YACUMAMA FOREST CARBON PROJECT

Document Prepared by ClimeCo LLC

Project title	Yacumama Forest Carbon Project
Project ID	1133
Crediting period	01-January-2012 to 31-December-2041
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Prepared by	Brad Seely Vice President, Nature-Based Solutions bseely@climeco.com 587.801.8446

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Yacumama Forest Carbon Project ("Project") is a payment for ecosystem services forest conservation project, otherwise known as a Reducing Emission from Deforestation and forest Degradation (REDD) project, on 3,202 ha of privately-owned forestland located in the Amazon Basin of Peru. The Yacumama property encompasses tropical rainforest in three parcels: Yacumama (202 ha), Yacurana (1,425 ha), and Santuario Privado (1,575 ha), of which the latter two parcels would be made available for conversion to agricultural uses in the absence of carbon financing with the total forest area of 2,863 ha subject to conversion. During the 30-year period crediting period (2012 to 2041), the project results in a total of 681,516 t CO_2e emission reductions and average of 22,717 t CO_2e per year[1].

The overall goal for the Project is to protect and conserve the tropical lowland floodplain forest on Yacumama for long-term carbon sequestration, avoidance of GHG emissions from deforestation and degradation, and conservation of biodiversity. Yacumama is a privately held, former eco-tourist lodge and forestland located in the Amazon Basin of Peru whose current ownership ("project proponent") chose to alter its mission from tourism, supplemented by forest resource exploitation and agriculture, to ecological research, education, and conservation.

A majority of Yacumama would, by economic necessity, be harvested and converted to agricultural use by the project proponent in the absence of funding from carbon financing to support the costs of maintaining the property. The project proponent began harvesting activities based upon an approved 12-month harvest Plan. However, before pursuing a more aggressive approach to harvest the timber, Yacumama management became aware of and investigated the development of a carbon project as an alternative income stream. The Yacumama management team ceased timber harvesting operations by 2011 and began to investigate carbon financing as a sustainable long-term solution to their financial situation.

Yacumama began contacting various technical experts in late 2011 and sent the Virginia Tech Conservation Management Institute maps, a forest harvest plan, ownership documents, tax receipts, export licenses, photographs, etc. to review for the purpose of implementing a forest carbon project. The Project will use carbon financing to protect the forest and avoid harvesting of the forest for the valuable timber and conversion to agriculture. The primary methods employed to achieve the desired result are maintaining and increasing a robust presence both at the main facility and implementing regular patrols of the property to prevent incursions and illegal logging.

The main Project Proponent and property owner is now Aaron Bishop (Yacumama LTD S.A.), who has recently taken ownership following the death of the former owner, Lawrence Bishop. In the project, Mr. Bishop is responsible for hiring contractors for monitoring activities, carbon sales, and finances. The other entity directly involved in the Project is Mr. Norman Walters, the site manager. Mr. Walters is responsible for management of the infrastructure, forest protection at Yacumama, and general business matters. In addition, Mr. Walters is the diplomatic liaison between Yacumama and the local communities because of his fluency in the local Spanish dialect. ClimeCo LLC. updated the project design document, revised the

[1] *Further information available at Yacumama ERR calcs.xlsx*

baseline, associated data collection, and the project monitoring plan. Project activities are to undertake a forest carbon inventory, model regional deforestation and land-use patterns, and mitigate deforestation pressures by utilizing payment for the Project's ecosystem services. In addition to voluntarily foregoing land clearing and conversion to agriculture, current ownership chose to alter its mission from tourism, supplemented by forest resource exploitation and agriculture, to ecological research, education, and conservation. The primary methods employed to achieve the desired result are maintaining and increasing a robust presence and implementing regular patrols of the property to prevent incursions and illegal logging.

The Project was first developed and registered under the Verified Carbon Standard (VSC v.4.2) as Agriculture, Forestry, or Land Use (AFOLU). It is not covered by a jurisdictional REDD program.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/ verification	01-January-2012 to 31-December-2013	VCS	Environmental Services, Inc., (ESI)	Two years
Verification	01-January-2014 to 31-December-2022	VCS	TÜV SÜD America, Inc	Nine years

1.3 Sectoral Scope and Project Type

Sectoral scope [2]	14
AFOLU project category [3]	Reduced Emissions from Deforestation and Degradation (REDD+)
Project activity type	Avoiding Planned Deforestation (APD) Non-grouped project

1.4 Project Eligibility

1.4.1 General eligibility

The Yacumama Forest Carbon project is eligible to participate in the VCS program because:

- Project activity, Avoiding Planned Deforestation (APD), is included under the scope of the VCS Program and not excluded under Table 2.1 of the VCS Standard.
- The project is already VCS registered (Project ID 1133), The project was listed within three years from the start date (Jann 1, 2012) as evidenced by the signed Communication Agreement dated 10/09/2013 and the validation was completed within 5 years from start date as evidenced by the Validation Deed of Representation dated Dec 31, 2016.
- The applied methodology, VM0007 REDD+ v4.7, is eligible under the VCS Program.

[2] *Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes*
[3] *See Appendix 1 of the VCS Standard*

- The project activity complies with the applicability conditions outlined in Section 4.2.1 and 4.23 of VM0007 REDD+ v4.7 methodology. Those conditions were evaluated during the first registration process of the project, which occurred on 29 December 2016. Last version of the standard (v3.5) and tools/templates are described on Section 2 of the registered PD[4].

1.4.2 AFOLU project eligibility

The Yacumama Forest Carbon project is eligible to participate in the VCS Program because the AFOLU project category selected, REDD-APD, is appropriate and all related requirements are met[5]. Project activities reduce net GHG emissions by stopping deforestation on forest lands that are legally authorized and documented for conversion. Project owner had an approved harvest plan[6] (dated from 2009) but decided to pursue carbon financing, and started the project in 2012, Initial eligibility analysis confirmed that land in the project area has been qualified as forest at least 10 years before the project start date[7]. The project area was covered by mature tropical lowland floodplain rainforest that aligns with the FAO's definition of forest, i.e. "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach these thresholds in situ[8]." Native ecosystems have not been converted, cleared, drained, or degraded to generate GHG credits. There is no evidence of deforestation since the project's start date (see Appendix 6.2). The landowner has not materially changed native ecosystems within the project area because of the project.

1.4.3 Transfer project eligibility

Not applicable because the Yacumama Forest Carbon project is not registered under another GHG program.

1.5 Project Design

☒ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☐ Grouped project

1.5.1 Grouped project design

Not applicable.

1.6 Project Proponent

Organization name	Yacumama
Contact person	Aaron Bishop
Title	Owner
Address	657 Cajon Street, Redlands, CA 92373

[4] *See PDF Yacumama_PROJ_DESC_1133_29DEC2016 at https://registry.verra.org/app/projectDetail/VCS/1133*
[5] *Appendix 1 of Standard v4.7*
[6] *See Appendix B of PDF Yacumama_PROJ_DESC_1133_29DEC2016*
[7] *See previous validation report available at Verra Registry website (VALID_REP_1133_03APR2017 >> Pg 16 >> Section 3.2.2).*
[8] *https://openknowledge.fao.org/server/api/core/bitstreams/531a9e1b-596d-4b07-b9fd-3103fb4d0e72/content*

Telephone	(+1) 909-792-1028
Email	yfcpproject@gmail.com

1.7 Other Entities Involved in the Project

Organization name	Yacumama
Role in the project	Site Manager
Contact person	Norman Walters
Title	Director Yacumama S.R. Ltda Peru SA
Address	644 NW 18th St. Homestead, FL 33030
Telephone	(+1) 786-376-1072
Email	newaltersdesigns@gmail.com

Organization name	Virginia Tech Conservation Management Institute
Role in the project	Technical Lead (2012-2020)
Contact person	Verl Emrick
Title	Research Scientist-Ecologist
Address	1900 Kraft Drive, Suite 250, Blacksburg Va
Telephone	(+1) 540-231-8851
Email	vemrick@vt.edu

Organization name	ClimeCo
Role in the project	Project Development Consultant (2021-present)
Contact person	Brad Seely
Title	Vice President, Nature-Based Solutions
Address	1 East Philadelphia Ave Boyertown, PA 19512
Telephone	(+1) 587.801.8446
Email	bseely@climeco.com

1.8 Ownership

The main Project Proponent and property owner is now Aaron Bishop (Yacumama LTD S.A.), who has recently taken ownership following the death of the former owner Lawrence Bishop. The owner of the land is the same who has the rights of the GHG emission reduction credits (VCUs), and the total surface of the property (3,202 ha) is under control of the same owner, Aaron Bishop.

1.9 Project Start Date

Project start date	01-January-2012
Justification	Project start date is based upon a series of decisions made by the Yacumama management team during 2010 and 2011 (personal communication Lawrence Bishop December 2011) to cease pursuing timber harvesting operations and pursue carbon financing as a sustainable long-term solution to their financial situation. Since the previous project developer received documents from Mr. Bishop in January 2012 specifically for the purpose of pursuing a Forest Carbon Project, the project is using January 1, 2012, as the project start date.

1.10 Project Crediting Period

Crediting period	☐ *Seven years, twice renewable* ☐ *Ten years, fixed* X Other: 30 years, fixed
Start and end date of first or fixed crediting period	01-January-2012 to 31-December-2041

Details describing the implementation of project activities are available in Section 5.3.

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

☒ < 300,000 tCO2e/year (project)

☐ ≥ 300,000 tCO2e/year (large project)

Calendar year of crediting period	Estimated GHG emission reductions (tCO_2e)
01-January-2012 to 31-December-2012	65,230
01-January-2013 to 31-December-2013	66,564
01-January-2014 to 31-December-2014	31,558

01-January-2015 to 31-December-2015	32,121
01-January-2016 to 31-December-2016	32,684
01-January-2017 to 31-December-2017	33,247
01-January-2018 to 31-December-2018	33,810
01-January-2019 to 31-December-2019	34,373
01-January-2020 to 31-December-2020	34,936
01-January-2021 to 31-December-2021	35,499
01-January-2022 to 31-December-2022	27,502
01-January-2023 to 31-December-2023	27,436
01-January-2024 to 31-December-2024	27,479
01-January-2025 to 31-December-2025	27,521
01-January-2026 to 31-December-2026	27,563
01-January-2027 to 31-December-2027	27,605
01-January-2028 to 31-December-2028	27,648
01-January-2029 to 31-December-2029	27,690
01-January-2030 to 31-December-2030	15,662
01-January-2031 to 31-December-2031	4,871
01-January-2032 to 31-December-2032	4,352
01-January-2033	4,352

to 31-December-2033	
01-January-2034 to 31-December-2034	4,352
01-January-2035 to 31-December-2035	4,352
01-January-2036 to 31-December-2036	4,352
01-January-2037 to 31-December-2037	4,352
01-January-2038 to 31-December-2038	4,352
01-January-2039 to 31-December-2039	4,352
01-January-2040 to 31-December-2040	4,352
01-January-2041 to 31-December-2041	4,352
Total estimated ERRs during the first or fixed crediting period	681,516
Total number of years	30
Average annual ERRs	22,717

1.12 Description of the Project Activity

The primary activity of the project is to prevent planned deforestation. A majority of Yacumama would, by economic necessity, be harvested by the project proponent in the absence of funding from carbon financing in order to maintain ownership of the property. The project proponent began implementing the harvest of forest resources based upon an approved 12-month harvest Plan *Operativo Anual Para Permiso Forestal De Propiedad Privada* (Annual Operating Plan Forest Permit on Private Property). However, before pursuing a more aggressive approach to harvest the timber, Yacumama management became aware of and investigated pursuing carbon offsets as an alternative income stream. The Yacumama management team ceased timber harvesting operations by 2011 and began to investigate carbon financing as a sustainable long-term solution to their financial situation.

Initially, Lawrence Bishop, Aaron's father, was responsible for hiring contractors to monitor, manage carbon sales, and finances in the United States. Mr. Bishop has served as the primary United States fiscal manager for Yacumama lodge since inception in the 1990's. Mr. Bishop initially contracted the Virginia Tech Conservation Management Institute to support the development of the project design document, collect data supporting the Project, design the project monitoring plan and implement the project monitoring plan. For the baseline review, Mr. Bishop contracted ClimeCo to support the development of the project design document, collect data supporting the Project. Implementation decisions regarding Project activities are the sole responsibility of Aaron Bishop (Yacumama Lodge).

Utilizing carbon financing, the project aims to conserve the forest, thereby preventing the harvesting of valuable timber and its conversion to agricultural land. To achieve this, a strong presence is maintained at the main facility, Yacumama Lodge, and regular patrols are conducted to deter unauthorized entry and illegal logging. Bi-weekly boat patrols along the Yarapa River and its tributaries, Sabalillo and Yanayacu, focus on easily accessible riverbanks. The project's guardians, who are also members of the Puerto Miguel community, monitor any signs of intrusion, such as boats or campsites, considering the 50m buffer zone from the stream's center. They also engage with the local community, informing them of the conservation efforts and the prohibition of logging within the project area.

Additionally, 24 signs have been strategically placed along the riverbank to reinforce this message as illustrated on image Figure 1.12-1. The involvement of the project guardian, who is also the commissioner and a respected member of the Puerto Miguel community, is crucial for effective communication and the enforcement of the project's conservation objectives.

Finally, a forest carbon monitoring program was implemented to insure permanence for the climate benefits. In total, 25 permanent nested circular plots were randomly allocated withing the Project area for source of forest biomass data (Appendix A of registered PD Figure 1.12-2, Table 1.12-1). Diameter at breast height (1.3m above ground) of included trees is measured following Standard Operating Procedures based on Pearson et al. 2005[9]. Virginia Tech Institute and ClimeCo were responsible for field measurements that happen in 2013 and 2023, respectively. Results from the monitoring program indicate aboveground carbon (tCO_2e) within the Yacumama project area grew 3% during the first 10 years (Table 1.12-1).

Figure 1.12-1 Sign posted along the riverbank to inform about the Yacumama Forest Carbon Project. All communication is in Spanish (Private property. Yacumama Project. Trespassing of unauthorized people is prohibited. Do not cut trees in this zone).

[9] *See PDF file SOP for field data collection (Moist Tropical Forests) Dec 20*

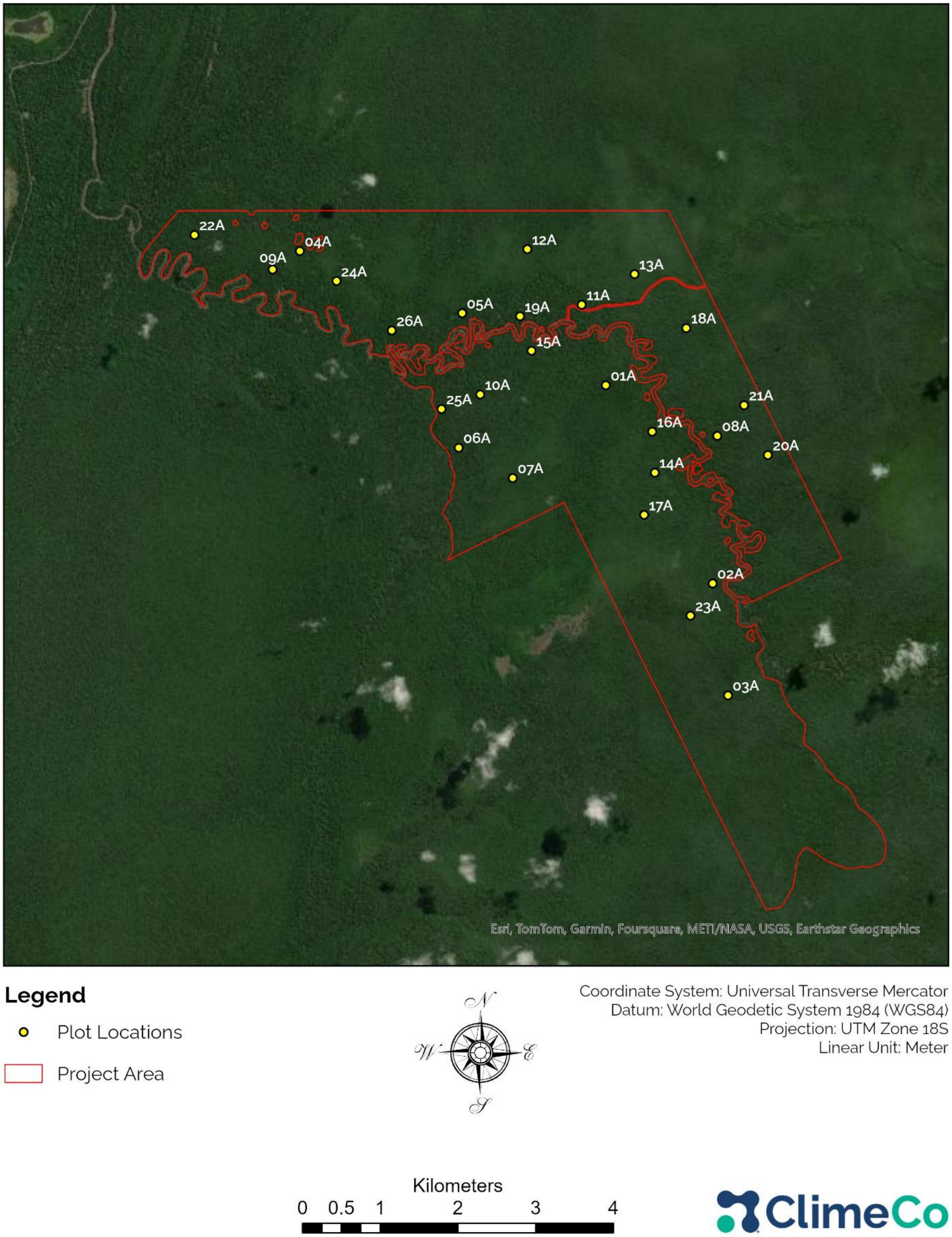

Figure 1.12-2 Yacumama Project area and forest plot allocation.

Table 1.12-1 Coordinates to Forest biomass assessment and monitoring plot locations.

Forest Plot ID	WGS84 UTM Zone 18S	
	UTM X-Coordinate	UTM Y-Coordinate
01A	678296	9492323
02A	679668	9489778
03A	679865	9488339
04A	674361	9494048
05A	676446	9493250
06A	676402	9491522
07A	677100	9491132
08A	679729	9491673
09A	674011	9493810
10A	676679	9492205
11A	677986	9493358
12A	677285	9494071
13A	678663	9493754
14A*	678924	9491201
15A	677341	9492767
16A	678894	9491726
17A	678788	9490656
18A	679331	9493059
19A	677191	9493208
20A	680381	9491426
21A	680075	9492068
22A	673004	9494255
23A	679384	9489362
24A	674830	9493661
25A	676182	9492019
26A	675544	9493026

Table 1.12-2 Aboveground carbon in the Yacumama forest plots in 2013 and 2023.

Plot ID	AGB (t CO_2e)	
	2013	**2023**
01A	308.92	248.51
02A	270.53	178.26
03A	205.55	239.07
04A	238.83	247.89
05A	369.57	381.36
06A	300.56	392.43

07A	292.28	380.16
08A	300.56	392.43
09A	292.28	380.16
10A	276.52	181.24
11A	316.35	249.91
12A	216.93	262.99
13A	290.89	142.04
14A*	250.36	-
15A	289.51	280.61
16A	204.83	171.92
17A	261.63	299.63
18A	279.02	388.02
19A	184.88	280.84
20A	469.03	322.55
21A	401.73	489.83
22A	256.81	361.35
23A	199.36	218.74
24A	220.36	159.86
25A	223.85	219.88
26A	-	374.60
Number of plots	25	25
Average	276.95	285.25
Total Project	792,91	816,68

*Plot was inaccessible in 2023, so a new plot 26A was allocated from a random direction and distance.

Furthermore, the need to staff the facility, patrol the forest and river and monitor the forest biomass required hiring and training of additional staff from the local community of Puerto Miguel. Usually, four members of the community are hired as temporary staff to help with the forest carbon monitoring program.

Finally, the Yacumama project is located within a jurisdiction not covered by a jurisdictional REDD+ program. Peru's Ministry of Environment is attempting to consolidate the country's carbon projects under a national jurisdictional REDD+ (J-REDD+) program, but nothing was officially published until writing this document.

1.13 Project Location

The Yacumama Forest Carbon Project is in the Peruvian Amazon Basin approximately 15 km straight line upstream from the confluence of the Rio Marañon and Rio Ucayali which join to form the Amazon River (Figures 1.13-1). The entire Yacumama property encompasses (3,202 ha) of tropical rainforest in three parcels: Yacumama (202 ha), Yacurana (1,425 ha), and Santuario Privado (1,575 ha). The eligible area for the carbon project includes the last two parcels, as depicted in Figures 1.13-2 and 1.13-3.

Figure 1.13-1 Yacumama Forest Carbon Project location at a continental scale.

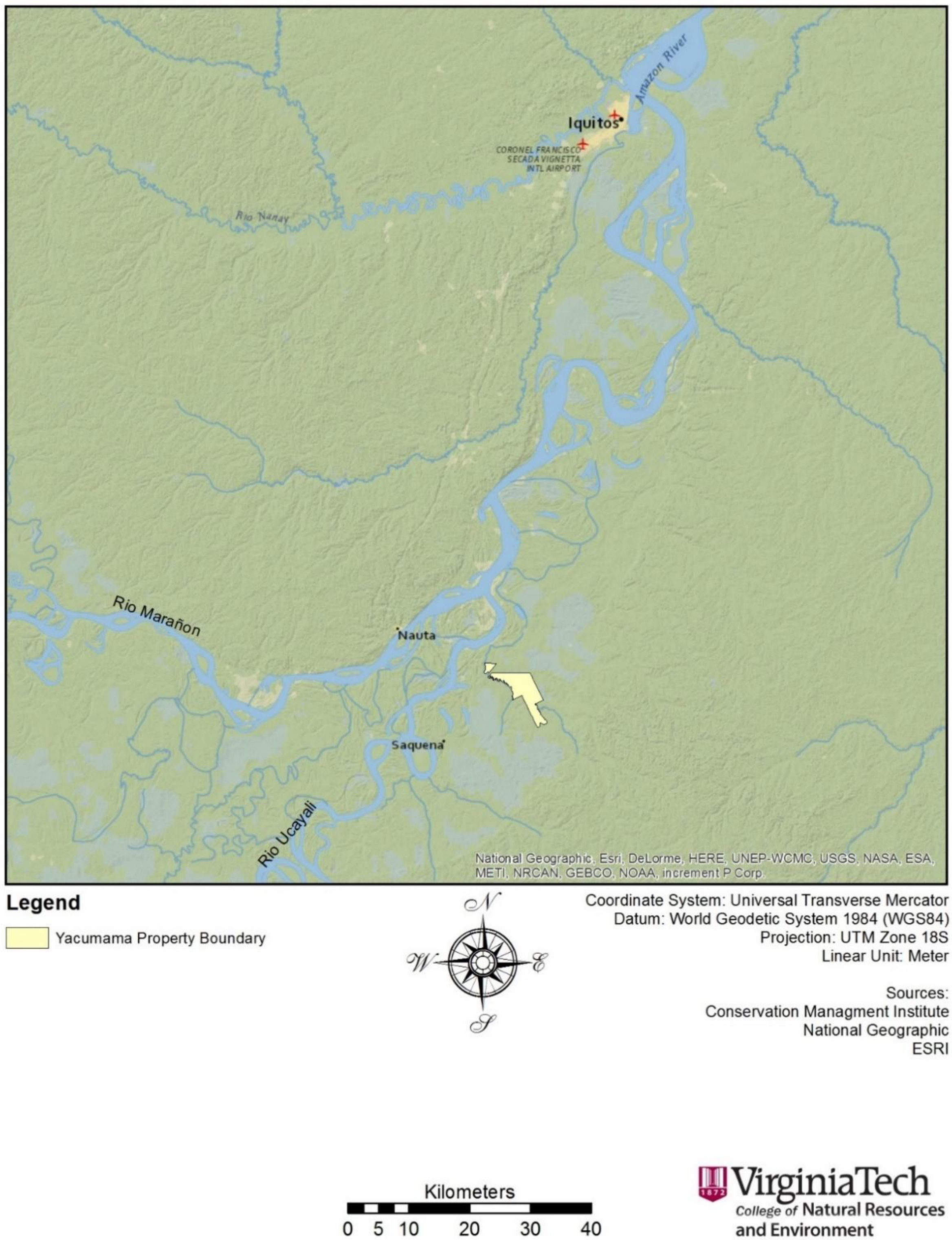

Figure 1.13-2 Yacumama Forest Carbon Project location at a regional scale, located at latitude -4° 34' 03.26'' South, and at longitude -73° 27' 04.64'' West in the Loreto District, Peru roughly 90 km south of the city of Iquitos.

