeting was held during the first quarter. Changes in members have stalled participation during the follow-up commission.</p>	7.5 Good coordination by the PNCAZ management committee during the implementation period.
7.6: Dissemination of experiences	Publications and events	8	7	2	<p>Several publications and events appeared during 2016 - 2018, most of these in relation to conservation management, carbon emissions and climate change.</p>	7.6 Good dissemination of scientific research

				<p>The PNCAZ is used as a case study at an international level, mainly for its management effectiveness and its REDD project:</p> <ul style="list-style-type: none"> - <i>Catálogo de Experiencias Exitosas ONGD-2015</i> (sept 2016), by Agencia Peruana de Coop. Internacional – APCI - Finding the new species of catfish found in Tocache caves - Althelia’s electronic newsletter - SERNANP/UICN: News about PNCAZ in Green List - CIMA’s Video about PNCAZ Program and cocoa project - Science Forum of the Congress of Biological Diversity (dic 2016): <i>The Cordillera Azul National Park’s comprehensive monitoring system: Articulating conservation and local development with a landscape approach</i> - Experiencia de Gestión Participativa en el PNCAZ, in Moyobamba regional meeting about participatory management - ExpoAmazonica 2017 - webinar about: <i>Solutions and lessons learned in the management of Amazon Protected Areas</i>, for the World Commission on Natural Protected Areas of IUCN - PANORAMA Solutions 2017: <i>Social participation contributions as a driver of innovation in the management of the Cordillera Azul National Park</i> - PNCAZ on the UICN – Programa Incubadora para la Innovación - CIMA fan page for dissemination of experience 	park management achievements.	
7.7 Verification with VCS and CCB	Verification certificate	1	1	---	<p>The verification processes the PNCAZ REDD Project, for August 2014 – August 2015, and August 2015 – August 2016 finished during the last quarter of 2016 and 2017 respectively; last verification used the VCS – CCBS format. Later, the monitoring process of the August 2016 – August 2018 period begins during the second quarter of 2018.</p>	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.

To ensure consistency with all previous monitoring events, the classification method employed followed the approach used for the previous monitoring events in 2016, 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 2018 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 5.1 shows the collection of images that were used in the final classification.

Table 2.1: Images that were used in the final classification

Path Row	Date	Image ID	cloud cover
path 7 row 66			
	9/2/2018	LC80070662018245LGN00	54.27
	7/16/2018	LC80070662018197LGN00	12.69
	6/30/2018	LC80070662018181LGN00	9.92
path 7 row 65			
	9/18/2018	LC80070652018261LGN00	72.46
	7/16/2018	LC80070652018197LGN00	6.81
	6/30/2018	LC80070652018181LGN00	13.38
	3/10/2018	LC80070652018069LGN00	51.72
path 7 row 64			
	7/16/2018	LC80070642018197LGN00	12.08
path 8 row 65			
	9/9/2018	LC80080652018252LGN00	13.59
	8/24/2018	LC80080652018236LGN00	17.93
	6/21/2018	LC80080652018172LGN00	12.47
path 8 row 64			
	9/9/2018	LC80080662018252LGN00	8.37
	7/7/2018	LC80080662018188LGN00	5.56

Pre-processing

When using Landsat 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 NASA⁵⁹.

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.*, 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 2018 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.

⁵⁹ <http://landsathandbook.gsfc.nasa.gov/level/>

(90m x 90m). In some cases where clouds, cloud shadows and terrain shadows caused classification errors, shadow effects were delineated and classified.

The result of this classification procedure is shown in Figure 2.1. where 98% of the reference region is classified with less than 2% unclassifiable due to cloud coverage (Table 2.2).