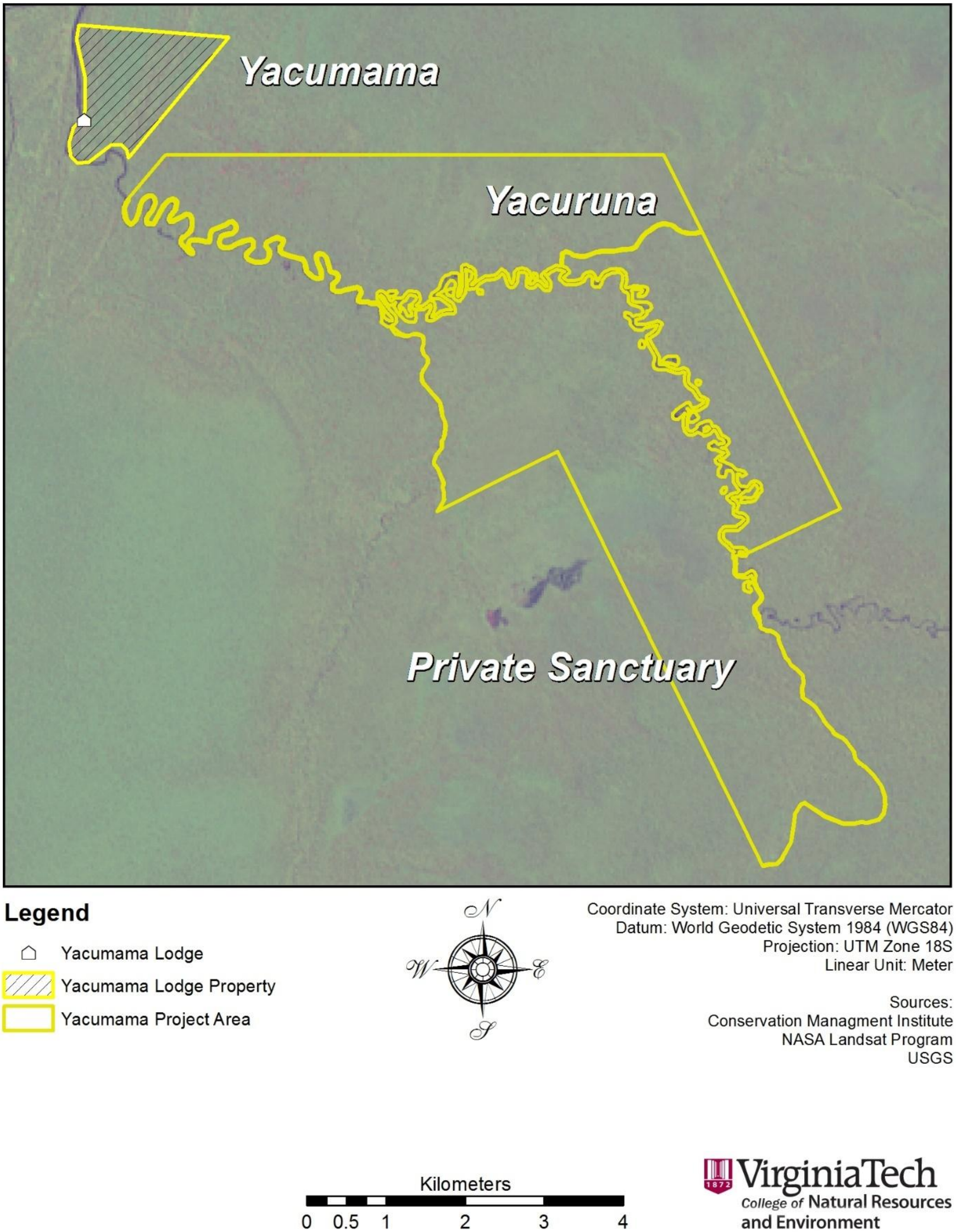

Figure 1.13-3 Yacumama Forest Carbon Project boundary at a local scale.

1.14 Conditions Prior to Project Initiation

The three parcels, now known as Yacumama, were purchased in 1992 with the intent of developing a lodge and private conservation area to support ecotourism and promote education, research, and the conservation of biodiversity. From 1992-1994 lodge buildings and other infrastructure were constructed to support the ecotourism operation. In addition, the relationship with the local village of Puerto Miguel began in earnest as workers were hired and local goods and services were procured. By 1995 the lodge was fully operational and being promoted internationally. From 1995-2001 business was running smoothly for Yacumama and there were continued improvements to infrastructure and expanded lodge facilities to support additional tourism were constructed. During this time period, Yacumama management built and supplied a health care clinic in Puerto Miguel and assisted in the development of a local women's cooperative to sell local arts and crafts to visitors. In September 2001 the terrorist attacks in the United States caused an immediate cessation of new reservations and cancellation of all previously booked guests. Because of the absence of business, the lodge was forced to close, and the facilities were 'mothballed' from 2002-2004 leaving only a skeleton staff to provide security and limited maintenance. During 2005-2006 the lodge underwent renovations and updates in anticipation of re-opening. By 2007 as the world economy experienced recession, the management of Yacumama began to promote and focus on conservation education and scientific research instead of tourism as a strategy to expand their clientele. However, in 2008, a fire in the main lodge damaged much of the building and other infrastructure, prompting the management to again close Yacumama. By 2009 Yacumama management had determined that the ecotourism model for maintaining the property was unsustainable and a different approach was required. Because of the cost of maintaining the facility, Yacumama management decided to undertake logging operations and develop agriculture on the two parcels encompassing the project area and consulted on the development of a harvest plan with the Government of Peru[10]. An initial 12-month harvest Plan Operativo Anual Para Permiso Forestal De Propiedad Privada (Annual Operating Plan Forest Permit on Private Property) was developed for Yacumama to implement using their own manpower and sawmill. After initial limited logging and exporting of lumber, Yacumama management concluded that to make sufficient income to maintain the lodge property a large-scale logging operation, which was beyond their current means, was required. Yacumama management began to investigate increasing their manpower and/or subcontracting a logging company to cut, mill and export the lumber and convert the logged area to agricultural purposes. However, before pursuing a more aggressive approach to harvest the timber Yacumama management became aware of and investigated pursuing carbon offsets as an alternative income stream. As a result, by late 2011, management concluded that there were two economic options: 1) sell the timber and develop agriculture on the property which would result in the large-scale logging, or 2) pursue carbon financing to maintain and protect the property and the associated biodiversity and ecosystem services[11].

Table 1.14-1 Summary history of Yacumama lodge and property.

Year	Event	Note
1992-1993	Purchase of property	Property was purchased from the Government of Peru for the purpose of developing an ecotourism lodge to provide income to conserve

[10] *See accompanying PDF Scanned Harvest plan_Yacumama*
[11] *See table 1 for summary.*

		the property. Official land survey was conducted.
1993-1994	Infrastructure development	Building of the lodge, bungalows and infrastructure to support ecotourism operation. Interaction with local communities begins in earnest (i.e. local workers, purchasing agricultural goods etc.).
1994-1995	Opening of Yacumama lodge	Promotion and client development focusing on educational tourism.
1995-2001	Yacumama lodge operation	Expansion of lodge facilities to meet the needs of larger groups. Continued improvement in infrastructure.
2001-2002	Tourism declines substantially	The terrorist attacks of September 11, 2001 caused an immediate cessation of tourism for Yacumama. All previously booked groups cancelled. The lodge closes due to lack of bookings and is mothballed.
2002-2004	Yacumama lodge closed	Skeleton staff is maintained for security and maintenance of lodge facilities. Core infrastructure is maintained by cannibalizing other superfluous facilities.
2005-2006	Yacumama lodge refurbishment	Based upon improving economic conditions and the potential for increased tourism Yacumama refurbishes and updates lodge facilities in anticipation of re-opening. During this period Yacumama also funds the building of a health clinic in the village of Puerto Miguel.
2007-2008	Yacumama lodge refocus	Because of the international economic slowdown bookings were reduced. Yacumama management decides to increasingly focus on education and scientific research.
2008	Partial destruction of lodge facilities by fire	Fire partially destroys lodge facilities and results in closure as a tourist lodge. Lodge is mothballed and skeleton staff is maintained for security and maintenance of lodge facilities.
2009	Alternative income from logging	Due to the cost of maintaining the lodge facility Yacumama and the surrounding property would have to generate income from forest harvest

		and/or agricultural activities. Yacumama management undertakes logging operations and obtains necessary permits from Government of Peru. After initial logging and exporting of lumber Yacumama management concluded that to make sufficient income to maintain the property a large-scale logging operation was required.
2009-2011	Forest management decisions	By 2011 management decided that there were two economic options:1) engage in the large-scale logging and agricultural development of the property, or 2) pursue forest carbon financing to maintain the property.
2012-Present	Forest carbon project	Yacumama explicitly begins a forest carbon project, and project activities of forest conservation and preventing land conversion. maintained.

Yacumama Climate, Soils and Hydrology

The upper Peruvian Amazon basin (Figure 1.13-1), where the Project is located, has a lowland tropical climate characterized by high heat / humidity and substantial rainfall throughout the year. Mean annual temperature at nearby Jenaro Herrera[12] is 25.9°C with a mean annual rainfall of 2715 mm[13]. While precipitation occurs throughout the year, April typically has the highest rainfall and July the lowest rainfall. Soils of Yacumama are classified as entisols which are soils of recent origin that developed from unconsolidated parent material and show little development of pedogenic horizons except an “A” horizon. Within the Project area there are two identified soil subgroups Typic Hydraquents and Typic Fluvaquent (Nebel et al. 2001)[14]. Each subgroup has an upper “A” horizon 5–10 cm thick above an incipient “B” horizon extending to approximately 150 cm. The “B” horizon has a high clay content (generally exceeding 50%), but the fraction of sandy material increases with depth[9].

The upper Peruvian Amazon Basin, defined as the region above the confluence of the Rio Ucayali and Rio Marañon (Figure 1.13-2), is affected by yearly flooding events that temporarily inundate large tracts of tropical forest. On average, flood stages peak in April and drop to their lowest in August but can be quite variable from year to year[15,16].It is estimated that about 12% of the region (over 60,000 km^2) are

[12] The closest town with climate information available is Jenaro Herrera, a small river town situated on the Rio Ucayali, approximately 44 km southwest of the Yacumama Lodge.
[13] Nebel, G. 2001. Sustainable land-use in Peruvian flood plain forests: options, planning and implementation. Forest Ecology and Management 150: 187-198.
[14] Nebel, G., J. Dragsted, and A.S. Vega. 2001a. Litter fall, biomass and net primary production in flood plain forests in the Peruvian Amazon. Forest Ecology and Management 150: 93-102.
[15] Kvist, L.P., and G. Nebel. 2001. A review of Peruvian flood plain forests: ecosystems, inhabitants and resource use. Forest Ecology and Management 150: 3-26.
[16] Lamotte, S. 1990. Fluvial dynamics and succession in the Lower Ucayali River basin, Peruvian Amazon. Forest Ecology and Management 33/34: 141-156.

exposed to annual flooding in the Peruvian Amazon Basin[17]. Water levels on the Ucayali can shift 9-10 m per year from its lowest to highest points[18]. The annual flooding is a natural part of the system and a key component of local ecosystem processes. Flood waters originating in the Andes Mountains carry large sediment loads that deposit essential plant nutrients as the flood waters recede. During the highest peak of flooding, almost the entire Yacumama property can be inundated. Thus, depending upon the time of year, the forest at Yacumama provides critical habitat for not only terrestrial species but aquatic species as well.

Streams in the Amazon basin are classified as either white-water, black-water, or clear-water. This functional classification, based on the color of the streams and rivers, provides important clues to the origin, nutrient content, and even fish species assemblages[8, 19]. White-water rivers are turbid, nutrient rich, and muddy in color due to the large amount of suspended sediment from runoff originating in the Andes[8]. White-water rivers are the most common type in the Peruvian Amazon Basin, including the two major tributaries forming the Amazon River, the Rio Ucayali and the Rio Marañon. Clear-water rivers originate in geologically older regions with low rates of erosion, hold little suspended sediments, are nutrient poor, and are an uncommon river type in Peru. Black-water rivers, which are common in the Amazon basin, get their color from slowly degrading phenolic substances in leaves (e.g., tannins) originating in poorly drained swampy areas [8]. The Rio Yarapa on which Yacumama is located and which bisects much of the Project Area (Figure 1.13-3) is considered a black-water river. However, streams and rivers may also change water types during different times of the year which is true of the Rio Yarapa[8]. A river that is black water for the majority of the year can become white-water during the annual flood stage due to the increased sediments collected during high-water periods. Portions of the Yacumama property are influenced by white-water coming from the nearby Rio Cumaceba and Rio Ucayali which mix with the Rio Yarapa during high flood stage.

Yacumama Vegetation

Yacumama is located in the western Amazon basin and is part of the Amazon basin mixed-water flooded forest and riparian vegetation ecological system[20] (Figure 1.14-11). More commonly, the forests at Yacumama are described and classified as tropical lowland floodplain rainforest. The floodplain forests of this region alternate between terrestrial and aquatic phases, impacted by floodwaters from 1-6 months per year based on topography. Nebel et al. (2001b) provides thorough treatment of the tree species composition on the floodplain forests of the Peruvian Amazon. The nutrient availability of the soils of floodplain forests is heavily influenced by the type of stream or river that seasonally floods the forest (Kvist and Nebel 2001). The relatively nutrient rich white-water rivers supply more sediment to forests than clear-water or black-water rivers. The Rio Yarapa is generally classified as a black-water river but during flood stage the Rio Yarapa carries a significant amount of sediment and resembles a white-water

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[17] Salo, J., R. Kalliola, I. Hakkinen, Y. Makinen, P. Niemela, M. Puhakka, and P. D. Coley. 1986. River dynamics and the diversity of Amazon lowland forest. Nature 322: 254-258.

[18] Lamotte, S. 1990. Fluvial dynamics and succession in the Lower Ucayali River basin, Peruvian Amazon. Forest Ecology and Management 33/34: 141-156.

[19] Saint-Paul, U., J. Zuanon, M. A. Vallacorta Correa, M. Garcia, N. N. Fabre, U. Berger, and W. Junk. 2000. Fish communities in central Amazonian white- and blackwater floodplains. Environmental Biology of Fishes 57: 235-250.

[20] Josse, C., G. Navarro, F. Encarnación, A. Tovar, P. Comer, W. Ferreira, F. Rodríguez, J. Saito, J. Sanjurjo, J. Dyson, E. Rubin de Celis, R. Zárate, J. Chang, M. Ahuite, C. Vargas, F. Paredes, W. Castro, J. Maco y F.Reátegui. 2007. Ecological Systems of the Amazon Basin of Peru and Bolivia.Clasification and Mapping. NatureServe. Arlington, Virginia, USA

river thus increasing the number of sediments and nutrients delivered to the forests of Yacumama thereby maintaining soil fertility.

Within the floodplain forests, two different habitat types have been described primarily based on the duration of inundation, restinga and tahuampa. Restinga is a riverine mixed forest habitat that occurs on the highest portions of the flood plain forest and is only inundated for 1-3 months a year (Kvist and Nebel 2001). Tahuampa is also a riverine mixed forest habitat, occurs on lower terrain than restinga, and is typically inundated from 3-6 months a year. Soils of both restinga and tahuampa are usually well-drained, and the tree species are resilient against long periods of inundation. Factors such as amplitude, frequency, and duration of flooding play a role in determining species composition, because different species have varying tolerances to flooding[15]. There are no clearcut transitions between habitat types, and intermediate zones will have a mix of species from both restinga and tahuampa[15]. Nebel et al. (2001b) examined in detail the floristic composition of both restinga and tahuampa habitat types. In addition, the highest species richness in the low restinga, and tahuampa, suggesting that plant diversity is related to inundation period[21]. The proximity of habitat types to a river system is often an indicator of the age of the forest because of the constantly changing course of the river. The meandering nature of rivers in the floodplain contributes to the diversity of the region, creating a mosaic of different aged forests as it migrates[22]. The project location (i.e. Western Amazon basin) is widely considered one of the most biodiverse regions on the planet with a high diversity of plants, insects, mammals, amphibians, and birds[23,24]. The floodplain ecosystems of the Peruvian Amazon basin have the highest species richness compared to all other floodplain forests worldwide[25,23].

Yacumama Land Use Land Cover (LULC) Benchmark Map

Landsat sensors were used in geospatial analysis and to create LULC benchmark map for the project. The medium resolution imagery provided by Landsat sensors is commonly used to map deforestation and estimate area change and widely recognized as a cost effective and accurate image source for mid-resolution data analysis[26]. The 2012 land use/land cover (LULC) map (Figure 1.14-1) was derived from a cloud free Landsat 5, 2011 (Julian Day 219) image as downloaded from the United States Geographic Survey's (USGS) Global Visualization Viewer (GloVis) (http://glovis.usgs.gov). Geo-rectification was performed in ArcGIS 10.1 with the 'Geo-referencing' toolbar using the first order polynomial transformation to resample using cubic convolution with the benchmark August 2011 image having an RMS Forward of .32365. Rectification followed all relevant industry standards[26]. As the classification was

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[21] Nebel, G., L. P. Kvist, J. K. Vanclay, H. Christensen, L. Freitas, and J. Ruiz. 2001b. Structure and floristic composition of flood plain forests in the Peruvian Amazon I. Overstory. Forest Ecology and Management 150: 27-57.

[22] Salo, J., R. Kalliola, I. Hakkinen, Y. Makinen, P. Niemela, M. Puhakka, and P. D. Coley. 1986. River dynamics and the diversity of Amazon lowland forest. Nature 322: 254-258.

[23] Finer, M., and M. Orta-Martinez. 2010. A second hydrocarbon boom threatens the Peruvian Amazon: trends, projections, and policy implications. Environmental Research Letters. 5:

[24] Schulman, L., K. Ruokolainen, L. Junikka, I. E. Sääksjärvi, M. Salo, S-K. Juvonen, J. Salo, and M.Higgins. 2007. Amazonian biodiversity and protected areas:do they meet? Biodiversity Conservation 16:3011–3051

[25] Wittmann, F, J. Schöngart, and W. J. Junk. 2011.W.J. Phytogeography, Species Diversity, Community Structure and Dynamics of Central Amazonian Floodplain Forests. In: Amazonian Floodplain Forests: Ecophysiology, Junk et al. (eds.), Biodiversity and Sustainable Management, Ecological Studies 210.

[26] GOFC-GOLD, 2014, A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals associated with deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation. GOFC-GOLD Report version COP20-1, (GOFC-GOLD Land Cover Project Office, Wageningen University, The Netherlands)

a single-image photo-interpretive process no additional preprocessing was deemed necessary, outside of stacking the individual bands in ESRI's ArcGIS 10.1 (http://www.esri.com/).

Project Developer performed a full visual delineation of the project area using Landsat. All digitization was performed at an approximate scale of 1:15,000 by an experienced photo-interpreter (PI) familiar with satellite imagery applications, photointerpretation and possessing a priori knowledge of land use/land cover in the area. We used the band combination of 5,4,2 (short-wave infrared, near infrared, green). We reviewed other combinations (e.g., Normalized Difference Vegetation Index (NDVI), bands 4,3,2) but found no additional benefit to the PI and were therefore not included. Subject matter experts possessing significant field experience on the Yacumama property also provided input and assistance during the mapping process.

Image classification consisted of 6 LULC types: Forest, Cropland, Grassland, Settlements, Water, and Non-forest based upon the descriptions in GOFC-GOLD (2014) with a minimum mapping unit of 1 hectare. Image classification was ultimately restricted to one of 4 types, forest[27], non-forest, settlement or water, as no additional LULC types were distinguishable on the property. Because the project area was relatively small, and mapping was accomplished through visual interpretation, a wall-to-wall mapping strategy was employed as it was practical and the most suitable method for the project. To account for the area of water in the Yarapa and the common oxbow lakes, each were identified in a GIS using heads up digitizing and confirmed via ground visits in 2013 and their area calculated. In addition, a 50m buffer from stream center was placed on the Rio Yarapa and an unnamed tributary for a total of 133 ha of "permanent" of water in rivers and oxbow lakes. Analysts also detected 4 ha of non-forested land with the project area. The area of water and non-forested area was subtracted from the total of the two parcels to result in a total forested area of 2863ha. Upon completion of the initial map, final review and quality control was performed by project developed under organizational standard operating procedures before the validation and accuracy assessment step.

Accuracy Assessment

Rapideye imagery was used to assess the accuracy of the 2012 landcover map (Figure 1.14-1) and is considered an appropriate tool for "ground-truthing" the interpretation of satellite imagery and for assessing the accuracy (GOFC-GOLD 2014)[15]. The Rapideye 5-band image (August 2010) with five-meter resolution, was used to assess accuracy. The image was obtained directly from the vendor. Project Developer conducted an accuracy assessment on all project area land cover maps following industry standards and applicable practices as described in Congalton (1991)[28] and GFOI (2013)[29]. Using the specific land cover layer, random points were created for Forest, Water and Non-forest cover classes. Accuracy assessment points were created and allocated using the Create Random Points tool in ArcGIS 10.1 with the following parameters: a Minimum of 250 meters between points and points within 15 meters of a boundary were removed to eliminate confusion during the accuracy assessment. For the Non forest class 5 points were manually placed because of the small overall area of the class. A subject

[27] *We used the following CDM definition of "Forest" … a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ.*
[28] *Congalton, R.G. 1991. A review of assessing the accuracy of classifications of remotely sensed data. Remote Sensing of Environment. 37:35-46.*
[29] *GFOI (2013) Integrating remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests: Methods and Guidance from the Global Forest Observations Initiative: Pub: Group on Earth Observations, Geneva, Switzerland, 2014.*

matter expert (based on education, experience, and on-the-ground familiarity with the project area) classified all points using Rapid Eye high resolution imagery from the respective mapping year, after which the points were intersected with the land cover layer to calculate accuracy. Using this approach, the total accuracy of the 2012 benchmark LULC map (Figure 1.14-1) was calculated to be 97.26%.

Table 1.14-2 Summary of the Accuracy Assessment (by LULC class) for the 2012 benchmark LULC map.

		Forest	Non-Forest	Water	Grand Total	User Accuracy
Observer	Forest	50	2		52	96.15%
	Non-Forest		3		3	100.00%
	Water			18	18	100.00%
	Grand Total	**50**	**5**	**18**	**73**	
	LC Accuracy	100.00%	60.00%	100.00%	**Total accuracy**	97.26%

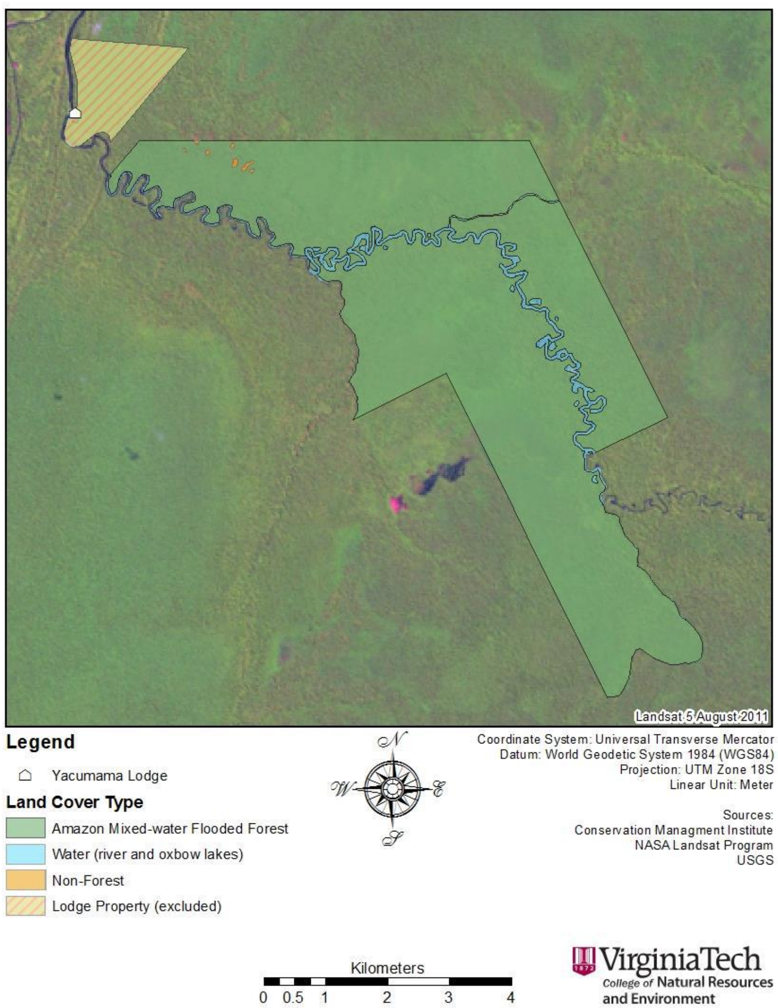

Figure 1.14-1 Forest cover benchmark map (2012) for the Project.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is in compliance with local laws, statutes and other regulatory frameworks as follows.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975)

This international agreement limits the trade of endangered species to ensure that any trading that does occur does not threaten the survival of a species. Under the agreement, states are required to create their own regulations and statutes to enforce the agreement. Peru enacted Supreme Decree No. 030-2005-AG, Supreme Decree No. 001-2008-MINAM, and Directive No. 27-2006-INRENA-IFFS to regulate the export, import, and trading of CITES species. The Project complies with the international agreement and domestic legislation as no forest products from the Project area are traded/exported.

Peru's National Constitution (1993)

Peru's 1993 Constitution, in Chapter II, outlines the State's responsibilities regarding the environment and natural resources. Article 66 proclaims that natural resources, renewable and non-renewable, are patrimony of the State and that organic laws fix the conditions of their use and may grant them to private individuals. These concessions grant the title holders a real right subject to those legal regulations. Article 67 proclaims the State is responsible for promoting the sustainable use of its natural resources. Article 69 outlines the State's responsibility for promoting the sustainable development of the Amazon region. The Project complies with the specific environmental provisions of the constitution as it promotes the sustainable use of natural resources and sustainably extracts value from the Amazon region within the rights defined by the constitution (such that the project proponent has the legal authority to manage the natural resources on the private property).

General Environment Law (2005)

The General Environment Law establishes the framework for environmental management in Peru. The law broadly defines Peru's environmental policy priorities, emphasizing conservation of natural resources and sustainable management of wild flora and fauna. With the passage of this law, the Ministry of Environment, Peru's National Environment Authority (MINAM) was created to oversee, coordinate, and implement national environmental policies. Article 6 establishes the "Prevention Principle" which states that MINAM's objective is to "prevent, oversee, and avoid environmental degradation." Article 94 specifically states that the Peruvian government recognizes and supports payments for environmental services, which are defined as the "protection for water resources, protection for biodiversity, mitigation of greenhouse gas emissions, and scenic beauty, among other things." Article 94.3 states that "The National Environmental Authority promotes the creation of channels for financing, payment, and oversight of environmental services." The Project complies with this law as it promotes the general objectives within it, namely the conservation of natural forests, and seeks payment for the protection of natural resources/mitigation of greenhouse gases which are explicitly supported within the law.

Law No. 30215: Law on Remuneration Mechanisms for Ecosystem Services (2014)

This law defines ecosystem services as the "economic, social, and environmental benefits, direct and indirect, that people obtain from the proper functioning of ecosystems, such as water regulations in basins, maintenance of biodiversity, carbon sequestration, landscape beauty, soil formation, and the provision of genetic resources, among others, indicated in this law. Article 9 creates the Single Registry of

Remuneration Mechanisms for Ecosystem Services. Modalities of the remuneration mechanisms for ecosystem services that the taxpayers and those remunerated for the ecosystem service decide to adopt are evaluated and approved by the Ministry of the Environment. The Project needs verification approval from Verra to initiate the evaluation with the Ministry of the Environment of Peru. Once this occurs, the project will be evaluated by the Ministry of Environment and registered in the National Registry.

Law No. 29763 Forest and Wildlife Law (2011) (amended by Legislative Decree No. 1517 [2021] and Legislative Decree No. 1319 [2017]) and its regulations

This law replaces Peru's National Forest and Wildlife Law of 2000 (Law No. 27308). The law establishes the legal framework to regulate, promote, and supervise activities related to forest and wildlife in Peru, including establishing procedures for forest zoning, granting forest concessions, and granting enabling titles which establish the right to harvest on certain forest areas. Article 27 defines the forest zoning system which classifies forests based on their intended uses, including: permanent production zones, recovery areas, special treatment areas, and ecological protection zones. Article 44 mandates that commercial harvesting activities must have a forest management plan approved by the regional environmental authority unless they take place on private land. Article 10 emphasizes the importance of maintaining ecosystems services, including carbon sequestration, in all of Peru's forests and states that forest management plans should enhance and maintain ecosystem services. The Project complies with this law as it maintains and enhances the ecosystem services of the forest within the Project area.

National Strategy on Forests and Climate Change (2016)

Peru's National Strategy on Forests and Climate Change outlines a policy framework aimed at preventing deforestation and promoting sustainable forest management to reduce greenhouse gas emissions across the country. It's stated in this policy that Land Use, Land Use Change, and Forestry (LULUCF) account for a majority of Peru's greenhouse gas emissions at the national level; as such, the policy, and reducing emissions from deforestation and forest degradation, is critical for Peru to achieve its greenhouse gas reduction goals. The policy outlines Peru's National REDD+ strategy, which promotes participation from the private sector, payment for ecosystem services, and increasing market access to achieve the goals outlined in the policy; Peru does not currently have a jurisdictional REDD+ program. The Project complies with this policy framework as it promotes the general goals outlined within it and pursues payment for ecosystem services.

Nationally Determined Contributions (2020)

Peru's NDCs, submitted to the UNFCCC in 2020, outlines Peru's commitment and strategy to reduce greenhouse gas emissions by 30% (unconditional) by 2030; Peru's conditional 40% reduction target is contingent on receiving international, external financing. The emissions reductions target have an economy-wide scope. The NDC indicates that Peru anticipates participating in the cooperative approaches and market mechanisms of the Paris Agreement in order to increase the ambition of their NDC; in order to do this effectively, Peru will establish institutional policies to ensure robust and transparent accounting and to avoid double counting. The project supports the goals outlined in Peru's NDC and, by providing external funding, will assist in increasing the ambition of the NDC. The project will adhere to all domestic policies related to carbon projects to ensure accounting methods are transparent and to avoid double counting.

Peru's National Constitution (1993)

Peru's constitution guarantees workers' rights and establishes several labor standards, including a 48-hour work week, right to collective bargaining, right to strike, protections against forced labor and discrimination and the right to "fair and sufficient remuneration" which obliges the government to determine an appropriate minimum wage. Worker's rights are enshrined in the following articles of Peru's constitution: 2, 22,23, 24, 25, and 26. The Project complies with this law as it does not employ unconstitutional labor practices, nor does it infringe on the constitutional rights of employees.

Law No. 728: Law of Productivity and Labor Competitiveness (1997)

This law establishes broad labor regulations and employee protections for Peru's workforce, including employee benefits, termination policies, conditions of employment, wage regulations, and contributions to social programs. The Project complies with all tenets found in the law. The Project promotes job training and education of workers. The Project provides transfer of persons engaged in urban and rural areas of low productivity and income to other more productive activities. The Project ensures the incomes of workers and protection against arbitrary dismissal. The Project unifies works procurement rules and strengthens existing social benefits.

Law No. 29973: Procedural Labor Law (2010)

This law establishes and regulates labor dispute resolution procedures within Peru. Should any labor disputes occur within the project activities, the rules of this law will be adhered to. Legal and other requirements relating to workers' rights: Yacumama strictly follows all relevant laws including applicable labor laws, legal rulings, and other requirements relating to workers' rights. Yacumama is required under Peruvian law to follow appropriate safe labor practices to prevent workplace injury and will comply with all applicable local, district, and national workplace standards. Peru has the following relevant labor laws:

Supreme Decree No. 007-2002-TR (2002)

Supreme Decree No. 007-2002-TR regulates and governs standard working hours, conditions, and overtime. This law reinforces the 48-hour workweek (8-hours per day, 6 days per week) as the standard, outlines regulations for overtime pay, and includes requirements for employers to provide breaks and rest periods. The project complies with all provisions of this law by providing appropriate break and rest periods, adhering to standard hours and providing overtime pay when appropriate.

Supreme Decree No. 0003-2022-TR (2022)

This decree increased the National Minimum Remuneration to 1,025 soles. The minimum remuneration (RM) is the legally established minimum amount of money that is paid monthly to a worker who works a full day of 8 hours a day or 48 hours a week. The wage is determined based on a person's ability to meet their basic living expenses/needs. Worker legal rights will be posted at a prominent location at Yacumama. If an individual is employed who cannot read, Yacumama management will verbally communicate workers' rights. Yacumama staff are paid at a legal minimum rate and in a timely manner according to Peruvian labor laws.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☐ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes ☐ No

If yes to all:

1.18 Sustainable Development Contributions

The project activity of protecting native tropical rainforest from planned deforestation contributes to the UN SDGs and Peru's specific goals in numerous ways.

Peru has highlighted national goals[30] concerning eradication of poverty, conservation, restoration, and sustainable management of ecosystems, and protection of biodiversity. Peru has also stated that to assure a basic standard of living condition for every citizen, environmental health must be a priority. For Peru, the conservation and sustainable management of forest resources is key for climate change mitigation and adaptation, and for the provision of ecosystem services, ecotourism opportunities, and the preservation of Peru's cultural diversity.

Peru, a country containing 13% of the Amazonian rainforest, has specifically named rainforest protection as a national priority[31] as indicated by their Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change[32] (UNFCC) and their National Climate Change Adaptation Plan (2021). The goals of this plan are to limit Peru's GHG emissions by 30-40% by 2030, for Peru to become net carbon neutral by 2050, and to implement 90 adaptation measures in key sectors to improve resilience to climate change, including water, health, aquaculture, agriculture, and forestry. Peru also signed a Joint Declaration of Intent in 2021 with Norway, under which Norway made a $10M payment to Peru as part of the climate and forest partnership to support the implementation of Peru's climate emergency goals. The US Agency for International Development (USAID) is active in Peru, with numerous projects aimed at increasing climate resilience, empowering marginalized populations, improving natural resource management, reducing deforestation, limiting GHG emissions, and protecting biodiversity.

The project addresses several Sustainable Development Goals (SDGs) through its activities and impacts. In relation to SDG 1 (No Poverty), the project has positively contributed to financial security by employing two permanent staff and hiring six temporary staff, with plans to continue this employment. For SDG 15 (Life on Land), specifically targets 15.1 and 15.2, the project has protected and continues to safeguard

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[30] *https://sustainabledevelopment.un.org/index.php?page=view&type=6200&nr=25&menu=172*
[31] *https://www.usaid.gov/peru/press-releases/peru-reaching-key-milestones-rainforest-protection*
[32] *https://www.usaid.gov/climate/country-profiles/peru#:~:text=Government%20of%20Peru%20Climate%20Priorities&text=Key%20mitigation%20and%20adaptation%20goals,Aquaculture%2C%20Agriculture%2C%20and%20Forests*

2,863 hectares of tropical rainforest from planned or illegal deforestation through implementation and border patrols. This action also supports target 15.5 by conserving habitats for native species listed on the IUCN Red List, preventing habitat loss and fragmentation that result from deforestation. Regarding SDG 13 (Climate Action), particularly target 13.2, the project has made significant contributions to mitigating climate change. By conserving the 2,863 hectares of tropical rainforest, the project will prevent the release of 681,516 thousand tonnes of carbon emissions avoided over the project's lifetime. These efforts demonstrate the project's multifaceted approach to addressing poverty, biodiversity conservation, and climate change mitigation.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

Monitoring of leakage carbon stock change and GHG emissions follow methods outlined in VCS module M-REDD (VMD0015 v2.3), LK-ASP (VMD0009 v1.3) and LK-ME (VMD0011 v1.2). Remotely sensed data was collected and analyzed over the entire project area and the parcel controlled by the Project proponent (Yacumama), where the lodge is located, that is not included in the project area, but it is also owned by Project proponent, the identified baseline agent of deforestation. Forest Cover Monitoring Maps for the project area and lodge property were updated for the years of 2014 (beginning of monitoring period), 2019 (5-year period of monitoring) and 2022 (year of baseline renewal). Further information on image resolution and processing methods is available in Section 5.3. Results from leakage monitoring ensure that no deforestation or greenhouse gas emissions (biomass burning and N_2O) occur within project area and lodge property, which are both owned by project proponent No income generated by the project will be used for activities that will result in GHG emissions from deforestation.

1.19.2 Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

1.19.3 Further Information

No further information is applicable.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	In identifying stakeholders, the Project Proponent in collaboration with the project team Conservation Management Institute at Virginia Tech-College of Natural Resources and Environment in collaboration and local employees considered the significance of the user populations [of the Project area] and how deeply affected they may be by the project activities. The team used the stakeholder identification and engagement procedural steps found in the Social and Biodiversity Impact Assessment Manual for REDD+ Projects: Part 3 – Biodiversity Impact Assessment Toolbox27F[33] and the ICMM Community Development Toolkit28F[34]. The project team conducted a thorough assessment of the potential stakeholders that could be impacted by the project by discussing historical community engagement and stakeholder interactions prior to the purchase of the property, reviewing the project details and activities, considering other lodges and businesses in the area, and reviewing the local geography and locations of community members and community groups in proximity to the project area. This process first started with brainstorming existing stakeholders based on existing relationships and interactions in the project area. This list was used as the starting point to expand the list with stakeholder feedback, primarily from local community members to suggest other people with an interest in the project. The team considered several key questions during this process to best inform the stakeholder identification process: • Who will benefit from the project? • Who could be affected by potential negative impacts of the project? • Who will be responsible for implementing measures to mitigate the negative impacts?

[33] sbia-part-3-pdf.pdf (forest-trends.org)
[34] COMMUNITY DEVELOPMENT TOOLKIT (icmm.com)

- Whose co-operation, expertise or influence would be helpful to the success of the project?
- Who is the most vulnerable, least visible and voiceless, for whom special consultation efforts may have to be made?
- Who supports or opposes the changes that the project will bring?
- Who might have resources to contribute?

This process provided a comprehensive list of people and groups who could be affected by, could affect or could have an interest in the project. This list was then used for consultation purposes, impact assessment and partnership assessment through the project's implementation. Due to the remote nature of the project location, the stakeholder identification process was limited geographically, which resulted in a list of stakeholders primarily related to ownership, employment, lodges, government offices, and community members that live closest to the lodge, but do not have any ownership or resource access within the project area. No areas outside the project area were predicted to be impacted by the project and there have not been any significant changes in the makeup of stakeholders over time.

The following stakeholders were identified using the process described above across 6 stakeholder groups:

- Project Proponent as the Site Owner (Internal)
- Yacumama lodge team, including management and employees. All stakeholders within this category also identify as members of local communities outside of the project area (Internal and Communities)
- The village of Puerto Miguel Loreto Province, Peru as potential interested stakeholders outside of the project area with no property rights or resource access in the project area. This stakeholder group includes potentially vulnerable or marginalized groups, such as women, elderly, and children (Communities and Potentially Vulnerable and/or Marginalized Peoples)
- Amazon Promise, a U.S. based, non-profit organization founded to provide critical medical and dental care to remote populations living in the Upper Amazon Basin of Northeastern Peru (Community-based Organization)
- Dolphin Corners Ecolodge (Industry)
- Renaco Lodge (Industry)
- Jungle Walk Lodge (Industry)

	• Peruvian Forestry Department (Government Agency As this is a privately owned area, the Project Proponent, Aaron Bishop, is the primary stakeholder involved in the project activities. Outside of the Project Proponent, the primary and most involved stakeholder group are the employees of the lodge. Several of the local lodge staff were actively involved in the collection of forest biomass data and have played a key role in patrolling the property and biodiversity monitoring.
Legal or customary tenure/access rights	There are not any legal or customary tenure/access rights to project area and resources, including collective and conflicting rights, held by stakeholders, indigenous people (IPs), local communities (LCs), and customary rights holders in the Project area, as the property is held under private ownership by Aaron Bishop.
Stakeholder diversity and changes over time	The main Project Proponent and property owner is Aaron Bishop (Yacumama LTD S.A.) who has recently taken ownership (early 2024) following the passing of the former owner and family member, Lawrence Bishop. Puerto Miguel is a small town in the Loreto region of Peru, located on the banks of the Ucayali River. It is part of the Alto Amazonas province, one of the eight provinces that make up the region. The Loreto region is Peru's largest and northernmost department, covering almost one-third of the country's territory and bordering Ecuador, Colombia and Brazil. It is also one of the most sparsely populated regions due to its remote location in the Amazon rainforest. The social, economic and cultural diversity of Puerto Miguel reflects the diversity of the Loreto region as a whole, which has been influenced by various indigenous groups, mestizos, criollos, Afro-Peruvians, Europeans and Asians over time. The main indigenous groups in Puerto Miguel are the Cocama-Cocamilla and the Shipibo-Conibo, who have their own languages, traditions and cosmovisions. They practice subsistence agriculture, fishing, hunting and handicrafts, and have a close relationship with nature and the river. They also participate in community-based tourism initiatives that offer visitors an authentic experience of their culture and environment. The socio-economic activities of the communities do not involve the project's privately owned land. Community members of Puerto Miguel have interacted with the ecolodges, as they provide

	an opportunity for employment in the region. Ecolodges in the region attract a variety of visitors and backpackers from across the globe, who are drawn to the region for its unique biodiversity and cultural values. The Yacumama lodge and the project also provide opportunities for employment in the region, only employing local community members. Amazon Promise has interacted with community members by providing critical health care services.
Expected changes in well-being	The project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area. For the larger community (i.e., residents of Puerto Miguel, staff and owners of other lodges etc.) there are direct and indirect benefits under the Project scenario. Residents of the village of Puerto Miguel directly benefit from the renewed support by Yacumama management to the local health clinic. Furthermore, Yacumama serves as the logistical base for Amazon Promise[35], a non-profit organization providing needed medical and dental care to remote populations living in the Upper Amazon Basin of northeastern-Peru. The environmental effects of maintaining forest cover on the Rio Yarapa will benefit both the lodges and community of Puerto Miguel through maintenance of water quality and habitat for the important Rio Yarapa fishery.
Location of stakeholders	There are three stakeholder groups that are located within the Project Area: The Project Proponent, Yacumama lodge management and employees, and Amazon Promise. A spatial analysis was conducted to evaluate the presence of local populations within 20 km of the project area boundary. Google basemaps were used to digitize settlements/localities within a 20 km buffer of the project area boundary (Figure 2.1-1). Despite the presence of local populations within 20 km of the project area boundary, these communities do not rely on the project area at all, as it is privately held. There are no additional stakeholders, including Indigenous Peoples (IPs), local communities (LCs), customary rights holders, and areas outside the project area that are predicted to be impacted by the

[35] http://www.amazonpromise.org/

	project. The socio-economic activities of the communities do not involve the project's privately owned land. Although none of the local communities within 20 km of the project area boundary is reliant on the project area, the village of Puerto Miguel was consulted during the initial registration process of the project and community members are kept informed about the project as per the project's communications plan.
Location of resources	Not applicable; property is owned by Aaron Bishop and resources are owned accordingly. No stakeholders own or have customary access to the resources.

2.1.2 Stakeholder Consultation and Ongoing Communication

The Yacumama management has actively sought to inform and engage relevant stakeholders of the Project and encourage comments on the Project. Outside of the Project Proponent, the primary and most involved stakeholders are the employees of the lodge. Several of the local lodge staff were actively involved in the collection of forest biomass data and played a key role in patrolling the property and overseeing the biodiversity monitoring. Other stakeholder involvement has been solicited formally and informally during the project design and implementation to inform stakeholders of the Project and solicit feedback. Because local stakeholders in Puerto Miguel and Yacumama lodge do not have access to digital information, except through cell phones, a considerable effort was expended by Yacumama management and the project developer to engage with stakeholders in a culturally appropriate manner. To this extent, all engagement occurred in-person with direct representatives of stakeholder groups and both Spanish and English language flyers describing the Project were posted and circulated both among lodge employees and in the village of Puerto Miguel. Furthermore, a Spanish translation of the original English PD was placed at the lodge and the village. Several informal meetings and visits were held in Puerto Miguel with small groups and individuals where the project was discussed at a local tienda, at the Artisans village committee pavilion during local women's craft sales, and during sporting events prior to the formal stakeholder meetings referenced below. Additional details on the stakeholder consultations that occurred to informally and formally solicit feedback and share project details are below.

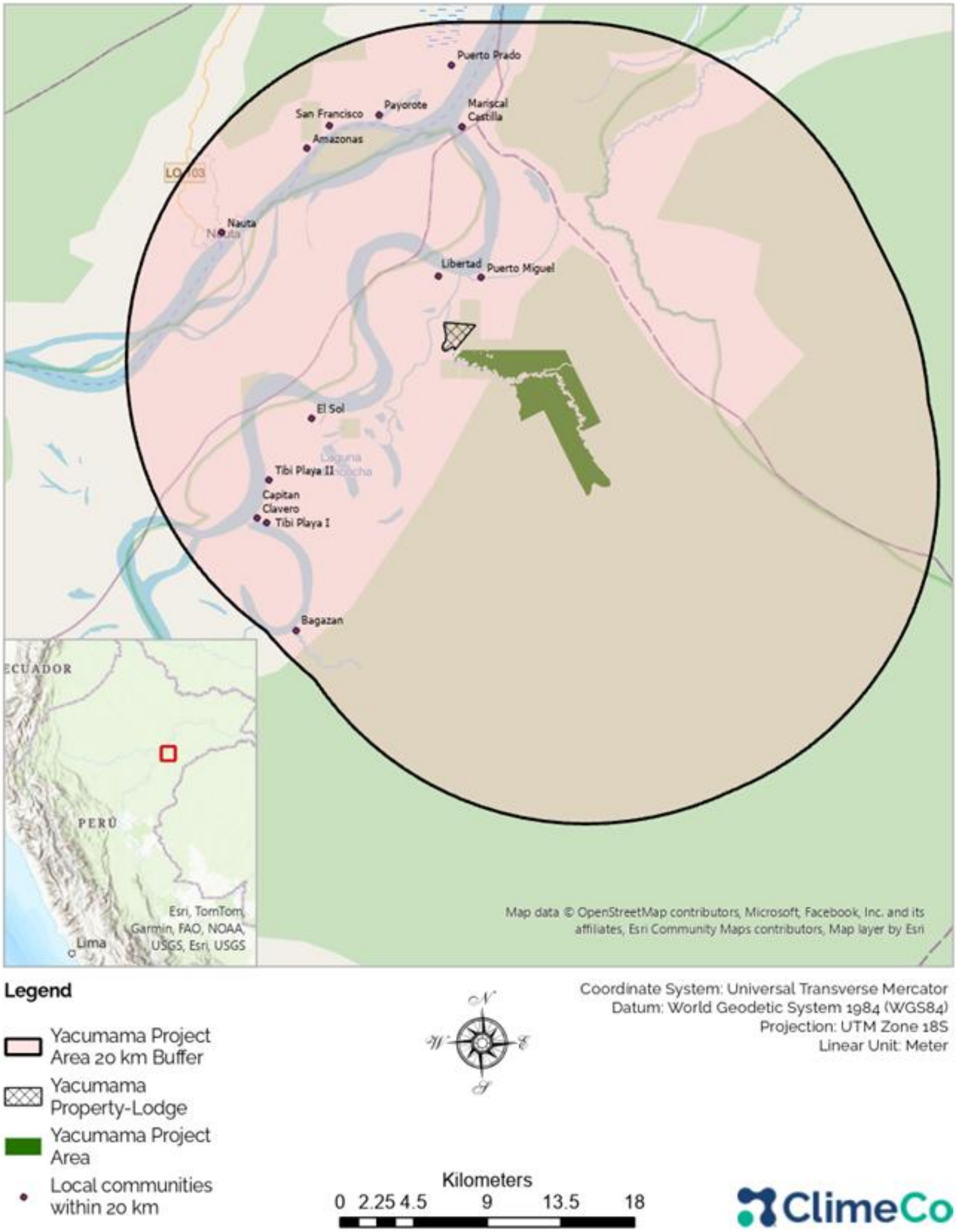

Figure 2.1-1 Analysis of local populations presence within 20 km of the project boundary for identification of stakeholders.