Figure 2.1: 2017 - 2018 Classification for full reference region

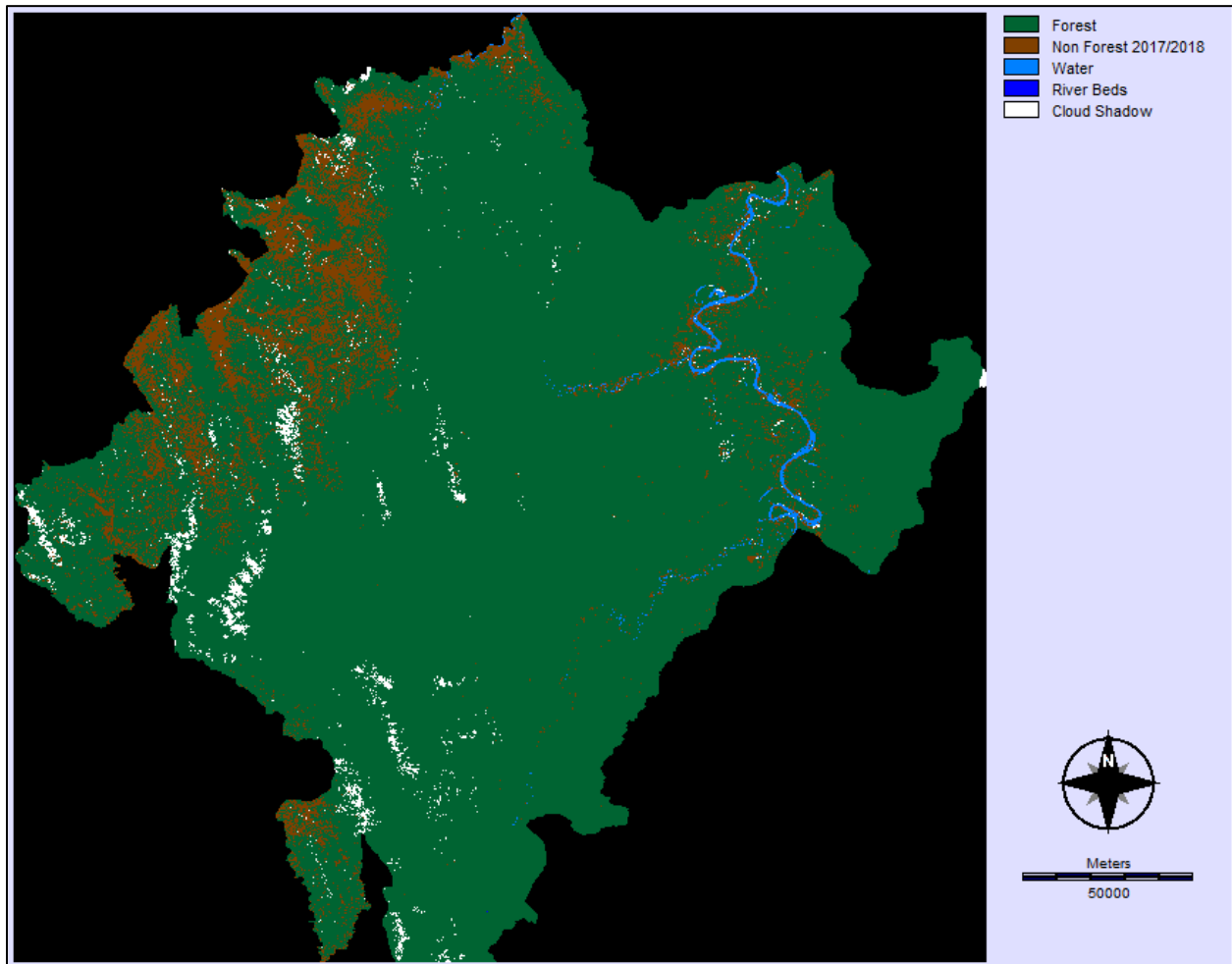


Table 2.2: Classification area

Category	Hectares
Forest & Non-Forest	3,701,262.51
Cloud & shadow	62,068.32
Total area classified	3,763,330.83
% cloud	1.65%

Analysis of the total cloud cover in the year 2016 - 2018 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