Date of stakeholder consultation	June 2013
Stakeholder engagement process	As part of the overall monitoring of illegal logging process, the permanent staff were interviewed for a Participatory Rural Appraisal (PRA) to evaluate whether harvesting of fuel wood, harvesting of wood for charcoal and/or illegal timber harvest may be occurring in the project area. Because of its' relative isolation, there are no communities within the project area with the exception of the 'permanent lodge staff' and there is no recognized village or town adjacent to the project area. However, the permanent staff of the Yacumama lodge have, in many cases, been located at the site for over 20 years and constitute a "community" that is adjacent to the project area. In addition, the project team identified the staff members at nearby ecolodges: Dolphin Corner, Renaco lodge, Jungle Walk lodge, and villagers attending the formal and informal meetings at Puerto Miguel as part of the PRA process. Thus, as part of the overall process of soliciting input for the project, and in the course of describing, explaining, and answering questions about the project, the team asked attending stakeholders three key questions through semi-structured interviews: 1. Are you aware of illegal harvest of trees in the project area? 2. Are you aware of harvest of wood for fuel in the project area? Charcoal production? 3. Is there wood collection of any kind occurring?
Consultation outcome	The discussion and interview with the Yacumama staff were considered the most relevant because the staff had been responsible for maintaining, patrolling and protecting the property, including the project area, for over 20 years. The staff was certain that no illegal timber harvesting was occurring because the equipment necessary could not possibly come up the Yarapa without their knowledge due to the relatively small size of the river. The staff also pointed that the local community understood Yacumama was privately owned land and thus was generally avoided because of the ample "public" forest land in the region. The community meetings and discussions confirmed what the Yacumama staff had communicated; that there was no known illegal harvest of timber occurring. The villagers pointed out that there were extensive forest resources closer to the village than the Project area where they were able to obtain resources. The only resource that the villagers indicated that was of potential interest was palm leaf for roofing material.

	The Yacumama staff was not aware and did not believe that wood was being collected in the project area for fuel, especially for charcoal production as charcoal is not normally used for cooking. Norman Walters confirmed that Yacumama had in the past used propane, and that the other lodges currently used propane, for cooking and heating water. This fact was further confirmed by observing two establishments in Puerto Miguel that prepared food (bakery and small tienda) were both using propane cook stoves. As with illegal harvest of trees, the general consensus among the villagers was that any collection of fuelwood wood occurs closer to the village and not a ½ day upriver within the Project area.
Ongoing communication	Additional meetings with the same group of stakeholders should be held annually for further consultation and engagement. Details of the project activities were communicated to groups through Yacumama management as needed.
Stakeholder input	During the PRA, no individual or group of stakeholders believed that illegal harvest of forest resources was occurring on the project area. Thus, the PRA demonstrated < 10% of the individuals that were interviewed believed that harvesting of fuel wood, harvesting of wood for charcoal and/or illegal timber harvest was occurring in the project area. This fact was confirmed by extensive ground reconnaissance.

Date of stakeholder consultation	June 25, 2013, 7:00 PM at the Yacumama Lodge
Stakeholder engagement process	A formal stakeholder consultation meeting was held at the Yacumama Lodge on Tuesday June 25, 2013, with several employees of Yacumama. Eleven individuals were in attendance: VTCMI staff (Verl Emrick, Eric Wolf, Mike St. Germain, Aaron Teets) and Yacumama management (Norman Walters) and staff (Alfredo, Chino, Hugo, Percy, Magno, and Juan). The meeting was led by Norman Walters and the project team from CMI. The consultation sought to discuss the project design and implementation, potential risks, costs, and benefits resulting from the project, and discuss the basic elements of a carbon project design and implementation.
Consultation outcome	The staff was supportive of the project activities and carbon project development following the meeting. Multiple stakeholders also attended the following day's consultation (see below) for further discussion of the project's implementation plan and benefits. The consultation confirmed that there would still be employment opportunities and benefits for those employed at the lodge through the project activities. This discussion confirmed that there is low concern of illegal timber harvesting. Subsequent field work revealed that overstory palms were a very minor

	component of the forest and the fronds typically are collected from understory palms. The consultation confirmed that the project activities would need dedicated equipment in order to negatively affect the geography of the region, including boats.
Ongoing communication	There is frequent communication with Yacumama staff, during which information on the project activities and general operation information is communicated across stakeholder groups. Formal meetings with set agendas and dedicated question and answer periods are organized with the staff prior to their occurrence to ensure availability and full participation of staff.
Stakeholder input	The primary interest and input from the lodge staff was related to how the project would affect future employment and if it would increase, decrease, or stay relatively constant. The second input was how the project could potentially affect collection of non-timber forest products, particularly palm leaves for roof maintenance at the lodge.

Date of stakeholder consultation	June 26, 2013, 4:00 PM Artisans Committee Pavilion, Puerto Miguel
Stakeholder engagement process	A second formal Community Meeting and Consultation was held on Wednesday June 26, 2013, 4:00pm at the Artisans Committee Pavilion, Puerto Miguel, Loreto Province, Peru. Approximately 70 men, women and children were in attendance form the village. Three village officials oversaw the meeting, and notes were taken and entered in the official community ledger. To ensure culturally meaningful engagement and attendance, Spanish and English language flyers describing the Project and meeting were posted and circulated both among lodge employees and in the village of Puerto Miguel. Furthermore, a Spanish translation of the original English PD was placed at the lodge and the village. The meeting was held in Spanish and notes were recorded in Spanish and English. The meeting was held at the Artisans Committee Pavilion as this provided a more accessible meeting space than the Yacumama lodge, which is very remote in relation to the community. Holding the meeting at a community space in Puerto Miguel ensured accessibility to the consultation.
Consultation outcome	The project proponents confirmed to the village community group that employment opportunities would be advertised to Puerto Miguel villagers when available and that all individuals regardless of gender, race or ethnicity will be encouraged to apply. In addition, when the lodge was hosting both project related activities and/or educational activities Yacumama would source provisions, laundry service etc. from the village. The project will also fund the re-establishment of the health clinic as

	planned. Two additional issues that were of interest to the village community group were: access to the Yarapa River for fishing and the collection palm thatch for roofing. It was confirmed in this consultation that each will be specifically allowed under the project scenario. At the conclusion of the meeting, the community official called for a voice vote on whether Puerto Miguel would support the project, and the response was a unanimous 'Yes'. The official notes from the meeting were signed in the community records. Figure 2.1-3,2.1-4 and 2.1-5 are provided to document the consultation.
Ongoing communication	Project updates will be communicated to community members of Puerto Miguel as they are available for the project. Norman Walters serves as the primary channel for community communication, and he communicates details on the project activities, including site visits for validation/verification and management team site visits, to coordinate employment opportunities and share project details.
Stakeholder input	Eight individuals from the village formally spoke at the consultation as community representatives and engaged in discussion with the project team for approximately 2 hours. There were three main concerns that the villagers expressed with regard to the project. The first was continued access to the Yarapa River for the purposes of fishing. The second was the opportunities for continued economic interaction with the lodge either through short-term or long-term employment, purchasing of goods from the village (fish, vegetables etc.) and/or bringing visitors to purchase local crafts. Finally, there was nearly unanimous support for Yacumama supporting the private clinic as part of the project.

ClimeCo worked closely with the primary stakeholder of the project, Lawrence Bishop at the time, and now Aaron Bishop following his passing, to explain the additional verification of the project, and worked closely with Norman Walters to prepare the staff for the verification and site visit audit. ClimeCo organized and led meetings with the field crew, project proponent, and Yacumama staff in preparation for the 2024 verification. These meetings were held virtually, due to the geographic range of the teams, and in person during the site visit. These meetings were held in English and Spanish as appropriate.

An additional stakeholder consultation will be held following the most recent verification in order to review key project details, findings, outcomes, and operational changes at the project proponent level. ClimeCo, Aaron Bishop and Norman Walters will review the following information, including but not limited to an overview of the carbon credits issued to date, the state of the voluntary carbon market, a project summary, status of the project activities, future project timeline, and findings from the verification process. This consultation will solicit feedback regarding the implementation of the project activities. This will include but is not limited to all identified costs, risks, benefits, and all identified positive and negative impacts of the project design. The consultation will be documented with a sign-in sheet, pictures, and signed notes.

Figure 2.1-2 Stakeholder meeting held on Wednesday June 26, 2013 4:00pm at the Artisans Committee Pavilion, Puerto Miguel, Loreto, Peru.

Figure 2.1-3 Yacumama management (Norman Walters) discussing project with local stakeholders in Puerto Miguel.


Figure 2.1-4 Receiving input from local stakeholders in Puerto Miguel at the meeting conducted on June 26, 2013.

2.1.3 Free Prior and Informed Consent

Obtaining consent	The project proponent, Aaron Bishop, has sole ownership of the property rights and as such the free, prior, and informed consent (FPIC) process is not applicable to this project activity. There are no ongoing or unresolved conflicts, and the project does not exacerbate nor influence the outcomes of unresolved conflicts.
Outcome of FPIC	See above. The project has not and will not encroach on land, relocate people without consent, and force physical or economic displacement.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
No grievance was raised during the monitoring period.	Not applicable

2.1.5 Public Comments

Comments received	Actions taken
Not applicable because no additional public comments were received outside of the Public Comment Period.	Not applicable

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

The project management team at ClimeCo possesses the necessary experience related to all project activities, including the development and management of VCS forest and non-forest carbon projects. ClimeCo is a leading carbon project company, with experience globally across major carbon standards and multiple project types. The former 3GreenTree team (now ClimeCo) is a leading forest carbon project developer with experience that includes creating the IFM VM0012 methodology, developing multiple VCS forest carbon projects worldwide, and extensive forest management and ecosystem modeling expertise. The ClimeCo team holds significant experience developing and managing VCS AFOLU and non-AFOLU projects under various carbon standards (further details at: https://climeco.com). Key staff include Brad Seely, PhD. (https://climeco.com/brad-seely/) and Clive Welham, PhD., RPBio, (https://climeco.com/clive-welham/).

Mr. Aaron Bishop is responsible for hiring qualified contractors for future monitoring assessments, carbon sales, and finances in the United States. Mr. Norman Walters is responsible for management of the infrastructure of the lodge facilities[36], forest protection at Yacumama, and business matters within the country of Peru. In addition, Mr. Walters is the diplomatic liaison between Yacumama and the locals. Mr. Walters has extensive experience working in the Peruvian Amazon and was the manager for Yacumama Lodge, and managed all aspects of construction, employee relations, banking, liaison for all Peruvian Government actions and interactions, and defended Yacumama SRLtda. in the Peruvian Judicial System. Mr. Walters is responsible for the day-to-day operations at Yacumama during the project.

Dr. Verl Emrick was responsible for managing and implementing all the initial scientific/technical aspects of the project. Dr. Emrick is a Research Ecologist and Senior Project Manager with the Virginia Tech-Conservation Management Institute within the College of Natural Resources and Environment.

[36] *The former Yacumama lodge is adjacent to the project area but is not part of the project. The remaining lodge buildings now house the permanent staff (who are the only permanent residents near the project area) that, support researchers, patrol project area and monitor boat traffic on the Yarapa river within the project area.*

2.2.2 Risk Assessment

	Risk identified	Mitigation or preventative measure (s) taken
Natural and human-induced risks to stakeholders' wellbeing	The natural risks identified relate to mean precipitation and river flood	The project area is situated in a region characterized by high precipitation and frequent flooding, which can pose risks to the lodge infrastructure used as a base for project guardians. To mitigate and prevent these risks, the lodge infrastructure undergoes regular renovations, including raising the floor to reduce vulnerability to flooding. Additionally, river levels are closely monitored throughout the rainy season to ensure timely response to any potential threats, safeguarding the wellbeing of the project stakeholders.
Risks to stakeholder participation	The only risk identified in the stakeholder participation related to ensuring equitable access to information and accessibility of consultations across identified stakeholder groups.	To mitigate and prevent this risk from occurring, all engagement occurred in-person with direct representatives of stakeholder groups and both Spanish and English language flyers describing the Project and meetings were posted and circulated both among lodge employees and in the village of Puerto Miguel. Furthermore, a Spanish translation of the original English PD was placed at the lodge and the village. Community meetings were held in community spaces.
Working conditions	Given that work takes place in the tropical lowland floodplain forest forests of Peru, several potential risks have been identified related to field accidents that may require first aid (including accidents	To mitigate and precent these risks, the following measures are in place: • Field crews are trained in forestry field risks, including inclement weather conditions and

	related to animals, plants, personal injury etc.).	proper best management practices in the industry • Field crews are requested to carry basic first aid kits while in the field to treat minor cuts and ailments • Field crews bring appropriate field supplies, including equipment, water, and food • Transportation will be provided to the nearest hospital for employees, field crews, and visitors as needed for more serious medical care. There have been no project injuries related to these risks to date. • Employees and field crews are trained in the use of equipment and/or have been using the field equipment as a part of their daily life. • Sharp equipment must be transported in their cases. • Field crews, visitors, and employees are advised to wear snake boots, long pants, long shirts, hats, sunscreen, and other protective clothing measures to protect against natural elements and animals. Chest or hip waders are advised to be worn in the field during times of heavy rains and high waters. • Weather is closely monitored in the region, including periods of predicted heavy rains and

		droughts. Field visits are planned accordingly and have been rescheduled in the past for safety reasons associated with risks of flash flooding. • Boats are used to navigate the project areas in times of rainy seasons and high waters. Only experienced and/or licensed drivers may drive boats within the project activities.
Safety of women and girls	No risk identified	No mitigation or preventative measure necessary to be taken as equal opportunities have been provided in the context of gender equity and pay for labor and work. No child labor occurs within the project. No discrimination or sexual harassment has occurred. Reference Section 2.3 for further information on respect for human rights and equity.
Safety of minority and marginalized groups, including children	No risk identified	No mitigation or preventative measure necessary to be taken as equal opportunities have been provided in the context of gender equity and pay for labor and work. No child labor occurs within the project. No discrimination or sexual harassment has occurred. Reference Section 2.3 for further information on respect for human rights and equity.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified	No mitigation or preventative measure necessary to be taken as the project activities do not generate any pollutants or waste materials, including but not limited to air, noise, discharges to water, generation of waste, or release of hazardous materials.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified [37]	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	The Project is committed to providing an environment free of discrimination, where all individuals are treated with respect and dignity. This is confirmed by conversations with Project staff and employee records.
Sexual harassment	No risk identified	The Project is committed to providing an environment free of sexual harassment, where all individuals are treated with respect and dignity. This is confirmed by conversations with Project staff and employee records.
Equal pay for equal work	No risk identified	The Project is committed to offer women and men equal remuneration for work of equal value. Women and men working in identical or similar jobs receive the same pay. This is confirmed by conversations with Project staff and employee records.
Gender equity in labor and work	No risk identified	The Project is committed to gender equity in all aspects of labor and work. Equal opportunities have been provided in the context of gender equity and pay for labor and work.
Forced labor	No risk identified	Project staff and contracted workers employed by third parties are not forced labor. This is confirmed by conversations with

[37] *The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.*

		Project staff and employee records.
Child labor	No risk identified	Project staff and contracted workers employed by third parties do not use child labor. Only residents of Puerto Miguel are hired as Project staff. This is confirmed by conversations with Project staff and employee records.
Human trafficking	No risk identified	Project staff and contracted workers employed by third parties does not use human trafficking. Only residents of Puerto Miguel are hired as Project staff. This is confirmed by conversations with Project staff and employee records.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project respects human rights as set out in the International Labour Organization's Declaration on Fundamental Principals and Rights at Work as part of project design and implementation and is committed to upholding the rights of indigenous peoples, local communities, and customary rights holders in its area of intervention as applicable. The project follows the principles and standards of international human rights law, the United Nations Declaration on the Rights of Indigenous Peoples, and the ILO Convention 169 on Indigenous and Tribal Peoples. Yacumama LTD. is committed to ensuring employee health and safety, offering fair compensation and employment benefits, expanding employment opportunities, and offering job training. The project recognizes, respects, and promotes the protection of the rights of employees in line with international

	human rights laws. Reference Sections 2.3.1. and 1.15 for further information on a safe, equitable working environment. While there are no Indigenous People (IPs), local communities (LCs), nor customary rights holders in the Project area, the project ensured that the identified stakeholder groups, including local community members, were fully informed, consulted, and involved in the design, implementation, and monitoring of the project activities.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The Yacumama forest carbon project is conserving the biodiversity and cultural heritage of the Amazon rainforest by reducing deforestation and promoting sustainable livelihoods for the local communities. The project monitors and reports on the impacts of its activities on the cultural values and practices of the indigenous peoples and other forest dwellers, such as their sacred sites, traditional knowledge, languages, and customs. The project also engages with the stakeholders through participatory processes, consultations, and capacity building to ensure their rights and interests are respected and protected.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
Disputes over rights to territories and resources	There are no ongoing or unresolved conflicts or disputes over rights to lands, territories, and resources in the project area. There were no disputes that were resolved within the last ten years. Accordingly, there are no activities undertaken by the project that could prejudice the outcome of any unresolved dispute. Land

	tenure documentation, including land titles and proof of purchase, has been provided to the audit team to confirm these statements.
Respect for property rights	There are no legal or customary tenure/access rights to territories and resources, including collective and conflicting rights, held by indigenous people (IPs), local communities (LCs), nor customary rights holders in the Project area, as Aaron Bishop owns the private property. The project area is completely under private property ownership. The project activities do not lead to involuntary removal or relocation of property rights holders from their lands or territories and do not force rights holders to relocate activities important to their culture or livelihood.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	The project does not impact on property rights as described in Section 2.3.4 above, and as such there is not a benefit sharing agreement in place.
Summary of the benefit sharing plan	Not applicable as the project did not impact on property rights.
Approval and dissemination of benefit sharing plan	Not applicable as the project area is privately owned by the project proponent.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No risk identified	No mitigation or preventative measure necessary to be taken as the project activities help protect biodiversity and ecosystem health in comparison to the without-project scenario. If the forest were to be converted to agriculture, the impact on biodiversity could be significant. The conversion process would involve deforestation, which

		directly leads to habitat loss. This loss of habitat can result in the extinction of species that are endemic to these forests and rely on them for survival. Additionally, agricultural practices often involve the use of pesticides and fertilizers, which can contaminate local water sources and harm aquatic life. The simplification of the ecosystem to a single crop also reduces the variety of food sources and shelter available for wildlife.
Soil degradation and soil erosion	No risk identified	No mitigation or preventative measure necessary to be taken as the project activities help protect soil health. Protecting the forest from deforestation enhances soil health, reduces soil erosion and compaction, reduces nutrient depletion, and improves water retention in comparison to the without-project scenario.
Water consumption and stress	No risk identified	No mitigation or preventative measure necessary to be taken as the project area is subject to natural rainfall to sustain tree health. The project activities do not contribute to water consumption or stress.
Usage of fertilizers	No risk identified	No mitigation or preventative measure necessary to be taken as the project activities do not include any usage of fertilizers or chemicals.

2.4.1 Rare, Threatened, and Endangered species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☒ Yes ☐ No

Species and habitat	Reference Appendix 6.2 for additional information on the species that may be present in the habitats within the

	project area, as the Yacumama property encompasses 3,202 ha of tropical rainforest in the Amazon Basin of Peru. The project will not adversely impact these areas, nor will it adversely impact the habitats for rare, threatened, or endangered species. The project activities actively promote the protection of critical habitats for these species, as it is well known that deforestation in the Amazon tropical rainforests has led to habitat loss, ecosystem fragmentation, biodiversity reduction, increased vulnerability to fires, and susceptibility to climate change, all of which can negatively impact the habitats of rare, threatened, or endangered species. The conservation of forests, including their biodiversity and ecosystem health, is the primary activity of the project. The previous verification report[38] confirmed that "no negative impacts are expected because activities related to the project goals do not involve a change to the management of the forest resources on the property."
Areas needed for habitat connectivity	The project will not adversely impact habitat connectivity as the main project activity is forest conservation.

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk identified	The project will not adversely impact the habitats for rare, threatened, or endangered species as the main project activity is forest conservation.
Areas for habitat connectivity	No risk identified	The project will not adversely impact habitat connectivity as the main project activity is forest conservation.

2.4.2 Introduction of species

This section is not applicable to this project since it is a REDD+ rather than ARR, ALM, WRC or ACoGS project types and thus no species were introduced.

2.4.3 Ecosystem conversion

This section is not applicable to this project since it is a REDD+ rather than ARR, ALM, WRC or ACoGS project types and thus no ecosystem was converted.

[38] VERIF_REP_1133_01JAN2012_31DEC2013.pdf

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0007	VM0007 REDD+ Methodology Framework (REDD+MF)	V1.7
Module	VMD0001	VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools (CP-AB)	V1.2
Module	VMD0005	VMD0005 Estimation of carbon stocks in the long-term wood products pool (CP-W)	V1.2
Module	VMD0006	VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation/forest degradation and planned wetland degradation (BL-PL)	V1.4
Module	VMD0009	VMD0009 Estimation of emissions from activity shifting for avoiding planned deforestation/forest degradation and avoiding planned wetland degradation (LK-ASP)	V1.3
Module	VMD0011	VMD0011 Estimation of emissions from market-effects (LK-ME)	V1.2
Module	VMD0013	VMD0013 Estimation of greenhouse gas emissions from biomass and peat burning	V1.3
Module	VMD0015	VMD0015 Methods for monitoring of greenhouse gas emissions and removals (M-REDD)	V2.3
Module	VMD0016	VMD0016 Methods for stratification of the project area (X-STR)	V1.3
Module	VMD0017	VMD0017 Estimation of uncertainty for REDD project activities (X-UNC)	V2.2
Tool	VT0001	VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities	V3.0
Tool	Not applicable	Tool for testing significance of GHG emissions in A/R CDM projects activities	V1.0

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
VM0007	Based on the methodology and the reference for the methodology, VCS "Tool for AFOLU Methodological Issues", this Project qualifies because of a reduction in emissions of carbon dioxide from planned deforestation in the Project scenario	✓ Land in the Project Area qualified as forest at least 10 years before the Project start date based on definition of forest land in FAO Forest Resource Assessment of 2000 and remote sensing analysis. ✓ No peat soils are present on the Project site. ✓ Project proponent can show ownership of the Project site and ownership of the carbon rights for the Project Area. ✓ Baseline deforestation in the Project Area falls within the category of planned deforestation (VCS category avoided planned deforestation). ✓ Baselines will be renewed every 10 years after the start of the Project except where triggers lead to a more frequent renewal. ✓ No areas registered under the Clean Development Mechanism, or any other carbon trading scheme are included within the Project site; validation under the Climate, Community, and Biodiversity Alliance for co-benefits has been disclosed. ✓ The baseline condition is conversion of the property to a permanent deforested state of agriculture. ✓ No reforestation is proposed for the Project; and leakage avoidance activities do not include either agriculture lands flooded to increase production, or intensifying livestock production.
	The Project is considered under the VCS category	✓ Conversion of forestlands to a deforested condition is legally permitted.