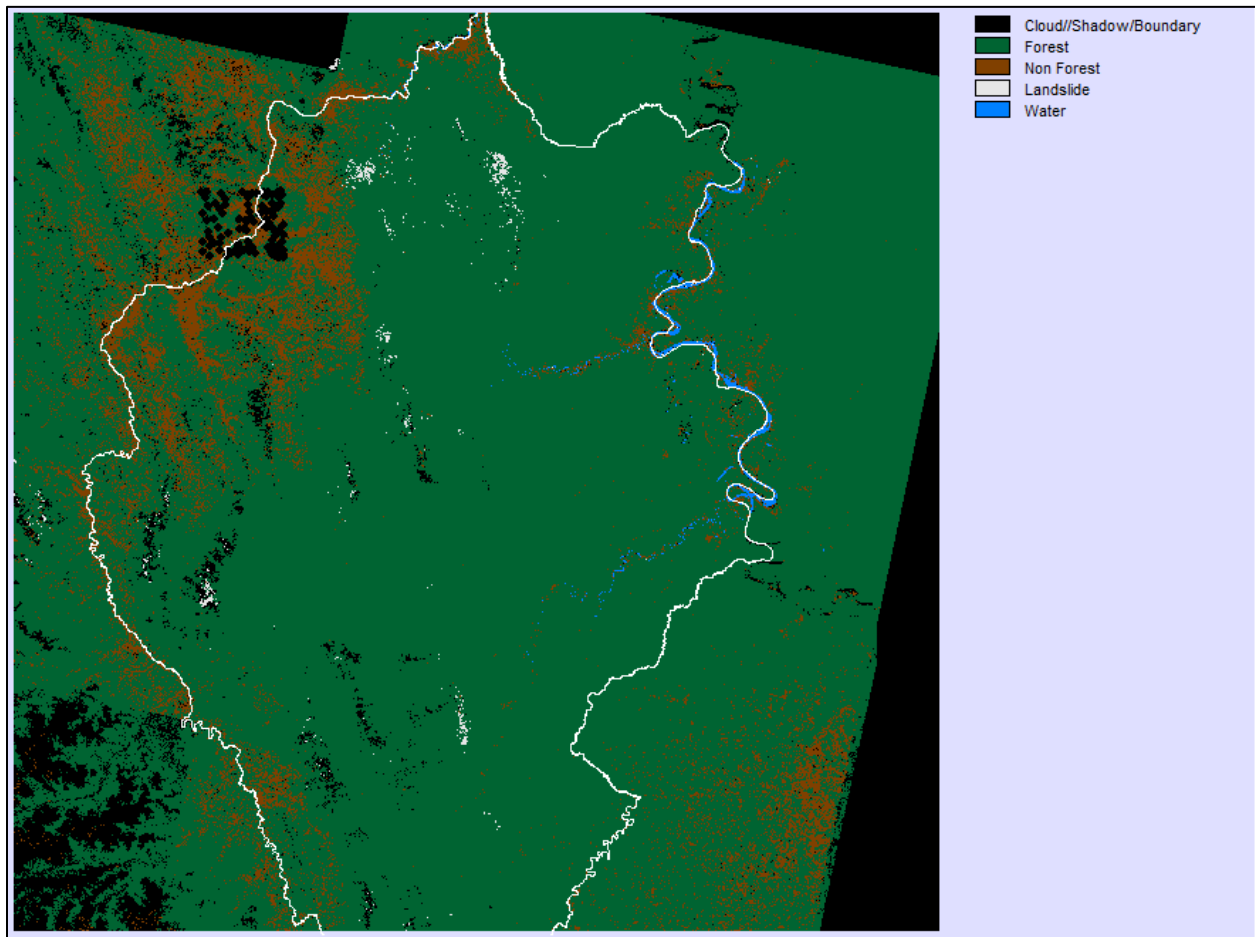
CLOUD COVER ANALYSIS	ha	% of area
Area that is clouded in 2014 & 2015	3,925.26	
Area this is only clouded in either 2014 or 2015	68,734.53	
Cloud cover total for both dates	72,659.79	1.93%

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.

Figure 2.2: Accuracy assessment points



All available high resolution 2018 imagery was used in this accuracy assessment, but no points fell within the project area. Many points are within the leakage belt. The map above shows the distribution of points in the full classification area. When classification is conducted the full landsat scenes are used which covers an area much greater than the reference region alone. Some of the accuracy assessment point all fall within the classification area, but outside of the reference region. This is a conservative approach since the landscape surrounding the reference region represents very challenging heterogenous mixtures of forest and non-forest.

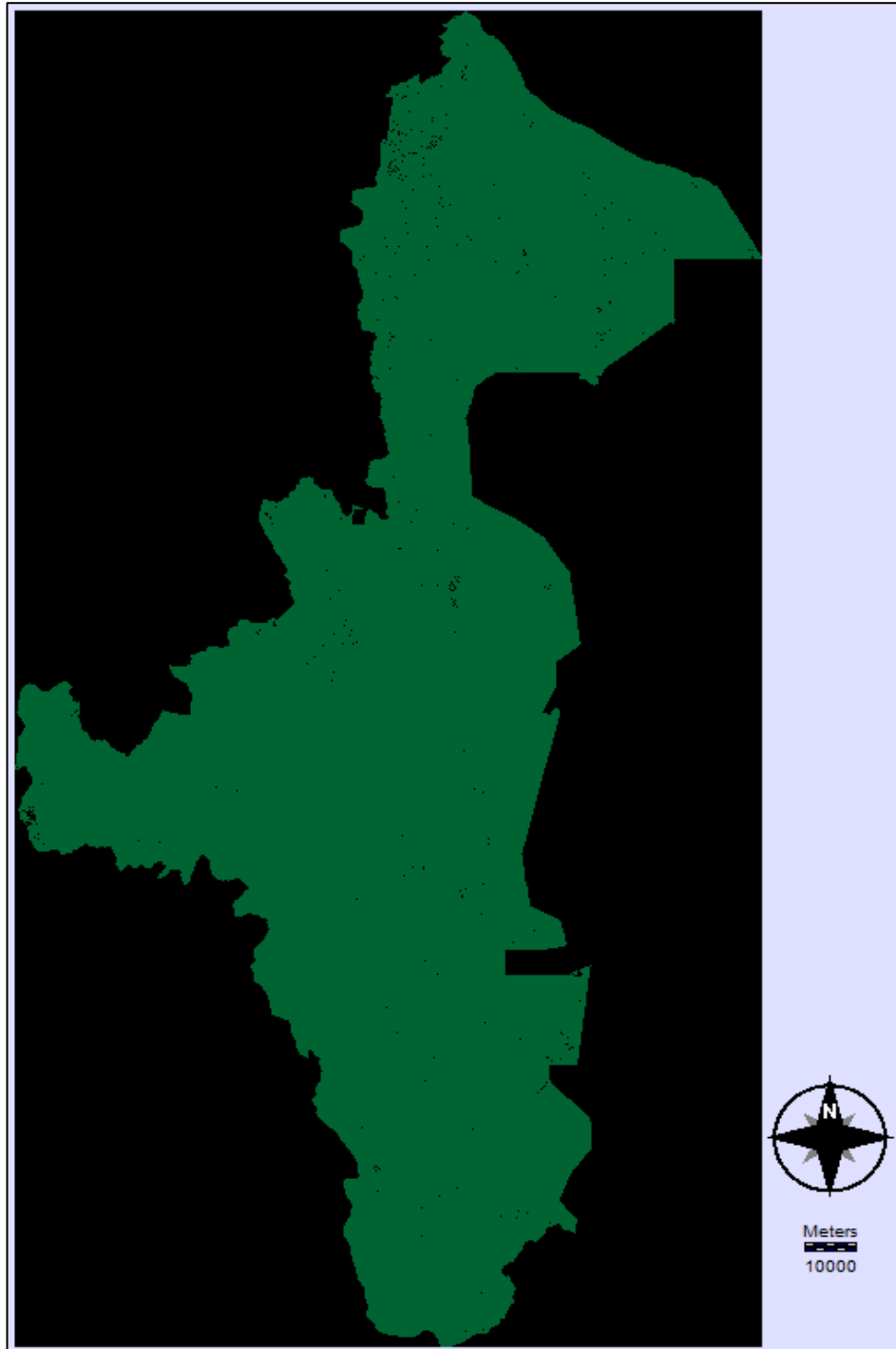
Overall classification accuracy was 95.5% Results of the accuracy assessment are in Table 2.4.

Table 2.4 Classification accuracy assessment 2016.