	Avoided Planned Deforestation.	✓ Documentation is available to clearly demonstrate with credible evidence that the land would have been converted to non-forest use if not for the Project. ✓ Post deforestation land use does not include reforestation.
VMD0015 M-REDD v2.3	Strata as defined in the relevant baseline modules are fixed and may not be changed without baseline revision.	✓ Strata as defined in BL-PL are fixed and did not change even after baseline revision.
VMD0017 X-UNC v2.2	A precision target of a 95% confidence interval half-width equal to or less than 15% of the recorded value must be targeted	✓ Sufficient measurement plots were included considering that precision is within the target of a 95% confidence interval half-width equal to or less than 15% of the recorded value of baseline emissions
VMD0016 X-STR v1.3	Different stratifications may be required for the baseline and project scenarios to achieve optimal accuracy of the estimates of net GHG emissions or removals.	✓ Project area stratum is a discrete, relatively homogeneous unit that improves accuracy and precision of carbon stock, carbon stock change and GHG emission estimates.
VMD0006 BL-PL v1.4	Applicable for estimating the baseline emissions on forest lands (usually privately or government owned) that are legally authorized and documented to be converted to non-forest land.	✓ Project owner has the 2009 harvest plan.
VMD0009 LK-ASP v1.3	Applicable for estimating the leakage emissions due to activity shifting from forest lands that are legally authorized and documented to be converted to non-forest land.	✓ Project owner has the 2009 harvest plan.
VMD0011 LK-ME v1.2	Applicable for calculating market-effects leakage from projects that are anticipated to reduce levels of wood harvest substantially and permanently.	✓ Project stopped deforestation permanently

VMD0001 CP-AB v1.2	Applicable to all forest types and age classes	✓ The project area is covered by mature tropical lowland floodplain rainforest that aligns with the FAO's definition of forest, i.e. "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 %, or trees able to reach these thresholds in situ."[39]
VMD0002 CP-D v1.1	Applicable to all forest types and age classes	✓ The project area is covered by mature tropical lowland floodplain rainforest that aligns with the FAO's definition of forest, i.e. "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 %, or trees able to reach these thresholds in situ."
VMD0005 CP-W v1.2	Applicable to all cases where wood is harvested for conversion to wood products for commercial markets, for all forest types and age classes	✓ Project owner has the 2009 harvest plan.
VMD0013 E-EPB v1.3	Applicable to REDD project activities with emissions from biomass burning	✓ Conversion of the forest includes harvesting merchantable trees, bulldozing, piling, and burning the remaining vegetation.

3.3 Project Boundary

The Project area encompasses the entire Yacumama property with the exception of a small parcel on which the former lodge buildings and other infrastructure is situated (Figure 3.3-1). The Project area is comprised of the parcels, Yacurana I and Santuario Privado which are solely owned and held and registered with COFOPRI, the Peruvian Government entity responsible for titling lands[40]. Examination of the COFOPRI map indicated some discrepancies from the original survey maps. Therefore, the Project identified and updated the boundaries of the three parcels using the original survey maps produced in the early 1990's and imagery from that time. The area of individual parcels did not precisely match the COFOPRI map document (Yacurana 1 1,425 ha, Santuario Privado 1,575), though the total area of 3,000 ha was consistent with that registered with COFOPRI (see Figure 1.13-3).

[39] content (fao.org)

[40] http://www.cofopri.gob.pe/index.aspx?flag=trans

Total forest area within the project area was determined by subtracting the area of "water" and "nonforested" area from the total project area [41]. To account for the area of water in the Yarapa and the common oxbow lakes, each were identified in a GIS using heads up digitizing and confirmed via ground visits in 2013 and their area calculated. In addition, a 50m buffer from stream center was placed on the Rio Yarapa and an unnamed tributary for a total of 133 ha of "permanent" of water in rivers and oxbow lakes. Analysts also detected 4 ha of non-forested land with the project area. The area of water and non-forested area was subtracted from the total of the two parcels to result in a total forested area of 2,863ha.

Project temporal boundaries consist of a 30-year crediting period (01-January-2012 to 31-December-2041), a first 2-year monitoring period (01-January-2012 to 31-December-2013), and a second 9-year monitoring period (01-January-2014 to 31-December-2022). The first 10-year baseline validity period spanned from 01-January-2012 to 31-December-2021, and the second 10-year baseline will cover the period of 01-January-2022 to 31-December-2031. The GHG emission sources, sinks and reservoirs included in or excluded from the boundary of the Yacumama project activity are shown below.

Table 3.3-1 Carbon pools included/excluded from the project boundary.

Carbon pool	Included?	Justification/Explanation
Above-ground biomass	Non-tree excluded	Stock change would be significant for tree carbon.
Below-ground biomass	Non-tree excluded	Stock change would be significant for tree carbon.
Dead wood	Included	Excluded. This is conservative.
Harvested wood products	Included	Relevant to the baseline
Litter	Excluded	Optional
Soil organic carbon	Excluded	This is conservative.

Table 3.3-2 GHG sources included/excluded from the project boundary.

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change.
		CH_4	Included	Non-CO_2 gases emitted from woody biomass burning – it is conservative to exclude.
		N_2O	Included	It is conservative to exclude.
	Combustion of fossil fuels	CO_2	Included	Potential emissions are negligible.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Excluded	Potential emissions are negligible.
	Use of fertilizers	CO_2	Excluded	Potential emissions are negligible.
		CH_4	Excluded	Potential emissions are negligible.

[41] *Detailed remote sensing methods including map figures and accuracy assessment are provided in section 1.14, "Yacumama Land Use Land Cover (LULC) Benchmark Map".*

Source		Gas	Included?	Justification/Explanation
		N_2O	Excluded	No fertilizer is used. It is conservative to exclude.
Project	Burning of woody biomass	CO_2	Included	Carbon stock decreases due to burning are accounted as a carbon stock change.
		CH_4	Included	Non-CO_2 gases emitted from woody biomass burning – must be included if fire occurs.
		N_2O	Included	
	Combustion of Fossil Fuels	CO_2	Included	Can be neglected if excluded from baseline accounting.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Excluded	Potential emissions are negligible.
	Use of Fertilizers	CO_2	Excluded	Potential emissions are negligible.
		CH_4	Excluded	Potential emissions are negligible.
		N_2O	Excluded	Can be excluded if excluded from baseline accounting.

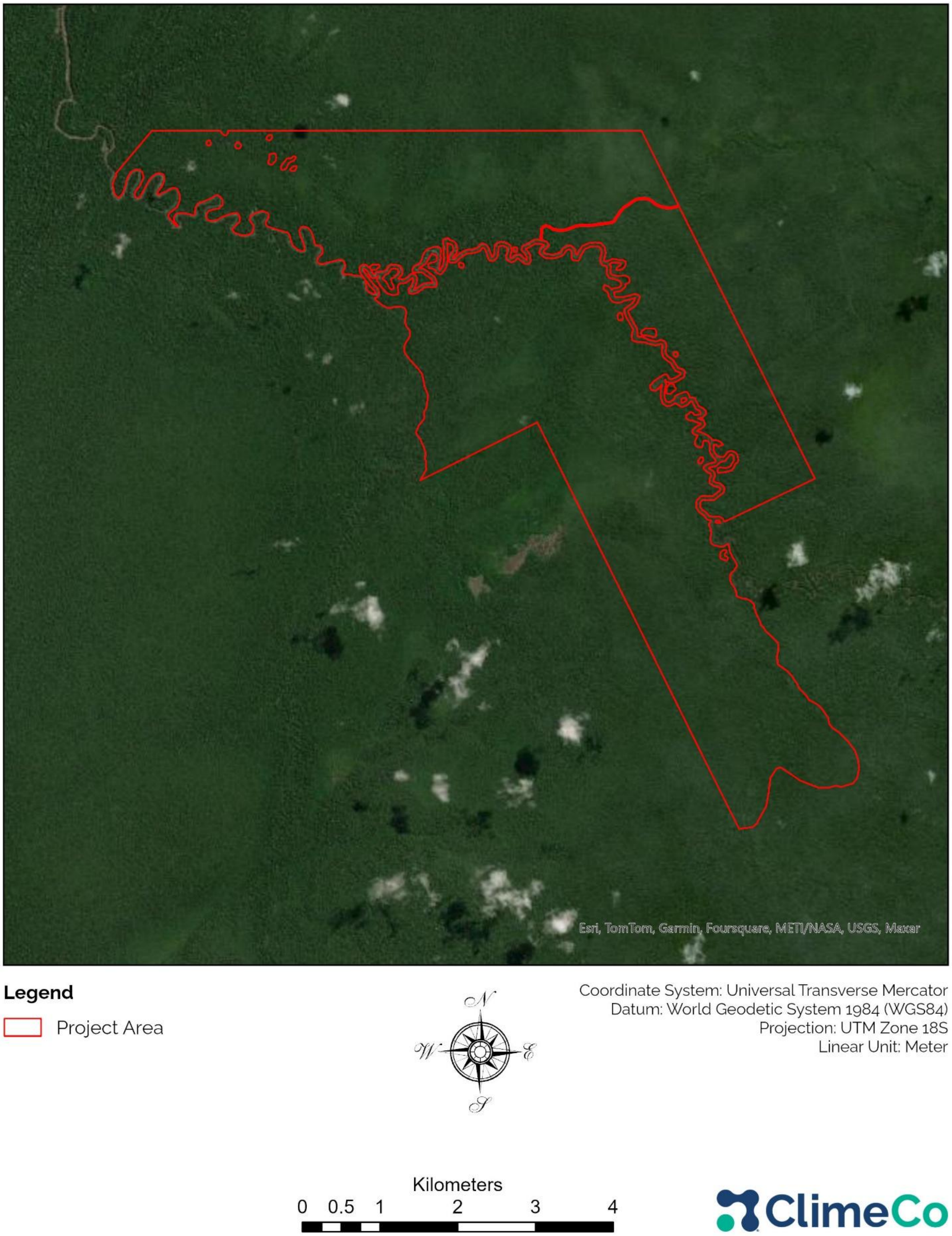

Figure 3.3-1 The eligible Project area for the Yacumama Forest Carbon Project.

3.4 Baseline Scenario

3.4.1 Baseline from Jan 1, 2012 to Dec 31, 2021

The baseline scenario, established in the original registered PD[4] (Period of Jan 1, 2012 to Dec 31, 2021), specified that 10% of the Project area per year would have been converted to agriculture culminating with the entire Project area been deforested within 10 years. The basis for that assumption was that the Project area, in its entirety, was determined to be suitable for conversion. The annual deposition of nutrient-rich sediments carried by rivers makes these areas some of the most fertile soils of the Amazon Basin[15]. These areas were widely acknowledged for their agricultural productivity, and in 1997, the Peruvian Amazon Research Institute (IIAP) called for intensified agricultural development in the floodplains of the Loreto Department due to the more favorable edaphic conditions when compared to dry land[15]. Furthermore, the suitability of floodplains in the Amazon basin for agriculture, in both a historical and prehistorical context, was widely recognized[42].

Furthermore, during the first validation, the two parcels that comprise the Project area, Fundo Yacurana I and Satuario-Privado, were both considered as suitable for agriculture. The entire area Fundo Yacurana I was assessed to be suitable for “agricultural exploitation” by the Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009). Specifically, it was identified that 61% of the property was considered as suitable for cultivo permanente (permanent cultivation) and 39% as pastoreo (Pasture) (Pages 5 & 6 of the registered PD[4]). Since Santuario-Privado was immediately adjacent to Fundo Yacurana I (see Figure 1.13-3), having the same soils, climate, and hydrologic regime; that parcel was, then, also considered as suitable for “agricultural exploitation”. In addition, the ownership and tax documents on page 23 of the 2009 harvest plan classified the property ‘type’ as S. Productiva (productive), the same as Yacurana I.

Section 4 of the registered PD[4] argued that a deforestation rate based on the first-year harvest plan approved for the initial parcel was economically unrealistic and that, following VMD006, a common practice analysis was more appropriate as an alternative approach to determining the deforestation rate. A common practice analysis was presented focusing on two similar forested areas that had been recently converted to agriculture. The average deforestation rate derived from this analysis (2,387.5 ha/yr) was used as evidence to demonstrate that the 10% deforestation rate assumed in the Project baseline (286.3 ha/yr) was relatively conservative and justified for the Project area.

However, in 2025, during the second verification and baseline reassessment, it was determined that the original validated deforestation analysis did not include enough proxy areas to justify the deforestation rate under the requirements of VMD006 (a minimum of 6 must be evaluated). Accordingly, the baseline established for Jan, 2012 to Dec, 2021 and the original 10% annual deforestation rate were re-evaluated and updated to comply with all requirements in Section 5.1.3 of VMD0006. In the updated analysis (Section 4.1.3), seven proxy areas were identified, and historical tree-cover loss was quantified for each proxy area during the defined reference periods. Forest types, soil types, and slope conditions in all proxy area were consistent with those in the Project area. The primary deforestation driver of conversion to permanent agriculture was also consistent with the Project area. However, due to the absence of reliable,

[42] *Fraser JA, Alves-Pereira A, Junqueira AB, Peroni N, Clement CR. 2012. Convergent Adaptations: Bitter Manioc Cultivation Systems in Fertile Anthropogenic Dark Earths and Floodplain Soils in Central Amazonia. PLoS ONE 7: 1-13.*

publicly available tenure datasets for Peru[43], it was not possible to directly identify landholdings with the same formal tenure status as the project area. To address this limitation, the proxy areas were conservatively delineated using multiple reference layers[44,45,46] to ensure they reasonably represent locations where the same agent of deforestation would operate in the baseline scenario. Two methodology deviations were required to complete the analysis (see Section 3.6 for details).

Forest cover loss was analyzed for the initial reference period from 2002 to 2013 (to adjust the baseline established for Jan, 2012 to Dec, 2021). For each proxy area, annual deforestation rates were calculated as the average annual area of forest cover lost over the relevant reference period, and the project-level deforestation rate was established as the average of the seven proxy-area rates.

The total Project area eligible for deforestation during this period (APlanned,i) was also estimated based on an evaluation of the selected proxy areas. Specifically, deforestation was analyzed across a 20-year period (2002-2021) for all proxy areas, with particular attention to those proxies that exhibit advanced or near-complete deforestation trajectories and can therefore be considered to have largely completed their deforestation cycle. This assessment allows for an evidence-based procedure to obtain the maximum extent of forest conversion that is realistically achieved under comparable land-use and deforestation agent conditions. Among the seven proxy areas analyzed, four proxies (Proxies 4, 5, 6, and 7) exhibit high cumulative deforestation levels over the 20-year period, with total forest loss ranging from 80% to nearly 100% of the 2002 forest area. These proxies showed agricultural expansion progressing to an advanced stage and to minimal or fragmented remaining forest cover. Based on this analysis, it was conservatively estimated that 80% of the forested portion of the Project area (2,863 ha) could be converted to agriculture, corresponding to a potential total deforested area of 2,290.4 ha (Aplanned,i). This total of 2,290.4 ha was used as the cap on cumulative allowable forest cover loss during the crediting period. The procedure for deriving the cap limit for $A_{planned}$ is described as a methodology deviation with detailed information available in Section 3.6.1.

The updated analysis showed an annual deforestation rate of 4.22% (121 ha/year), which was applied for the period of 2014 to 2021. The original 10% annual deforestation rate was preserved for the initial two years of the Project (included in the 2012-2013 verification), during which 286.3 ha/year (totaling 572.6 ha) were counted toward the cumulative loss cap. A detailed description of the deforestation-rate revision process is provided in Section 4.1.3.

3.4.2 Baseline from Jan 1, 2022 to Dec 31, 2031

Reassessment of the baseline scenario followed requirements established on Section 6.2 of the methodology VM0007 v1.7, which states that baseline reassessment must include the evaluation of the

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43 A comprehensive bibliographic and institutional review was conducted to identify existing spatial datasets on land tenure and property ownership in Peru. Twelve relevant sources were assessed (SUNARP; MIDAGRI; COFOPRI – GEO LLAQTA; SNCP; MINCU – BDPI; GEOSERFOR; OSINFOR – SISFOR/Observatorio; SERNANP – GeoANP/Geoportal; INGEMMET – GEOCATMIN; GEOBOSQUES/MINAM; SBN – SINABIP Libre; and MapBiomas Perú). However, no single, authoritative, nationally consistent, and publicly accessible parcel-level dataset containing legally recognized tenure attributes suitable for application under the VMD0006 proxy selection requirements was identified.

44 https://developers.google.com/earth-engine/datasets/catalog/projects_landandcarbon_assets_wri_gdm_drivers_forest_loss_1km_v1_2_2001_2024

45 https://plataforma.mapbiomas.org/coverage/coverage_lclu?t[regionKey]=peru&t[ids][]=16-1-1&t[divisionCategoryId]=4&tl[id]=1&tl[themeKey]=coverage&tl[subthemeKey]=coverage_lclu&tl[legendKey]=default&tl[year]=2024&tl[pixelValues][]=27

46 https://doi.org/10.5281/zenodo.4473715 validity of proxies for GHG emissions. For the period from 2022 to 2031, the updated proxy area analysis resulted in an estimated annual deforestation rate of 3.15% (90 ha/year). The starting point for this baseline reassessment is the forest cover at the end of baseline period (Dec 31, 2021). This reassessment analyzed changes in the drivers and/or behavior of the baseline agent of deforestation that can cause the change in land use and/or land management practices and changes in carbon stocks. Deforestation was monitored within all areas owned by Project proponent, the Project area and the parcel where lodge is located, using remote sensing following the rules established in the monitoring plan available in Section 5.3. Results indicate that agent of deforestation, still the Project proponent, has not materially changed the project area because of the project activities. Within the project boundary, no intact forest was cleared for agriculture production. Furthermore, evaluation of Laws, Statutes and Other Regulatory Frameworks in Peru since project start date identified that the new National Strategy on Forests and Climate Change (2016)[47] would forbid deforestation of the whole Project area, considering its REDD purpose. Peru's Strategy outlines a policy framework aimed at preventing deforestation to reduce GHG emissions across the country.

Nevertheless, in the absence of the carbon project, the most plausible baseline land-use change scenario within the project area is conversion of forest to agriculture using slash-and-burn practices, consistent with documented common practice in the Peruvian Amazon Basin. National technical assessments and peer-reviewed literature describe agricultural expansion in lowland Amazonian Peru—particularly along river corridors—as being implemented through a sequential process of vegetation cutting, tree felling, drying of biomass, and subsequent burning (tumba, rozo y quema)[48,49]. This land-conversion system is characteristic of both smallholder and emerging commercial agriculture in the region and has been widely identified as a principal driver of deforestation associated with subsistence and market-oriented crop production[49,50]. Government technical documentation further indicates that, under this system, a substantial fraction of cleared aboveground biomass is intentionally burned to facilitate land preparation, with estimates suggesting that approximately half of the biomass is combusted in situ and an additional fraction is burned ex situ, while the remaining biomass is left to decompose on site[51]. Slash-and-burn mechanism is the dominant operational method by which forest land is converted to crops commonly grown in the region, including rice, maize, manioc, plantains, oil palm, and cacao[49]. Accordingly, inclusion of post-deforestation burning as part of the reassessed baseline scenario[52], while explicitly accounting for incomplete combustion and residual biomass decomposition, is consistent with documented common practice and represents a conservative and methodologically sound baseline assumption under VM0007.

The date of the next scheduled baseline revision must be January 2032.

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[47] https://www.un-redd.org/sites/default/files/2021-10/Peru_ENBCC_2016_FINAL.pdf
[48] Ministry of the Environment (MINAM). (2016). National Strategy on Forests and Climate Change - ENBCC (Supreme Decree No. 007-2016-MINAM). Government of Peru. Available at https://www.minam.gob.pe/wp-content/uploads/2016/07/ESTRATEGIA-NACIONAL-SOBRE-BOSQUES-Y-CAMBIO-CLIM%C3%81TICO-DECRETO-SUPREMO-007-2016-MINAM1.pdf?utm_source=chatgpt.com
[49] Che Piu, H., & Menton, M. (2014). The context of REDD+ in Peru: Drivers, agents and institutions (Occasional Paper 106). Center for International Forestry Research (CIFOR). Available at: https://www.cifor-icraf.org/publications/pdf_files/OccPapers/OP-106.pdf
[50] La Barreda Noa, D. (2021). Deforestation and land-use change in the Peruvian Amazon: Drivers and policy challenges. Revista de Investigaciones Altoandinas, 23(3), 245–258. Available at https://www.ucm.es/iuca/file/articulo_2_m-a_2021_resumen?ver=
[51] Ministry of the Environment (MINAM). (2000) National Environmental Information System (SINIA). CHAPTER 4 - Causes of Deforestation (Document 173) (In Spanish). General Directorate of Territorial Planning, Lima, Peru. Available at https://sinia.minam.gob.pe/sites/default/files/sinia/archivos/public/docs/173.pdf
[52] To ensure methodological consistency, biomass-burning emissions were included in both baselines, except for the first two years of the project (2012 and 2013), for which VCUs had already been issued.

3.5 Additionality

Due to significant capital losses at the Yacumama lodge from multiple economic downturns and a fire that destroyed key infrastructure, the owners lack the financial resources needed to reinvest and rebuild the ecotourism business. In 2009, the Project proponent, who has clear title to Project property, obtained legal permission and an approved plan to harvest in the project area from the Government of Peru (see Appendix B of the original PD)[41]. In 2012, the Project proponent was faced with substantial costs just to maintain the property which became a significant drain on the financial resources of the owners of Yacumama. Because no income was generated, the Project proponent by economic necessity would have been forced to harvest the valuable timber and pursue agricultural development. Therefore, the Project proponent was identified as the agent of deforestation. As result there was a high likelihood of harvest of the valuable trees and clearing the land of remaining woody vegetation without carbon financing. This action would create open land with fertile soils that would be suitable for extensive commercial agriculture which is actively encouraged by the Peruvian government. Furthermore, the Yacumama Plan Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009) identified 61% of the Yacurana I parcel as suitable for cultivo permanente (permanent cultivation) and 39% pastoreo (Pasture) (Page 6 of the original PD)[41]. Santuario-Privado is immediately adjacent to Fundo Yacurana I (see Figure 1.13-3), has the same soils, climate, and hydrologic regime and thus was also suitable for "agricultural exploitation". In addition, the ownership and tax documents on page 23 of the 2009 harvest plan classified the property 'type' as S. Productiva (productive) the same as Yacurana I. Conversion of the forest includes harvesting merchantable trees, bulldozing, piling, and burning the remaining vegetation. No part of the Project area was restricted from development due to government regulation or other legal requirements.

The following analysis was conducted to determine alternative baseline scenarios according to the procedure presented in "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0)." This tool is applicable because a) the proposed Project activities did not violate any Peruvian law, and b) the use of this tool results in identification of the most plausible baseline scenario of the several possible baseline scenarios identified below.

3.5.1 Additionality from Jan 1, 2012 to Dec 31, 2021

Step 1: Identification of alternative land use scenarios to the AFOLU Project activity.
The following was a "ranking" of the most likely alternative land uses.

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

A. Harvest of Forest and Conversion to Agriculture

Harvest of forest and conversion to agriculture is still the most probable land use under the baseline scenario. Large-scale cultivation, cattle ranching with expansion of areas under pasture, production of annual crops using slash and burn agriculture, and large-scale cultivation of oil palm are all primary agricultural drivers of deforestation in the Peruvian Amazon Basin[50]. From 2015-2022, the Peruvian Amazon Basin had lost 413kha of tree cover, equivalent to a 1.1% decrease in tree cover since 2000, and

278Mt of CO_2e emissions[53]. The main dominant driver of tree cover loss was shown to be mainly shifting agriculture which is temporary loss or permanent deforestation due to small- and medium-scale agriculture. The available land at Yacumama was considered, during the validation, suitable for land conversion to agriculture. The entire area Fundo Yacurana I was assessed to be suitable for “agricultural exploitation” by the Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009). Specifically, it was identified that 61% of the property was considered as suitable for cultivo permanente (permanent cultivation) and 39% as pastoreo (Pasture) (Pages 5 & 6 of the registered PD[4]). Since Santuario-Privado was immediately adjacent to Fundo Yacurana I (see Figure 1.13-3), having the same soils, climate, and hydrologic regime; that parcel was, then, also considered as suitable for “agricultural exploitation”. In addition, the ownership and tax documents on page 23 of the 2009 harvest plan classified the property ‘type’ as S. Productiva (productive), the same as Yacurana I. These areas were widely recognized for their productivity. The annual inundation of floodwaters results in deposition of nutrient rich sediments carried by nearby rivers, resulting in some of the most fertile soils of the Amazon Basin[15,54].