Classification	Land-use class as determined from ground-truth points		Total	Accuracy (%)	Error of Commission (%)
	Forest	Non-forest		User's accuracy	
				(# correct/ row total)	
Forest	49	1	50	98.00%	2.00%
Non-forest	4	46	50	92.00%	8.00%
Total	48	52	100		
Accuracy (%) Producer's accuracy (# correct/ column total)	102.08%	88.46%			Overall Accuracy 95.00%
Error of Omission (%)	8.33%	1.92%			

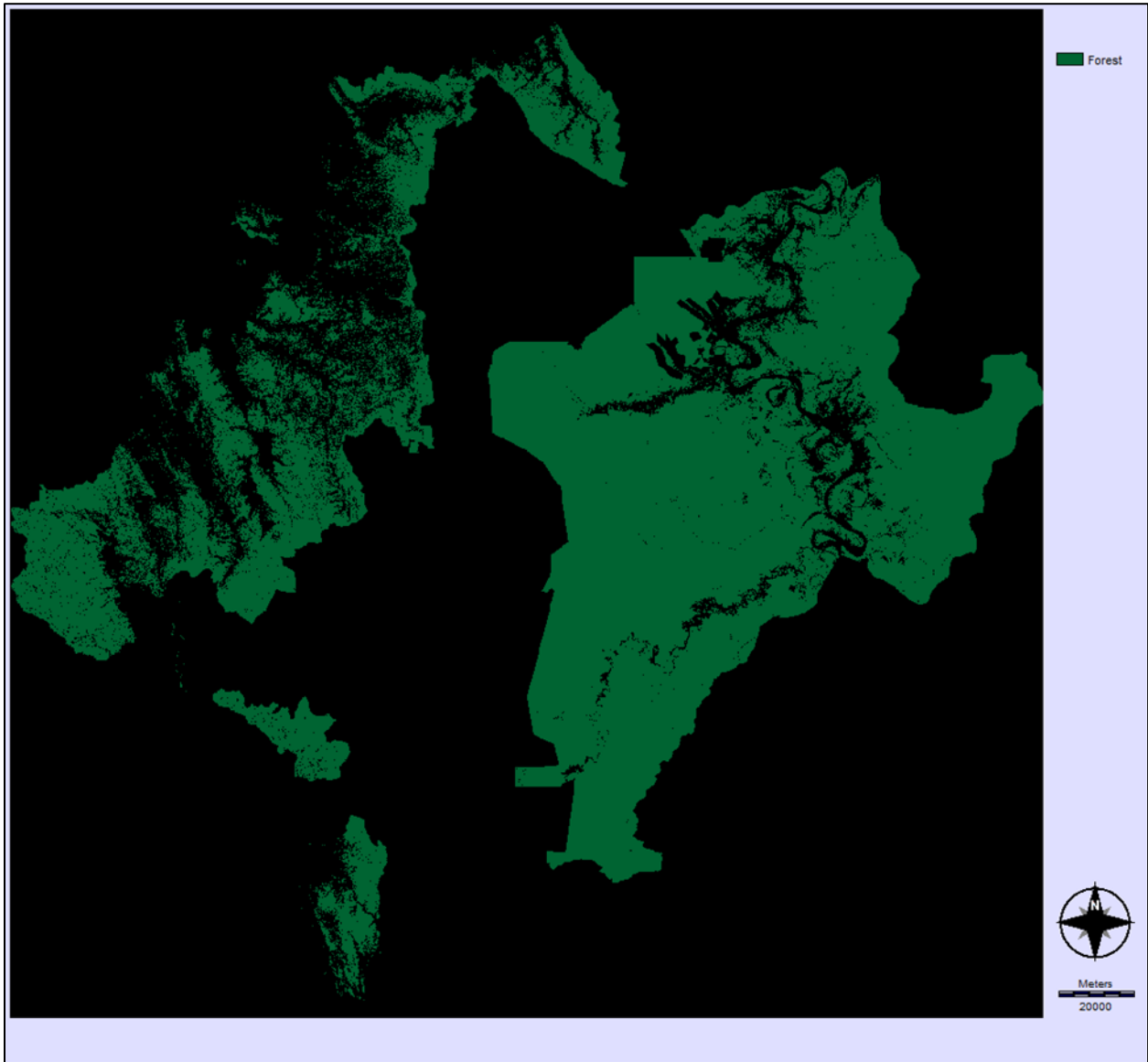
New benchmark maps were created for 2016 for the project area (Figure 2.3) and leakage belt (Figure 2.4)

Figure 2.3: Project Forest Cover Benchmark Map 2018



Shape: 2018_PA_benchmark
Shape: 2018_PA_AllClasses

Figure 2.4: Leakage Belt Forest Cover Monitoring Map 2018



APPENDIX 3: REFERENCES CITED

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