B. Purchase of the Land by another Entity to Re-open Lodge for Ecotourism

An alternative land use involved the selling of the land and lodge to another entity to refurbish and re-open the lodge. There are several ecotourism lodges in the region which were currently operating, and this is a potential alternative land use. However, most of the value associated with the property was in the timber. The lodge infrastructure is located on a separate small parcel from the project area and not included in the Project calculations. Presuming a buyer can be found that would refurbish and operate the lodge the financial burden in taxes and protection costs would not be eliminated for the Project area.

C. Purchase Property as a Private Protected/Conservation Area

Privately owned conservation areas existed in Peru. However, there was no tangible income to offset the purchase price, maintenance, protection, and tax burden that accompanies owning a private conservation area. In addition, Yacumama while conserving considerable biodiversity was not unique within Peru. Therefore, the purchase/financial support by an NGO was considered unlikely.

D. Continuation of Pre-Project Land Use

The Project area has always been forested. Current income from the Project area was zero. Property taxes, maintenance and patrolling are still required expenses; therefore, continuation of the pre-Project land use was unsustainable.

E. Project activity on the land within the Project boundary performed without being registered as the VCS AFOLU project

This alternative land use was essentially continuation of the pre-Project land use. Income from the Project Area was zero, while expenses for this scenario include property taxes, maintenance, patrolling, and monitoring. Therefore, conducting the Project without registration as a VCS AFOLU Project was unsustainable.

[53] *Global Forest Watch https://www.globalforestwatch.org/map/*
[54] *McClain, M. E. and R. E. Cossio. 2003. The use and conservation of riparian zones in the rural Peruvian Amazon. Environmental Conservation 30:242–248.*

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

Because Yacumama is private property all alternatives presented in 1a are legal under Peruvian law.

"Alternative A", harvest of forest and conversion to agriculture was legal under Peruvian law. The Forests and Wildlife Law which was approved by the Peruvian Congress and published in July 2011 (Law 29763, "Ley Forestal y del Fauna Silvestre"). This bill governs the harvesting of forests and provides the legal basis for the "Alternative A" scenario. Law 29763 states that those who have title to authorization certificates (títulos habilitantes) of forest concessions must abide by the corresponding management plan that is approved by the regional forestry and wildlife authority. Yacumama had an approved plan to conduct harvest operations within the project area (Plan Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 {Annual operating plan for permission to timber private property 2009} Appendix B of the original PD) thereby providing the legal basis for the baseline scenario.

"Alternative B", Purchase of lodge infrastructure and property. Because the Project proponent owned the land and infrastructure the sale would have been legal under the Peruvian constitution. The Constitution of Peru (1993) guaranteed all persons the right to own and inherit property. Legislative Decree No. 653 (1991) ended the period of agrarian reform in Peru by removing restrictions on the transfer of land. The decree permitted the subdivision of land, and land sale, transfer, rental, mortgage, and inheritance (USAID 2010).

"Alternative C", Purchase of the entire property as a private protected area was legal under the Natural Protected Areas Act (Law 26834, 1997); incorporated into the Natural Protected Areas System wildlife sanctuaries, and scenic reserves[70].

"Alternatives D and E" required no change in ownership and essentially no change in land management thus these alternatives would have been legal under Peruvian Law.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Because the Project generates no financial or economic benefits other than VCS related income, simple cost analysis is selected. The lodge property adjacent to the project area will be run as a not-for profit business in the future with all student groups and researchers only charged the costs of providing lodging, meals, and maintenance. Any funds generated through the selling of VCUs were separate from lodge related activities completely.

Sub-step 2b. Option 1. Apply simple cost analysis.

Costs have been documented for the Project and audited to demonstrate no financial benefits other than VCU related income. The details on costs and revenue are provided in the financial model spreadsheet made available to the auditors. As there is no income from agriculture or tourism, the project area does not generate incomes other than the sale of carbon credits.

Step 4. Common Practice Analysis

Similar activities to the proposed project occurring in Peru over the previous 10 years from project initiation were analysed for common practice. There were multiple private properties officially recognized as private protected areas and numerous privately held preserves within national protected areas in

Peru[70]. The owners of private protected areas voluntarily accept terms and conditions of use to conserve biological diversity and other environmental services. When private protected areas are designated, the central Peruvian government does not compensate owners for land use restrictions. In order to qualify as a “recognized” private protected area each area is required to develop a master plan with no financial assistance form the government. It is mandatory for national-level, regional, and private conservation areas[70]. The key distinction between the Project and other lands managed as private protected areas is that other areas were able to support the annual costs of management through outside means such as non-governmental organization (NGO) supported and endorsed ecotourism (e.g. the American Bird Conservancy), direct support by NGO’s, or private funds. For example, the Asociacion Ecosistemas Andinos (ECOAN) managed two private nature reserves. ECOAN managed the Abra Patricia - Alto Nieva Private Conservation Area (or Abra Patiricia Reserve) and the Huembo reserve. ECOAN policy was that “All the benefits of tourism are reinvested in conservation activities, including the operations and improvement of our reserves. When you visit our reserves, you directly support our conservation efforts.” On the ECOAN website (http://www.ecoanperu.org/espa%C3%B1ol/inicio.html) seventeen NGO’s, private companies and governmental agencies were listed as financial supporters ranging from the American Bird Conservancy and Conservation International to Conoco-Phillips and the United States Fish and Wildlife Service. In December 2010, a consortium of conservation organizations purchased privately owned lands that totalled 1,196 acres within a national protected area and subsequently donated them to the national government. Known as the Allpahuayo Mishana National Reserve, the donated lands are home to the Iquitos Gnatcatcher, a Critically Endangered bird. The Allpahuayo Mishana National Reserve is located only 15 miles from the city of Iquitos in northern Peru, protecting rare white-sand forests that are home to rare and unique plants and animals. Support from ABC, ConocoPhillips, the National Fish and Wildlife Foundation (NFWF), and the Robert W. Wilson Charitable Trust, allowed ProNaturaleza (a leading Peruvian conservation organization) to purchase the land from willing sellers in the eastern portion of the Reserve. ProNaturaleza assists in the management and protection of the privately purchased portion of the Allpahuayo Mishana National Reserve. The previous two examples of privately purchasing, protecting, and managing conservation lands were distinctly different from Yacumama in two key areas. The first was Yacumama having considerable biodiversity but that was not unique regionally within Peru. Many hectares surrounding the Project area are very similar ecologically and the nearby Pacaya-Samira national park protected large areas of similar habitats. Conversely the previous examples of privately protecting lands had unique and endemic habitats and biota. Secondly because of the relative ecological uniqueness of the previous two examples, they have attracted funding and support from at least 20 NGO’s, private companies, charitable organizations, and governmental agencies. Because Yacumama does not have unique habitat or endemic species and represents a relatively small proportion of the overall floodplain ecosystem in Peru, conservation organizations would be highly unlikely to put limited resources into the purchase and management of Yacumama. Therefore, financial support from these sources was not available to Yacumama landowners and thus the Project activity was additional.

3.5.2 Additionality from Jan 1, 2022 to Dec 31, 2031

By 2022, the project proponent was facing increasing challenges due to age and health issues, making it difficult to manage the property. The substantial costs of maintaining the property could be seen as a significant financial burden, as the only source of income was from credit sales. As a result, the proponent could be economically compelled to consider selling the property.

A potential buyer could harvest the valuable timber, pursue agricultural development, or even reopen the lodge for ecotourism. Alternatively, they could maintain the area as a private protected conservation zone. However, the project proponent is identified as the agent of deforestation still, and selling the property to capture the timber's value would have been the easier route.

Step 1: Identification of alternative land use scenarios to the AFOLU Project activity

The following was a "ranking" of the most likely alternative land uses.

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

A. Purchase of the Land by another Entity to Harvest the Forest and Convert to Agriculture

Harvest of forest and conversion to agriculture is still the most probable land use under the baseline scenario. The satellite imagery analysis from Global Forest Watch (GFW) reveals a trend of forest loss in the vicinity of the project area between 2014 and 2023. This deforestation pattern is primarily attributed to two main drivers: commodity-driven deforestation and shifting agriculture practices. Commodity-driven deforestation often involves the clearing of large tracts of forest for agricultural plantations, logging, and mining activities. Shifting agriculture, identified by GFW as the leading cause of deforestation around the project area, entails clearing forest land for temporary farming before relocating to new areas. However, in the Amazon region, fallow periods are shorter, leading to more permanent land-use conversion[55]. This indicates that the project area, in the absence of the carbon project, is at risk of deforestation for agricultural purposes, as these trends point to mounting pressure on the remaining forested area (such as the project area). The presence of the Rio Yarapa, which traverses the project area, can play a critical role in this dynamic. The river provides a natural access route into the forest, increasing the likelihood of illegal logging.

Figure 3.5-1 Tree loss and its drivers within and around the project area from 2014 to 2023[56].

[55] https://www.sciencedirect.com/science/article/abs/pii/S1389934119305441

[56] *Satellite imagery analysis from Global Forest Watch (GFW)*

Cacao and large-scale palm oil cultivation are significant drivers of deforestation for agriculture in the Peruvian Amazon Basin[57]. These activities have led to extensive forest loss, particularly in regions like Loreto, where the project area is located[58]. For instance, between 2012 and 2021, approximately 13,000 hectares of Amazon forest in Loreto and Ucayali were cleared for palm oil and cocoa plantations[59]. The economic incentives driving deforestation in the Peruvian Amazon is reported to be palm oil and cacao cultivation still. Palm oil cultivation is highly profitable due to its high yield. Palm oil plantations can produce over 5 tons of crude palm oil per hectare annually, with market prices exceeding $800 per ton[60]. Further, cacao cultivation also offers substantial economic returns. The average yield for cacao plantations is about 1 ton of cacao beans per hectare annually[61] with market prices about $7,000 per ton in 2024[62]. The price of cacao paid to producers in Peru varies depending on the quality and certification of the product. In 2023, producers in organic and fair-trade sectors can receive higher prices, with the Fairtrade Minimum Price for organic cacao set at around USD 2,400 per metric ton, and a premium price paid on top of that value[63, 64].

Population increase is the underlying driver of deforestation and conversion to agriculture in the Peruvian Amazon Basin. Population has grown from 4 to 33 million between 2007 and 2022 according to the Peruvian National Institute of Statistics and Informatics[65] . Concurrent with the increase in population is an increase in rural poverty in the Peruvian Amazon Basin. According to the World Bank's "Rising Strong: Peru Poverty and Equity Assessment: Overview Report[66]," there has been a notable increase in rural poverty in this region, particularly exacerbated by the COVID-19 pandemic. The national poverty rate surged to 30.1% in 2020, a level not seen since 2010, with extreme poverty reaching 5.1%. By the end of 2021, the poverty rate stood at 25.9%, with extreme poverty at 4.1%. The pandemic severely impacted the rural population, leading to job losses and reduced incomes, and further strained the limited healthcare infrastructure. Access to basic services such as water, sanitation, and electricity remains a significant challenge, with only 6% of rural households having access to these services. The quality of education and healthcare is also lower in the Amazon, contributing to persistent poverty. Additionally, rural households in the Amazon are more vulnerable to natural disasters and economic shocks, with 22.4% reporting experiencing a natural disaster in the past year.

B. Purchase of the Land by another Entity to Re-open Lodge for Ecotourism

An alternative land use involved the selling of the land and lodge to another entity to refurbish and re-open the lodge. As one of the fastest-growing sectors in Peru, tourism has become a crucial part of the country's economy. In 2014, travel and tourism contributed 9.7% to Peru's GDP, and this figure is predicted to rise to 11.1% by 2025[67]. A significant portion of this growth comes from ecotourism, particularly in protected areas, which has seen a steady increase in domestic and international visitors. The Peruvian Amazon and

[57] *https://news.mongabay.com/2024/02/report-shows-peru-failed-to-stop-amazon-deforestation-for-palm-oil-and-cacao/*
[58] *MAAP #134: Agriculture and Deforestation in the Peruvian Amazon - MAAP (maaproject.org)*
[59] *https://eia.org/wp-content/uploads/2024/02/EIA-US_Carving-up-the-Amazon_final-report.pdf*
[60] *Palm Oil in the Amazon: Threat or Opportunity? – State of the Planet (columbia.edu)*
[61] *Cocoa bean yields, 1961 to 2022 (ourworldindata.org)*
[62] *Cocoa PRICE Today | Cocoa Spot Price Chart | Live Price of Cocoa per Ounce | Markets Insider (businessinsider.com)*
[63] *Cacao Production in Peru – Climate Smart Cacao (plantagbiosciences.org)*
[64] *Projects | High quality Peruvian cocoa for fine chocolates (rikolto.org)*
[65] *Velarde SJ, Ugarte-Guerra J, Tito MR, Capella JL, Sandoval M, Hyman G, Castro A, Marín JA and Barona E. 2010. Reducing Emissions from All Land Uses in Peru. Final National Report. ASB Partnership for the Tropical Forest Margins. Nairobi, Kenya. 142 p.*
[66] *https://documents1.worldbank.org/curated/en/099042523145533834/pdf/P17673806236d70120a8920886c1651ceea.pdf*
[67] *World Tourism and Travel Council.* Travel & Tourism: Economic Impact 2015 Peru. *Report. 2015. Accessed May 30, 2017. https://www.wttc.org/-/media/files/reports/.../countries%202015/peru2015.pdf.*

regions like San Martín and Madre de Dios, has experienced a surge in ecotourism, with Private/Communal Protected Areas (PCPAs) becoming key hubs for eco-friendly lodging, wildlife tours, and cultural experiences. Since 2020, the highest number of PCPAs was Madre de Dios, with 122, followed by San Martín with 60, Loreto with 55 and Amazonas with 28, which exemplifies the potential of sustainable tourism development[68]. Currently, there are several ecotourism lodges in operation in the region. The increasing demand for nature-based tourism makes the project area attractive for investors looking to refurbish lodges and revitalize tourism infrastructure. However, most of the value associated with the property is still in the timber. The lodge infrastructure is located on a separate small parcel from the project area and not included in the Project calculations. The Lodge suffered from neglect over the last 10 years and will require significant upgrades to meet current expectation and tourism standards in the region. Presuming a buyer can be found that would refurbish and operate the lodge, the financial burden in taxes and protection costs would not be eliminated for the Project area. Therefore, re-opening the lodge for ecotourism is considered unlikely still.

C. Purchase Property as a Private Protected/Conservation Area

Privately owned conservation areas exist in Peru and have been crucial in expanding conservation efforts beyond government-protected areas. However, there is no tangible income to offset the purchase price, maintenance, protection, and tax burden that accompanies owning a private conservation area. In addition, Yacumama while conserving considerable biodiversity was not unique within Peru. Therefore, the purchase/financial support by an NGO is considered unlikely still.

D. Continuation of Pre-Project Land Use

The Project area has always been forested. The Project proponent, through the Lawrence A. Bishop Family Trust, continues to support the Project and will do so though the entire project longevity. Property taxes, maintenance and patrolling are still required expenses; therefore, continuation of the pre-Project land use is unsustainable still.

E. Project activity on the land within the Project boundary performed without being registered as the VCS AFOLU project

This alternative land use was essentially continuation of the pre-Project land use. Expenses for this scenario include property taxes, maintenance, patrolling, and monitoring. Therefore, conducting the Project without registration as a VCS AFOLU Project is unsustainable still.

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

Because Yacumama is a private property, all alternatives presented in 1a are legal under Peruvian law.

“Alternative A”, Purchase of the Land by another Entity to harvest the forest and convert it into agriculture is legal under Peruvian law. The Forests and Wildlife Law which was approved by the Peruvian Congress and published in July 2011 (Law 29763, “Ley Forestal y del Fauna Silvestre”). This bill governs the harvesting of forests and provides the legal basis for the “Alternative A” scenario. Law 29763 states that those who have title to authorization certificates (títulos habilitantes) of forest concessions must abide by the corresponding management plan that is approved by the regional forestry and wildlife authority.

[68] *Shanee, S., Shanee, N., Lock, W.* et al. *The Development and Growth of Non-Governmental Conservation in Peru: Privately and Communally Protected Areas.* Hum Ecol *48, 681–693 (2020). https://doi.org/10.1007/s10745-020-00188-8*

"Alternative B", Purchase of lodge infrastructure and property. Because the Project proponent owned the land and infrastructure the sale would have been legal under the Peruvian constitution. The Constitution of Peru (1993) guaranteed all persons the right to own and inherit property. Legislative Decree No. 653 (1991) ended the period of agrarian reform in Peru by removing restrictions on the transfer of land. The decree permitted the subdivision of land, and land sale, transfer, rental, mortgage, and inheritance[69].

"Alternative C", Purchase of the entire property as a private protected area is legal under the Natural Protected Areas Act (Law 26834, 1997); incorporated into the Natural Protected Areas System wildlife sanctuaries, and scenic reserves[70]. These areas are managed by private landowners with the goal of preserving biodiversity while promoting sustainable land use, including ecotourism and conservation activities[71]. PCAs are concentrated in regions with high biodiversity, such as Madre de Dios and San Martín, which have become ecotourism hubs due to their rich natural and cultural heritage.

"Alternatives D and E" required no change in ownership and essentially no change in land management thus these alternatives would have been legal under Peruvian Law.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Because the Project generates no financial or economic benefits other than carbon related income, simple cost analysis is selected. The lodge property adjacent to the project area is run as a not-for profit business, with groups only charged the costs of providing lodging, meals, and maintenance. Any funds generated through the selling of VCUs are completely separate from lodge related activities.

Sub-step 2b. Option 1. Apply simple cost analysis.

Costs have been documented for the Project and audited to demonstrate no financial benefits other than VCU related income. The details on costs and revenue are provided in the financial model spreadsheet[72] made available to the auditors. As there is no income from agriculture or tourism, the project area does not generate incomes other than the sale of carbon credits.

Step 4. Common Practice Analysis

Similar activities to the proposed project occurring in Peru over the previous 10 years since project initiation were analysed for common practice. There were multiple private properties officially recognized as private protected areas and numerous privately held preserves within national protected areas in Peru Figure 3-3. The owners of private protected areas voluntarily accept terms and conditions of use to conserve biological diversity and other environmental services. When private protected areas are designated, the central Peruvian government does not compensate owners for land use restrictions. In order to qualify as a "recognized" private protected area it is required to develop a master plan with no

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[69] USAID. 2010. Property Rights and Resource Governance: Peru.http://usaidlandtenure.net/sites/default/files/country-profiles/fullreports/USAID_Land_Tenure_Peru_Profile.pdf
[70] Solano, P. 2009. Legal framework for protected areas: Peru. IUCN-EPLP No. 81:53 pp.
[71] In Peru, the growth of Privately Protected Areas (PPAs) has been largely facilitated through the creation of Private Conservation Areas (ACPs) (Law No. 26834), Conservation Concessions (CCs), and Ecotourism Concessions (CEs) (Law No. 29763) - https://www.climatepolicydatabase.org/policies?keywords=peru.
[72] See accompanying Excel file Yacumama_Financial Model

financial assistance form the government. It is mandatory for national-level, regional, and private conservation areas[70].

The key distinction between the Project area and other lands managed as private protected areas is that other areas were able to support the annual costs of management through outside means such as non-governmental organization (NGO) supported and endorsed ecotourism (e.g. the American Bird Conservancy). For example, the *Asociacion Ecosistemas Andinos* (ECOAN) managed two private nature reserves. ECOAN managed the Abra Patricia - Alto Nieva Private Conservation Area (or Abra Patiricia Reserve) and the Huembo reserve. ECOAN policy was that “All the benefits of tourism are reinvested in conservation activities, including the operations and improvement of our reserves. When you visit our reserves, you directly support our conservation efforts.” On the ECOAN website (http://www.ecoanperu.org/espa%C3%B1ol/inicio.html) seventeen NGO’s, private companies and governmental agencies were listed as financial supporters ranging from the American Bird Conservancy and Conservation International to Conoco-Phillips and the United States Fish and Wildlife Service. In December 2010, a consortium of conservation organizations purchased privately owned lands that totalled 1,196 acres within a national protected area and subsequently donated them to the national government. Known as the Allpahuayo Mishana National Reserve, the donated lands are home to the Iquitos Gnatcatcher, a Critically Endangered bird. The Allpahuayo Mishana National Reserve is located only 15 miles from the city of Iquitos in northern Peru, protecting rare white-sand forests that are home to rare and unique plants and animals. Support from ABC, ConocoPhillips, the National Fish and Wildlife Foundation (NFWF), and the Robert W. Wilson Charitable Trust, allowed ProNaturaleza (a leading Peruvian conservation organization) to purchase the land from willing sellers in the eastern portion of the Reserve. ProNaturaleza assists in the management and protection of the privately purchased portion of the Allpahuayo Mishana National Reserve. The previous two examples of privately purchasing, protecting, and managing conservation lands were distinctly different from Yacumama in two key areas. The first was Yacumama having considerable biodiversity but that was not unique regionally within Peru. Many hectares surrounding the Project area are very similar ecologically and the nearby Pacaya-Samira national park protected large areas of similar habitats. Conversely the previous examples of privately protecting lands had unique and endemic habitats and biota. Secondly because of the relative ecological uniqueness of the previous two examples, they have attracted funding and support from at least 20 NGO’s, private companies, charitable organizations, and governmental agencies. Because Yacumama does not have unique habitat or endemic species and represents a relatively small proportion of the overall floodplain ecosystem in Peru, conservation organizations would be highly unlikely to put limited resources into the purchase and management of Yacumama. Therefore, financial support from these sources is not available to Yacumama landowners and thus the Project activity is additional still.

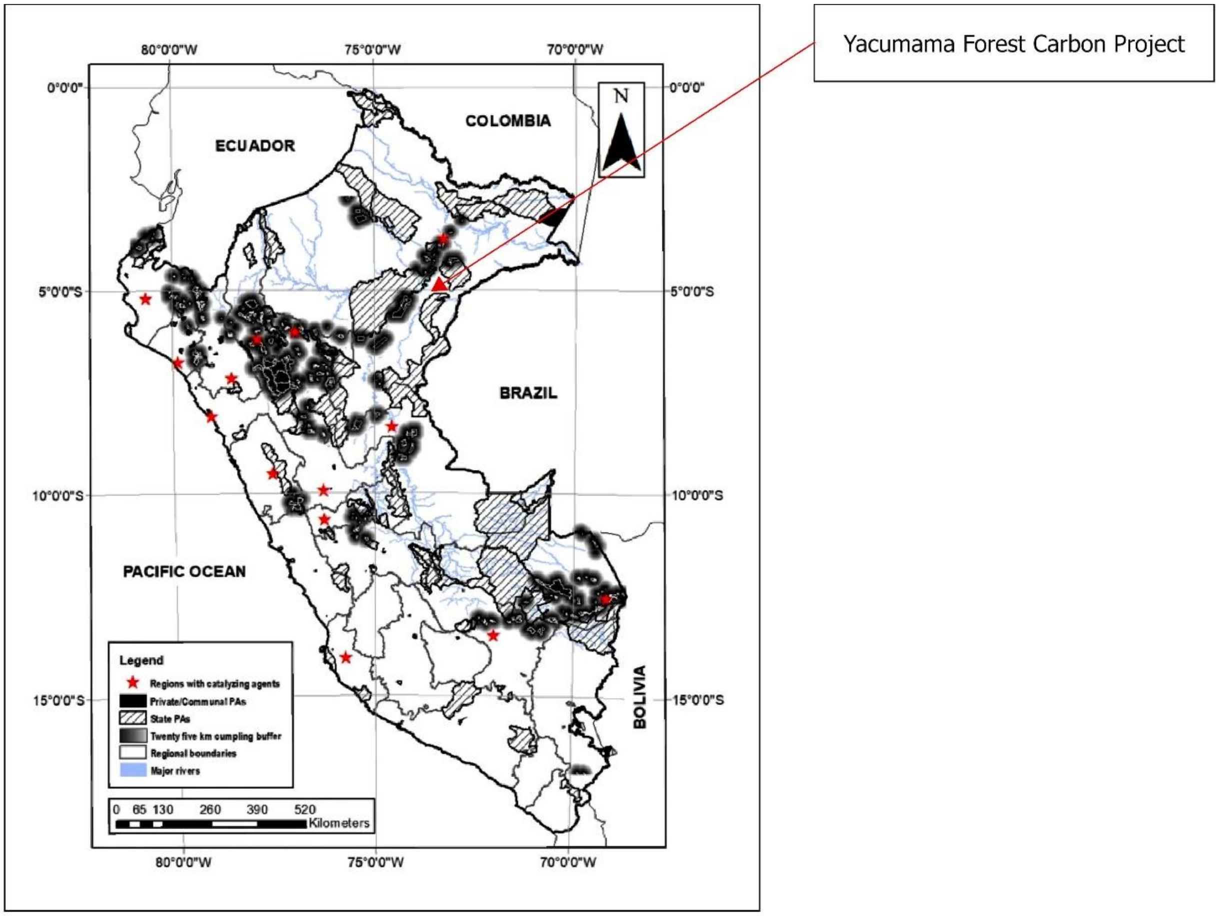

Figure 3.5-2 Map of Peru, showing regional boundaries, the location of state and private/communal protected areas, highlighting the Yacumama project location.

3.5.3 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes ☒ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☐ Yes ☐ No

3.5.4 Additionality Methods

Additionality followed VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities (Version 3.0).

3.6 Methodology Deviations

During initial validation, the Project requested a methodology deviation related to the calculation of (i) the Area of Deforestation (Section 1.2 BL-PL) and (ii) the Rate of Deforestation (Section 1.3 BL-PL). These matters pertained exclusively to the criteria and procedures applied to quantify the planned deforestation rate and did not affect any other components of the applied methodology.

At that time, Verra deferred to the Validation and Verification Body (VVB) to determine whether applying the documented deforestation plan (10%) to the entire Project Area, for the purpose of demonstrating intent to deforest, constituted a methodology deviation. The VVB concluded that this approach did not represent a methodology deviation, but rather an exemption. The exemption was accepted on the basis that: (i) the regional threat of deforestation was well substantiated; (ii) the Project's harvest plan represented a technically and legally feasible business-as-usual scenario; and (iii) sufficient justification was provided to demonstrate the appropriateness of applying the plan across the Project Area. The approach used to calculate the deforestation rate was likewise not classified as a methodology deviation at that time.

Notwithstanding the previous determination, the approach taken to determine the area and rate of deforestation were modified to follow more closely the requirements specified in VMD0006-BL-PL with a view to further strengthening methodological rigor, transparency and conservativeness. However, due to limitations in publicly available data, it was necessary to deviate from some of the specifications laid out in VMD0006. Two methodology deviations were formally applied during the baseline reassessment, as described below.

3.6.1 Area of Deforestation (1.2 BL-PL): procedure to obtain $A_{planned,i}$

Under VMD0006, the total area planned for deforestation must reflect the area that would be converted under the baseline scenario, based on documented intent or common practice.

In the project region, parcel-level land tenure data are not publicly available (See Section 3.6.2). As such, the project relied on a step-wise analysis of the identified proxy areas to estimate common practice conversion behavior consistent with the baseline agent. The following steps were taken:

1. **Examination of deforestation trends**: Seven proxies were analyzed and two distinct deforestation patterns were observed: large-scale, contiguous, rapid deforestation (Proxies 4-7) and fragmented, dispersed, incremental deforestation across broader landscapes (Proxies 1-3). It should be noted that the inclusion of Proxies 1–3 was intentional and designed to ensure conservativeness in the estimation of the deforestation rate. These proxies were delineated as broader landscape units, incorporating both deforested and remaining forest areas, rather than isolating discrete conversion parcels. This approach intentionally lowers the rate of deforestation. However, given the distinct behavioral differences observed between proxy groups, it is not methodologically appropriate to include all proxies in the procedure to obtain the $A_{planned.}$

A comparison of total proxy area size is provided in the Table 3.6-1. Proxies 1–3 are substantially larger and represent generalized landscape corridors, whereas Proxies 4–7 are more spatially compact and coherent.

Table 3.6-1Comparison of the total area of the six selected proxy areas and their deforestation trend patterns.

Proxy ID	Area (ha)	Deforestation Trends
1	14,204.92	Fragmented clearing patterns consistent with multiple owners.
2	13,887.70	
3	13,524.32	
4	6,247.86	Spatially compact and coherent consistent with single ownership.
5	5,058.67	
6	3,249.89	

2. **Spatial analysis of proxy groups to identify the most suitable representation of common practice conversion**:

   A spatial and temporal assessment was conducted to observe which proxy group most closely reflects the expected baseline conversion dynamics within the project area. Proxies 47 exhibit spatially coherent contiguous clearing patterns, rapid temporal progression of deforestation, and homogeneous post-conversion land use. The geometry, scale, and progression of these clearings are consistent with coordinated, parcel-scale land-use decisions and are indicative of single ownership or unified management units.

   By contrast, Proxies 1–3 display dispersed and incremental forest loss patterns across broader landscapes, consistent with multiple independent landholders and heterogeneous land-use decisions (Figure 3.6-1Figure 3.6-2)

   Based on these observed characteristics, Proxies 4–7 were determined to be the most appropriate representation of common practice for estimating the total area planned for deforestation (A_{planned}), as they reflect single-management conversion dynamics consistent with large-scale agricultural expansion anticipated under the baseline scenario.

Figure 3.6-1 Spatial comparison of proxy deforestation dynamics using ESRI basemap imagery accessed via ArcGIS Pro. Proxies 4–7 exhibit contiguous clearing blocks consistent with coordinated parcel-scale agricultural expansion, while Proxies 1–3 display fragmented, strip based and incremental clearing patterns characteristic of multi actor conversion.

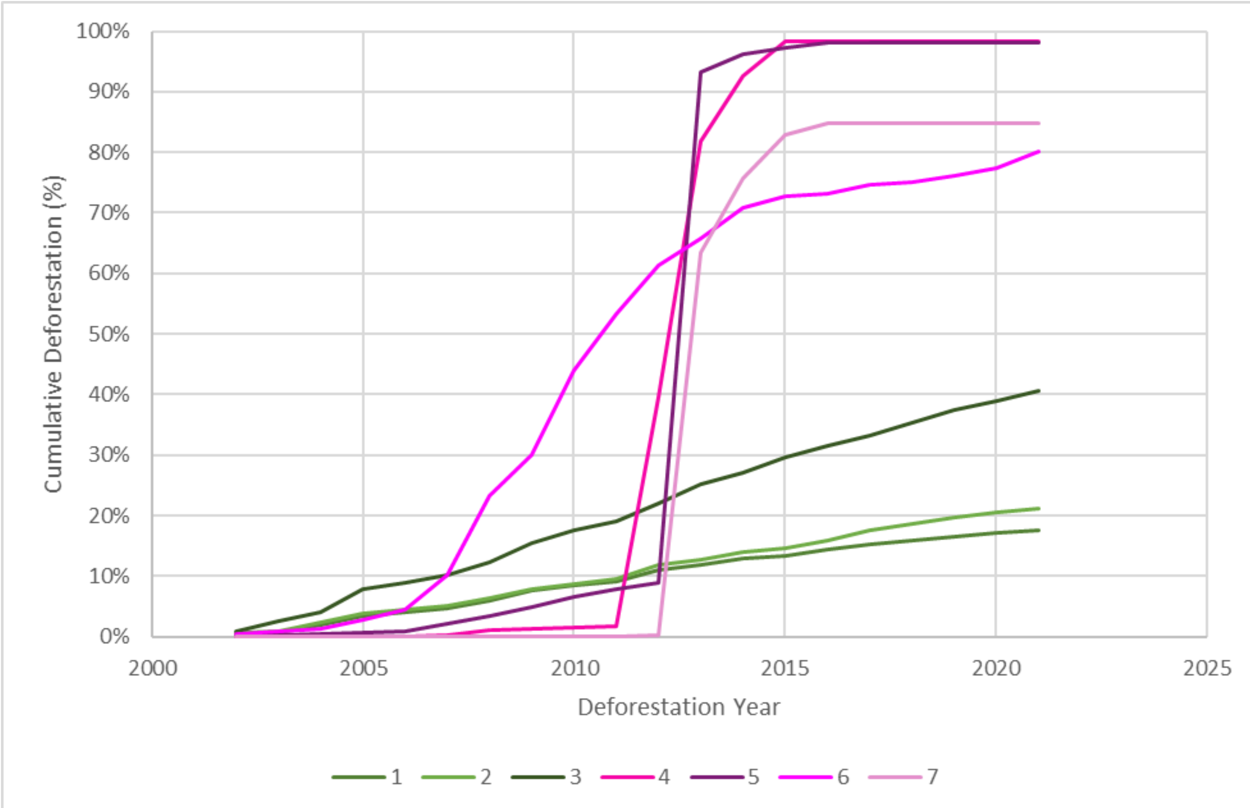

Figure 3.6-2 Cumulative Deforestation Trends Across Proxy Areas 1–7.

3. **Derivation of $A_{planned}$:** To ensure conservativeness in the determination of the total area planned for deforestation, the project did not apply the mean or maximum observed conversion percentage across Proxies 4–7. Instead, the lowest cumulative proportion of deforested area observed within this proxy group was selected as the cap. Among Proxies 4–7, the minimum observed conversion level was 80%, and this value was therefore applied to the project area. By adopting the lowest observed conversion proportion within the behaviorally similar proxy group, the project ensures that baseline deforestation is not overstated and that the $A_{planned}$ estimate remains conservative relative to documented common practice.

The decision to limit the value of $A_{planned}$ to the subset of proxies exhibiting behaviourally similar large-scale conversion dynamics (Proxies 4–7), rather than averaging across all identified proxies, constitutes a methodology deviation; however, this approach is conservative, as it acknowledges the differing behaviors across proxy groups and applies the lowest observed conversion proportion within the most representative proxy group and avoids overstating baseline deforestation. This deviation was only related to the procedure for deriving the cap limit for $A_{planned}$ and did not relate to any other part of the methodology. The deviation did not negatively impact the conservativeness of the quantification of GHG emission reductions or removals.

3.6.2 Rate of Deforestation (1.3 BL-PL): criteria to include proxies in the estimation of the $D\%_{planned,i,t}$

VMD0006 requires that the rate at which planned deforestation is projected to occur (area deforested per year) be determined using a valid, verifiable deforestation plan where such a plan exists. In the absence of a verifiable plan, the deforestation rate must be established through the examination of proxy areas. The methodology further requires that a minimum of six proxy areas be included and that proxy areas meet defined applicability criteria, including similarity in management and land use rights type relative to the project area under business-as-usual conditions.

A total of seven proxy areas were selected and analyzed through a consistent remote sensing assessment of historical forest cover change. The analysis revealed two distinct behavioral patterns:

- **Proxies 1–3**: Characterized by slower deforestation rates, smaller and more fragmented clearing patches, and spatial patterns suggestive of multi-property dynamics.
- **Proxies 4–7**: Characterized by relatively rapid deforestation, larger and more consolidated clearing patches, and patterns consistent with clearing within single large properties.

Due to limited publicly available national data on parcel-level tenure and deforestation agent attribution, the Project cannot conclusively demonstrate that Proxies 1–3 share identical land tenure structure, deforestation agents, and deforestation dynamics with the Project Area, as contemplated under the VMD0006 applicability criteria. However, remote sensing analysis confirms that all selected proxy areas are actively undergoing deforestation and are subject to ongoing forest loss pressures.

The inclusion of Proxies 1–3 was determined to be appropriate and conservative for the purpose of estimating D%Planned (Equation 4). Specifically:

1. **Conservativeness**: Proxies 1–3 exhibit the lowest cumulative deforestation levels over the analysis period among all selected proxy areas. Their inclusion reduces the average annual proportion of land cleared, thereby lowering the estimated planned deforestation rate applied to the project area. Excluding these proxies would increase the estimated rate and reduce methodological conservativeness.
2. **Ongoing Deforestation Trajectory**: These proxies continue to experience active forest loss and have not reached a deforestation endpoint. Their lower cumulative clearing reflects a mid-trajectory state rather than the absence of deforestation pressure.
3. **Independent Contextual Support**: The Verra final open-access deforestation risk map for Peru identifies Proxies 1–3 as areas of high projected deforestation risk during the 2020–2025 period (see tab “CR_2”). While this dataset is not used as a formal methodological input under VM0007/VMD0006, it provides independent contextual evidence that deforestation dynamics in these proxy areas remain active and comparable in trajectory.

Given these considerations, Proxies 1–3 were retained in the analysis to ensure representativeness across observable deforestation behaviors while maintaining a conservative estimate of the annual deforestation rate. This methodology deviation relates exclusively to the interpretation and application of the proxy selection criteria for determining the rate of deforestation. It does not affect any other component of the methodology. Importantly, the deviation does not result in an overestimation of GHG emission reductions or removals; rather, the inclusion of Proxies 1–3 strengthens conservativeness in the quantification of baseline emissions.

A detailed description of the proxy area selection process and analytical procedures is provided in Section 4.1.3.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The field plot network was re-measured in November of 2023 and the values reported in this section have been updated based on the carbon estimate made available to the auditors. All descriptions and assumptions of forest conversion are based on the initial baseline period (2012-2021).

4.1.1 Biomass Baseline Carbon Stocks[73]

Baseline biomass carbon stocks were the above ground tree > 5 cm DBH and below-ground biomass. Above-ground non-tree biomass (lianas and palms), down or standing dead wood, and leaf litter were not measured, which resulted in a conservative estimation of carbon stocks in the project area. The mean total carbon pool in 2023 was based on field data collected in 2023 and independently verified[74]. Above-ground biomass (kg) was calculated using the tropical wet forest equation from Brown (1997)[75]. Above-ground biomass for each tree was converted from kilograms to tons (divided by 1,000) and from the plot area to hectare (10,000 divided by plot area). Below-ground biomass for each tree was estimated using the appropriate root to shoot ratio from CP-AB (VMD0001 v1.2). Above and Below-ground biomass (t d.m./ha) were converted to above and below-ground carbon stock (t CO_{2}-e/ha) by multiplying the mass by the carbon fraction of biomass (0.47) and by the total atomic weight of CO_2 (44/12). Above-ground and below-ground biomass attributed to non-tree biomass (palms and lianas) and soil carbon was conservatively excluded. Table 4.1-1 summarizes the above-ground, below-ground and total tree biomass within the project area at Yacumama. Using the total area subject to deforestation (2,290.4 ha) the total above ground tree biomass is 379,119 (t d.m.) and total below ground biomass 89,216 (t d.m.).

Table 4.1-1 Summary of above-ground, below ground and total tree biomass with the project area at Yacumama.

	AGB Tree Biomass	BGB Tree Biomass	Total Tree Biomass
Average (t d.m./ha)	165.53	38.95	204.48
Average (t CO_{2}-e/ha)	285.25	67.13	352.38
Standard Deviation	87.49	22.87	110.29
Confidence (95%)	36.11	9.44	45.53
Confidence % of mean	7.90	7.11	7.74

[73] *See Appendix A of the registered PD for detailed field methods, QA/QC, and allometric equation validation*
[74] *See accompanying MS-excel Yacumama ERR calcs.*
[75] *Brown, S. (1997). Estimating biomass and biomass change of tropical forests: a primer (Vol. 134). Food & Agriculture Org..*

4.1.2 Uncertainty Analysis

Uncertainty was calculated using the equation and approach in the module X-UNC (VMD0017 v2.2).

4.1.2.1 Part 1 - Uncertainty in Baseline Estimates

Step 1: Assess uncertainty in projection of baseline rate of deforestation or degradation. Because the deforestation rate was determined through a common practice analysis and in concert with the Yacumama harvest plan there is no uncertainty in deforestation rate, thus

$$U_{REDD_{BSL,RATTE,t*}} = 0$$

Step 2: Assess uncertainty of emissions and removals in project area in Baseline Scenario using equation 5 from X-UNC (VMD0017 v2.2).

$$Uncertainty_{REDD\_BSL,SS} = \frac{\sqrt{\sum_1^n (U_{REDD\_BSL,i,pool\,\#} * E_{REDD\_BSL,i,pool\,\#})^2}}{\sum_1^n E_{REDD\_BSL,i,pool\,\#}}$$

$$U_{REDD_{BSL},SS,i} = \frac{659{,}406}{100{,}895}$$

$$U_{REDD_{BSL},SS,i} = 6.54\%$$

Where:

$Uncertainty_{REDD\_BSL,SS}$	Total uncertainty in the combined carbon stocks and greenhouse gas sources in the REDD baseline case (%)
$U_{REDD\_BSL,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in stratum *i* in the REDD baseline case (%)
$E_{REDD\_BSL,SS,t,i}$	Sum of combined carbon stocks and GHG sources in the REDD baseline case (t CO2-e)
i	1, 2, 3 ...M strata (unitless)

Step 3: Estimate Total Uncertainty in REDD Baseline Scenario using equation 6 from X-UNC (VMD0017 v2.2).

$$Uncertainty_{REDD_{BSL},t*} = \sqrt{{U_{REDD_{BSL,RATTE,t*}}}^2 + {U_{REDD\_BSL,SS,i}}^2}$$

$$Uncertainty_{REDD_{BSL},t*} = 6.54\%$$

4.1.2.2 Part 2 - Uncertainty in WRC baseline estimates

Not Applicable

4.1.2.3 Part 3 - Uncertainty in the Ex-Post REDD project scenario

No deforestation occurs during the first 10 years of the project. Deforestation was monitored and tracked directly using remote sensing techniques described below in section Monitoring of leakage, Carbon Stock changes and Greenhouse gas emissions. Since no ex-post (re-) measurements of carbon pools or GHG sources have been made, uncertainty in project scenario is already included in $Uncertainty_{REDD_{BSL},t*}$, so $U_{REDD_{WPS}}$ is set equal to zero.

$$U_{REDD-WPS} = 0$$

Where:

$U_{REDD-WPS}$	Total uncertainty in the REDD project scenario (%)
$U_{REDD-WPS,SS,i}$	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in stratum *i* in the REDD project scenario (%)
$E_{REDD-WPS,SS,t,i}$	Sum of combined carbon stock and GHG sources multiplied by the area of stratum *i* (A_i) in the REDD project scenario (t CO2e)
i	1, 2, 3 …*M* strata (unitless)

4.1.2.4 Part 4 - Uncertainty in WRC Project scenario estimates

Not Applicable

4.1.2.5 Part 5 - Total Error in REDD Project Activity

Total project uncertainty is equal to the combined uncertainty in the baseline and Project estimates for the REDD using equation 21 in X-UNC (VMD0017 v2.2).

$$NER_{REDD+\_ERROR,} = \sqrt{(Uncertainty_{REDD_{BSL},t*} \times \Delta C_{BSL-REDD,t*})^2 + (Uncertainty_{REDD_{WPS}} \times \Delta C_{WPS-REDD,t*})^2}$$

$$NER_{REDD+\_ERROR,} = 6.54\%$$

Where:

$NER_{REDD+ERROR,}$	Cumulative uncertainty for the REDD+ (REDD and WRC) project activities up to year $t*$ (%)
$Uncertainty_{REDD_{BSL},t*}$	Cumulative uncertainty in REDD baseline scenario up to year t (%)
$Uncertainty_{REDD_{WPS}}$	Total uncertainty in the REDD project scenario (%)
$\Delta C_{BSL-REDD,t*}$	Net GHG emissions in the REDD baseline scenario up to year $t*$ (t CO2e)
$\Delta C_{WPS-REDD,t*}$	Net GHG emissions in the REDD project scenario up to year $t*$ (t CO2e)
t	1, 2, 3, …$t*$ time elapsed since the project start (year)

Because total error is within the threshold of +/- 15% so no deduction is made in project accounting.

4.1.3 Updated Deforestation Rate: proxy area selection and analysis

To comply with the requirements of VMD0006, Section 5.1.3, a conservative and transparent approach was used to delineate proxy areas for estimating the baseline deforestation rate for the Yacumama project.

4.1.3.1 Context and data constraints

A key limitation for attending all of the VMD0006 requirements is the absence of accessible tenure or ownership boundary data in Peru. As such, it was not possible to directly identify polygons representing landholdings with the same management and land use rights type as the project area.

Despite this, we attempted to locate proxy sites with comparable tenure characteristics by reviewing available national and regional datasets, cadastral portals, and land-use information. However, no publicly available data with sufficient spatial coverage or reliability were found. A summary matrix of the data sources consulted and their relevance to the tenure assessment is provided in the supporting file: Peru Spatial Dataset Bibliographic Review.xlsx.

To address this, proxies were delineated using spatial indicators of the same agent of deforestation: permanent agricultural expansion, following a reproducible geospatial procedure grounded in publicly available datasets and conservativeness.

4.1.3.2 Data sources

1. **World Resource Institute (WRI) Global Forest Watch – Tree Cover Loss by Dominant Driver**[76]
   Accessed via Google Earth Engine. Agriculture-related driver classes were used as contextual reference layers to characterize agriculture-driven forest loss consistent with the project's baseline deforestation agent.
2. **MapBiomas Peru – Palm Oil and Agriculture Land Use Classes**[77]
   Used as a contextual reference layer to assess agricultural land-use patterns and broader deforestation trends.
3. **Existing Proxy Areas**
   The three proxy areas delineated in the registered Project Description were maintained and used as spatial reference points to help locate additional suitable proxies within the same landscape context.
4. **Global Palm Oil Map 2019**[78]
   This dataset is a high-resolution global map of industrial and smallholder oil palm plantations for 2019, accessed through ArcGIS Living Atlas, and was used as a reference layer to support the delineation of proxy areas.

4.1.3.3 Spatial analysis and delineation process

1. **Identification of deforestation corridors and general proxy region**
   Analysis of reference layers revealed that agricultural deforestation is concentrated along linear corridors such as roads and rivers. These features exhibit a consistent clearing pattern extending approximately 2 km on either side, corresponding to observed parcel widths in high-resolution satellite imagery (Figure 4.1-1). Priority was given to regions, where the original proxies were located, and the vicinity of the Yacumama project area. Two broad regions were therefore defined for proxy delineation: the Iquitos region and the Pucallpa region.

[76] https://developers.google.com/earth-engine/datasets/catalog/projects_landandcarbon_assets_wri_gdm_drivers_forest_loss_1km_v1_2_2001_2024

[77] https://plataforma.mapbiomas.org/coverage/coverage_lclu?t[regionKey]=peru&t[ids][]=16-1-1&t[divisionCategoryId]=4&tl[id]=1&tl[themeKey]=coverage&tl[subthemeKey]=coverage_lclu&tl[legendKey]=default&tl[year]=2024&tl[pixelValues][]=27

[78] https://doi.org/10.5281/zenodo.4473715

Figure 4.1-1 Linear pattern along road corridor (~2 km width) near Pucallpa.

2. **Digitization of linear features**
   Roads intersecting areas classified as "agriculture-driven loss" from the WRI dataset and other reference layers were manually digitized.

   Two primary roads were selected- one near Pucallpa and another near Iquitos.

3. **Buffering to represent management strips**
   Each digitized road was buffered by 2 km on either side, producing elongated polygons that capture the typical width of agricultural encroachment zones visible in satellite data.

   Settlement areas were excluded to avoid bias from mixed-use or residential zones, maintaining consistency with the intended post-deforestation land-use type.

4. **Subdivision of buffered polygons**

   - In the **Pucallpa** region, the buffered corridor was retained as a single proxy area. The area encompasses numerous smallholder palm-oil plantations, verified using the 2019 Global Palm Oil Map. Including both deforested and remaining forest patches ensured a conservative representation of ongoing agricultural expansion. Proxy 3 was created in this area.
   - In the **Iquitos** region, the buffered corridor was subdivided by the central road to create two proxy polygons. This subdivision reflects smaller settlement patterns and localized management zones, further reducing the risk of overestimating deforestation rates. Further, the Iquitos region exhibits a more fragmented and heterogeneous land-use pattern, with smaller-scale clearings interspersed with settlements and secondary vegetation. In this context, using the road as the primary divider provided a logical and transparent spatial boundary. Proxies 1 and 2 were digitized in this area.

5. **Delineation of remaining proxies**
   The three polygons referenced in the original PD were digitized from basemap imagery and maintained as Proxies 4,5 and 7.
   Finally, Proxy 6 was also digitized from the basemap imagery using the reference layers as another large-scale palm oil area in the Pucallpa area.

See Table 4.1-2 for a summary of all seven proxy areas and Figure 4.1-2 for a map of the proxy areas.

Table 4.1-2 Summary of Proxy Areas.

Proxy ID	Area (ha)	Location
1	14,205	Iquitos-along Road
2	13,888	Iquitos-along Road
3	13,524	Pucallpa- along Road
4	6,248	Pucallpa- original proxy
5	5,059	Pucallpa- original proxy
6	3,250	Pucallpa- large scale palm oil
7	2,565	Tamchiyacu- original proxy

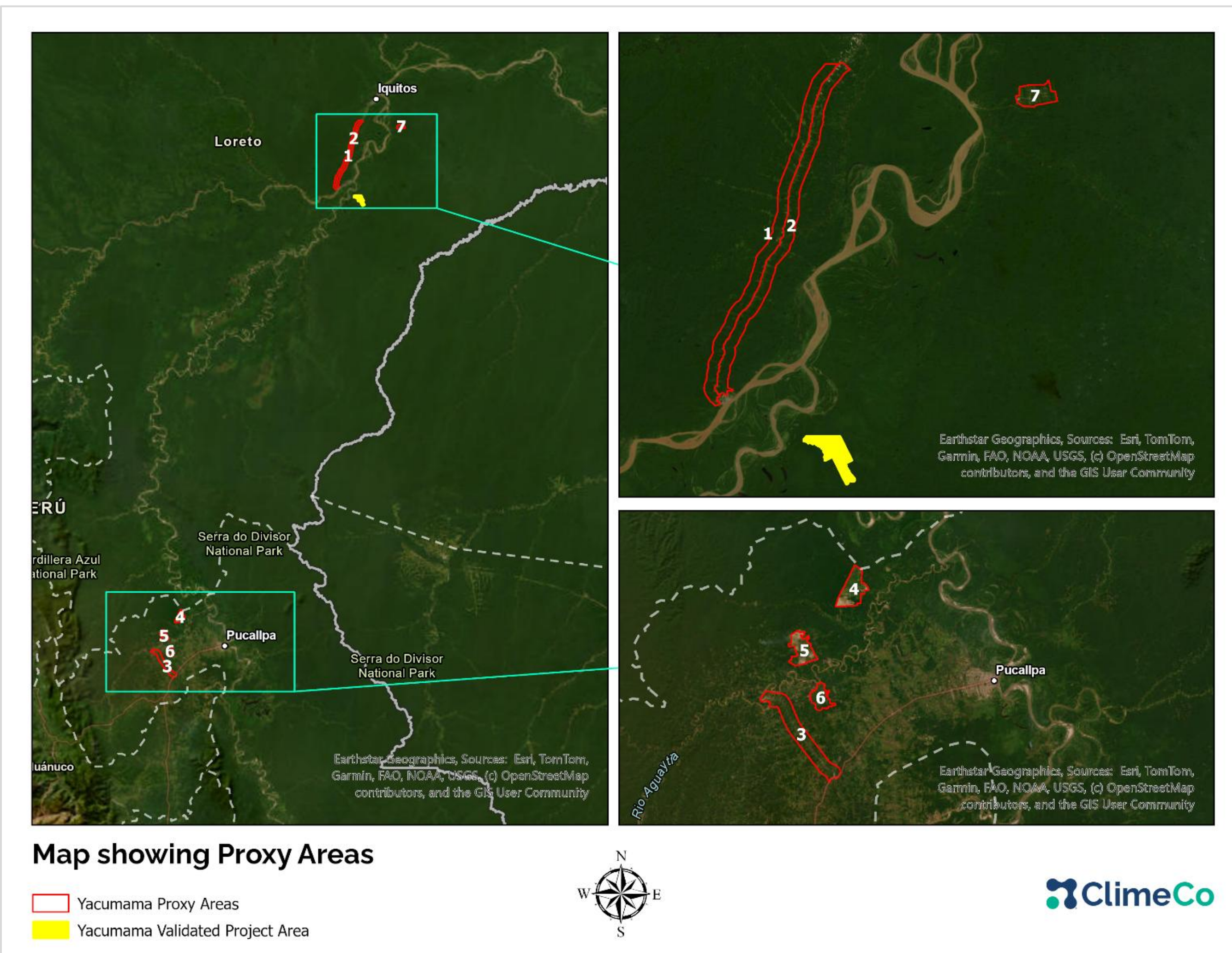

Figure 4.1-2 Map depicting proxy areas.

4.1.3.4 Conservativeness

Given the land tenure data limitations in Peru, this approach was intentionally designed to minimize bias and avoid overestimation of baseline deforestation rates. By relying on publicly available, verifiable datasets and applying consistent spatial rules, such as fixed 2 km buffers along agricultural deforestation corridors, the delineation process eliminates subjective judgment in defining proxy boundaries.

Proxy areas were selected only where deforestation could be confidently linked to agricultural expansion, and locations with uncertain or mixed drivers (e.g., settlement/infrastructure) were excluded. The inclusion of both active agricultural clearings and remaining forest patches further ensures that the derived rates represent a conservative lower-bound estimate of expected baseline deforestation.

This approach prioritizes representativeness over magnitude, ensuring that the proxies conservatively capture real, observable agricultural expansion patterns while remaining defensible under the intent of VMD0006 Section 5.1.3. It reflects the best available and most transparent methodology possible given the inherent spatial and data constraints in the Peruvian context.

4.1.3.5 Suitability Assessment

To comply with Section 5.1.3 of VMD0006, seven proxy areas were selected to determine the rate of planned deforestation. Criterion 7 of Section 5.1.3 requires that the forest type, soil type, slope/elevation characteristics of each proxy be within ± 20 % of those in the project area.

A spatial analysis was performed to verify this requirement. The following biophysical datasets were used:

- **Soil:** FAO Harmonized World Soil Database accessed via ArcGIS Online, used to identify eligible soil classes and their proportional distribution across the project area and proxies.
  1) Research shows which soil classes are eligible for conversion to agriculture inclusive of Gleysols[79], Acrisols[80] and Cambisols[81]).

- **Forest Type/Vegetation**: The national-level ecoregion shapefile from Ministerio del Ambiente (MINAM) of Peru (available from GEO GPS Perú)[82] was used to classify the project and proxy areas into ecoregion/forest-type categories, enabling comparison of forest/ecological zone composition.
- **Slope and Elevation**: Derived from SRTM Digital Elevation Model (30 m) downloaded from Google Earth Engine and processed in ArcGIS Pro to generate slope (%), elevation classes (500 m intervals), and ratio of gentle (< 15 %) to steep (≥ 15 %) terrain.

Spatial overlay and zonal analysis were conducted in GIS to verify the biophysical similarity of the seven selected proxy areas to the project area, as required under Section 5.1.3 of VMD0006. Using the FAO Harmonized World Soil Database (ArcGIS Online), the MINAM Peru ecoregion shapefile (GEO GPS Perú), and slope and elevation layers derived from the SRTM DEM, proportional distributions of soil type, forest/ecoregion, slope, and elevation classes were calculated for the project and each proxy. The results confirm that all proxies fall within ± 20 % of the project area across these parameters, demonstrating that the selected sites are biophysically comparable and suitable for use in estimating baseline deforestation rates.

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[79] *A) Feintrenie, L., Vázquez Navarrete, C. J., & Lagunes Espinoza, L. del C. (2025). Oil palm in Mexico and in the Americas / Le palmier à huile au Mexique et en Amérique latine. Cahiers Agricultures, 34, Article 11. https://doi.org/10.1051/cagri/2025009*
B) Feintrenie, L., Vázquez Navarrete, C. J., & Lagunes Espinoza, L. del C. (2021). Oil palm in Mexico and in the Americas / Le palmier à huile au Mexique et en Amérique latine. Cahiers Agricultures, 30, Article 41. https://doi.org/10.1051/cagri/2021026
C) Kahn, F. (1988). Ecology of economically important palms in Peruvian Amazonia. Advances in Economic Botany, 6.

[80] *Thompson-Morrison, H.; Ariantiningsih, F.; Arief, S.M.; Gaw, S.; Robinson, B. Nutrients and Contaminants in Soils of Current and Former Oil Palm Production Systems from Indonesia. Land 2023, 12, 2144. https://doi.org/10.3390/land12122144*

[81] *FAO. (2015). World Reference Base for Soil Resources 2014: International soil classification system for naming soils and creating legends for soil maps (Update 2015).*

[82] *https://www.geogpsperu.com/2018/03/mapa-de-ecorregiones-minam-shapefile-pdf.html#google_vignette*

Table 4.1-3 summarizes the results, and the supporting materials, including the spatial layers and an Excel file containing the eligibility calculations are provided separately.

Table 4.1-3 Results of Proxy Areas Suitability Evaluation.

Category	Project Area	P_1	P_2	P_3	P_4	P_5	P_6	P_7
Vegetation (%)								
Tropical Amazon Forest	100%	100%	100%	100%	100%	100%	100%	100%
Other	0%	0%	0%	0%	0%	0%	0%	0%
Elevation (%)								
0-500m	100%	100%	100%	100%	100%	100%	100%	100%
Slope Class (%)								
Gentle (<15%)	99.7%	88.2%	86.2%	92.6%	94.3%	94.4%	98.8%	97.3%
Steep (=>15%)	0.3%	11.8%	13.8%	7.4%	5.7%	5.6%	1.2%	2.7%
Soil Type (%)								
Cambisols, Gleysols and Acrisols	100%	100%	100%	100%	100%	100%	100%	100%
Other	0%	0%	0%	0%	0%	0%	0%	0%

4.1.3.6 Deforestation Rate

Methods and Data Sources

Tree Cover Data

- Data Source: The 2001 tree cover data was derived from the Global Forest Change (GFC) dataset by Hansen et al. (2013), accessible through Google Earth Engine (GEE). This dataset provides comprehensive tree cover and annual forest loss data starting from 2000.
- Methodology:
  - Baseline Tree Cover: The GFC dataset's 2000 tree cover data served as the initial reference. A minimum canopy cover threshold of 10% was applied, ensuring that only areas meeting this forest density were considered forested. To maintain ecological comparability, a minimum contiguous forest area of 0.5 hectares was set. Forest cover and contiguity align with FAO's definition of forest utilized in the Project.
  - Tree Loss Calculation in 2001: Data from 2001 was analyzed within the defined forested areas followed by subtracting these losses from the 2000 tree cover.
  - Overlay with Ecoregion Map: To refine accuracy, the 2001 forest cover layer was overlaid with ecoregion layer from Ministerio del Ambiente (MINAM) of Peru in ArcGIS. This overlay ensured that only areas classified as forest within the ecosystem map were retained in the analysis, helping to exclude other land cover types (e.g. plantations) that might have been misclassified in the GFC dataset.

The combined GFC and Peru Ecoregion data provided a verified forest cover dataset for 2001, which served as a reliable baseline for subsequent deforestation analysis. This data was extracted using a customized GEE script and refined in ArcGIS (see link - GEE Global Forest Change Script).

Tree Loss Data Analysis from 2002 to 2022

- Data Source: Tree loss from 2002 to 2022 was again derived from the GFC dataset, accessed through GEE.
- Methodology:

- Data Collection: Using GEE, tree loss data was collected for each year on an Area of Interest (AOI)[83] scale, capturing all recorded deforestation events around project location. The same 10% canopy cover and 0.5-hectare forest area thresholds applied in previous steps were maintained.
- ArcGIS: These annual tree loss datasets were then clipped to the verified 2001 forest cover in the proxy areas, ensuring that tree loss calculations focused only on areas meeting the 2001 forest cover criteria.

This approach created an annual tree loss dataset specifically for the proxy areas, providing a time series of deforestation trends from 2002 to 2022 (see link - GEE Tree Loss Script). The final tree cover and tree loss dataset which was extracted using ArcGIS. The extracted data was then used to calculate the annual deforestation rate for the project area.

Results

Deforestation Rate 1

Based on the analysis conducted, the deforestation rate 1 was **4.22%** and it was applied from 2014 until 2021.

Deforestation Rate 2

Based on the analysis conducted, the deforestation rate 2 was **3.15%** and it was applied from 2022 until 2031 (the reassessed baseline).

Table 4.1-4 summarizes the results of the deforestation rate analysis for the two periods. The complete calculation file is provided as supporting documentation.

Table 4.1-4 Results of Deforestation Rate Analysis.

Proxy ID	Total Size (ha)	2002 Forest Area (ha)	Def 1 (ha)	Def 2 (ha)	% Def 1	% Def 2	% Def 1 /yr	% Def 2 /yr
1	14,204.92	13,301.32	1,569.88	2,323.93	11.8%	17.5%	1.0%	0.9%
2	13,887.70	13,006.76	1,640.46	2,758.26	12.6%	21.2%	1.1%	1.1%
3	13,524.32	12,006.92	3,033.06	4,885.52	25.3%	40.7%	2.1%	2.0%
4	6,247.86	6,232.38	5,097.12	6,131.96	81.8%	98.4%	6.8%	4.9%
5	5,058.67	5,040.78	4,704.22	4,942.20	93.3%	98.0%	7.8%	4.9%
6	3,249.89	3,204.92	2,108.54	2,565.29	65.8%	80.0%	5.5%	4.0%
7	2,564.76	2,564.41	1,629.28	2,172.33	63.5%	84.7%	5.3%	4.2%
						Average	**4.22%**	**3.15%**

4.1.4 Carbon stocks in agro-ecosystems

Conversion to agriculture after harvest of forest products is the most probable land use under the baseline scenario. While it is likely that large areas of the Project would be subject to conversion to monocultures of rice or other intensive cropping system, under the baseline scenario we identified a ‘multi-crop / short-term fallow’ as our baseline agriculture system. The ‘multi-crop / short-term fallow’ agriculture system is the most widespread in the Loreto province followed by intensive cropping systems (Henman et al. 2008). In addition, the ‘Land Use Capacity Description’ (Yacumama Harvest Plan) classifies the entire area of Yacurana I as suitable for either ‘Pasture’ or ‘Standing Crop’ agriculture. For

[83] *AOI can be identified in GEE Global Forest Change Script.*

the "Private sanctuary" parcel, ownership, and tax documents on page 23 of the 2009 harvest plan classify the property 'type' as S. Productiva (productive) the same as Yacurana I and thus can be reasonably assumed to be suitable for the same type of agriculture.

Therefore, to establish post-deforestation tree stocks (above and below ground) the project determined that a "silvo-pasture" agro-ecosystem would be represent the most accurate and conservative post deforestation agro-ecosystem C stocks. It was used values from Markewitz et al. (2004)[84], who calculated an above ground biomass of 7.8 +/- 5.2[85] Mg ha^{-1} for 'degraded pasture with tree islands' (i.e. silvo-pasture system formed 19 years after deforestation in the Brazilian Amazon). This silvo-pasture system closely resembles the agro-ecosystem described above under the baseline scenario and has likely reached equilibrium with respect to C fluxes due to the time elapsed since deforestation. Below ground biomass was not directly measured by Markewitz et al. (2004) thus the project calculated $C_{BB\ tree\ post,i}$ in the same manner as in the project scenario using the above ground biomass estimates.

4.1.5 Fate of Forest Resources Lost to Agricultural Conversion (Long-lived Wood Products)[86]

The standard practice in Peru for conversion of forest to agricultural lands is to remove valuable timber species and then bulldoze and burn the remaining trees. Long Lived wood products were accounted for using Option 1 of the CP-W (VMD0005 v1.2).

Option 1: Direct Volume Extraction Estimation

Step 1: Identify the wood product class(es) that are the anticipated end use of the extracted carbon calculated in Step 2. Sawnwood.

The definition of sawnwood according to the UNFCC (2003) "Sawnwood is roundwood that is sawed lengthways or by profile chipping, to produce planks, beams, joists, sleepers and lumber…." On page 30 of the Yacumama annual harvest plan under the heading: Activities: Primary Processing …"The primary processing at the site…will be made using a portable sawmill…by which pieces of wood are obtained…." Thus, it is anticipated that the wood product class for the trees cut on the property would be sawnwood.

Step 2: Calculate the biomass carbon of the volume extracted by wood product type ty from within the project boundary:

$$C_{XB,ty,l} = \frac{1}{A_i} * \sum_{j=1}^{S} (V_{ex,ty,j,I} * D_j * CF_j * 44/12)$$

$$C_{XB,ty,l} = \frac{1}{2{,}290} * (245.99 * 0.55 * 0.47 * 44/12)$$

$$C_{XB,ty,l} = \frac{1}{2{,}290} * 233.15$$

[84] *Markewitz, D., Davidson, E., Moutinho, P., & Nepstad, D. (2004). Nutrient loss and redistribution after forest clearing on a highly weathered soil in Amazonia. Ecological Applications, 14(sp4), 177-199. Available at https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/01-6016*

[85] *The mean C value plus standard deviation (7.8+5.2 = 13 Mg ha^{-1}) was used as $C_{AB\ tree\ post,i}$ in the calculations below and in the accompanying MS-excel Yacumama ERR calcs.*

[86] *Long-lived wood products were calculated and then assessed for significance using T-SIG.*

$$C_{XB,ty,l} = 0.102\ tCO2 - e\ ha^{-1}$$

Where:

$C_{XB,ty,l}$	Mean stock of extracted biomass carbon by class of wood product ty from stratum *i*; t CO2-e ha-1
A_i	Total area of stratum *i*; ha.
$V_{ex,ty,j,I}$	Volume[87] of timber extracted from within stratum *i* (does not include slash left onsite) by species *j* and wood product class *ty*; m³
D_j	Mean wood density of species *j*; t d.m.m-3
CF_j	Carbon fraction of biomass for tree species *j*; t C t-1 d.m.
j	1, 2, 3, … *S* tree species
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)

Note: Because not all of the 7 commercial "species" listed in the harvest plan (Appendix B of the registered PD[4]) were actually identified to species, the project choose to use the total overall volume for Vex,ty,j . Furthermore, since these 7 commercial "species" were not identified to species, we calculated a mean Dj. Densities were obtained from Brown (1997)[88] and Zane et al. (2009)[89]. If multiple values were provided among studies, a mean value was calculated. The mean of the 7 species densities resulted in a tree density of 0.55.

Step 3: Calculate the biomass carbon extracted that enters the wood products pool at the time of deforestation.

$$C_{WP,i} = \sum_{ty=\ s,w,oir,p,o} C_{XB,ty,i} * (1 - WW_{ty})$$

$$C_{WP,i} = 0.102 * (1 - 0.24)$$

$$C_{WP,i} = 0.08\ \ tCO2e\ ha^{-1}$$

Where:

$C_{WP,i}$	Carbon stock entering the wood products pool from stratum *i*; t CO2-e ha^{-1}
$C_{XB,ty,i}$	Mean stock of extracted biomass carbon by class of wood product ty from stratum *i*; t CO2-e ha-1

[87] The value of 245.985m³ is listed on pg 29 of the Yacumama Harvest Plan.
[88] Brown, S. (1997). Estimating biomass and biomass change of tropical forests: a primer (Vol. 134). Food & Agriculture Org..
[89] Zanne, A.E., Lopez-Gonzalez, G., Coomes, D.A., Ilic, J., Jansen, S., Lewis, S.L., Miller, R.B., Swenson, N.G., Wiemann, M.C., and Chave, J. 2009. Global wood density database. Dryad. Identifier: http://hdl.handle.net/10255/dryad.235.

WW_{ty}	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product *ty*; dimensionless
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
i	1, 2, 3, … M strata

Step 4: Calculate the amount of wood products entering the pool at the time of deforestation ($C_{WP,i}$) calculated in C-WP) that is expected to be emitted over a 100-year timeframe.[90]

$$C_{WP100,i} = C_{WP,i} - C_{WP,i} * (1 - SLF_p) * (1 - OF_p)$$

$$C_{WP100,i} = 0.08 - 0.08 * (1 - 0.20) * (1 - 0.84)$$

$$C_{WP100,i} = 0.08 - (0.08 * 0.8 * 0.16)$$

$$C_{WP100,i} = 0.067\ tCO_2e\ ha^{-1}$$

Where:

$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*; t CO2-e ha-1
$C_{WP,i}$	Carbon stock entering wood products pool at time of deforestation from stratum *i*; t CO2-e ha-1
SLF_{ty}	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *ty*; dimensionless
OF_{ty}	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *ty*; dimensionless
ty	Wood product class – defined here as sawnwood (s), wood-based panels (w), other industrial roundwood (oir), paper and paper board (p), and other (o)
i	1, 2, 3, … M strata

4.1.6 Loss of biomass attributable to fuel-wood collection

Since the property is privately owned, no harvest of standing tree biomass for fuel-wood has occurred, has historically been allowed or will be allowed in the Project area under the project scenario.

4.1.7 Avoided emissions from fertilizer use

Emissions from fertilizer use were conservatively excluded from the baseline scenario.

[90] *Source data: Winjum, J.K., Brown, S. and Schlamadinger, B. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44: 272-284.*

4.1.8 Avoided emissions from biomass burning

In the baseline scenario, land clearing would include piling and burning of all remaining above-ground woody biomass on the site after the valuable timber species are removed. Module E-BPB (VMD0013 v1.3) was used to calculate emissions due to biomass burning. A_{burn} was considered as half of $A_{planned}$ (See Section 3.6.1).

$$E_{biomassburn,i,t} = \sum_{g=1}^{G} \left(\left(\left(A_{burn,i,t} \times B_{i,t} \times COMF_i \times G_{g,i} \right) \times 10^{-3} \right) \times GWP_g \right)$$

$$E_{biomassburn,i,t} = 0\ (for\ t = 2012\ and\ 2013)$$

$$E_{biomassburn,i,t} = 60\ (for\ t = 2014\ to\ 2021)$$

$$E_{biomassburn,i,t} = 45\ (for\ t = 2022\ and\ 2029)$$

$$E_{biomassburn,i,t} = 15\ (for\ t = 2030)$$

$$E_{biomassburn,i,t} = 0\ (for\ t = 2031\ to\ 2041)$$

Where:

$E_{biomassburn,i,t}$	Greenhouse gas emissions due to biomass burning in stratum *i* in year *t* of each GHG (CO_2, CH_4, N_2O) (t CO_2e)
$A_{burn,i,t}$	Area burnt for stratum *i* in year *t* (ha)
$B_{i,t}$	Average aboveground biomass stock before burning stratum *i*, year (t d.m. ha^{-1})
$COMF_i$	Combustion factor for stratum *i* (unitless)
$G_{g,i}$	Emission factor for stratum *i* for gas *g* (kg t^{-1} d.m. burnt)
GWP_g	Global warming potential for gas *g* (t CO_2/t gas g)
g	1, 2, 3 … G greenhouse gases including carbon dioxide[91], methane and nitrous oxide (unitless)
i	1, 2, 3, …M strata (unitless)
t	1, 2, 3, … t* time elapsed since the start of the project activity (years)

4.1.9 Avoided emissions from transportation fuel use

Emissions from transportation fuel use are conservatively omitted in both the baseline and project scenarios.

[91] *Carbon dioxide may be omitted where carbon dioxide emissions are calculated in an alternate module through stock change*

4.1.10 Total Carbon Stock Change in Baseline Scenario

Module BL-PL (VMD0006 v1.4) was used to calculate baseline carbon stock changes. The values of aboveground carbon (t CO_2e) before deforestation (forest values) were obtained from the plot network. Belowground carbon (t CO_2e) is a proportion of aboveground based on root to shoot ratios listed on VMD0001 v1.2. Above and belowground after deforestation (pasture values) were retrieved from literature as explained in Section 4.1.5. Total carbon stock changes in above ground tree biomass were calculated using equation 6 from BL-PL (VMD0006 v1.4).

$$\Delta C_{AB\ tree,i} = C_{AB\ tree\ bsl,i} - C_{AB\ tree\ post,i}$$

$$\Delta C_{AB\ tree,i} = 285.25\ t\ CO_2 - e\ ha^{-1} - 47.67\ t\ CO_2 - e\ ha^{-1}$$

$$\Delta C_{AB\ tree,i} = 237.59\ t\ CO_2 - e\ ha^{-1}$$

Total carbon stock changes in below ground tree biomass were calculated using equation 8 from BL-PL (VMD0006 v1.4).

$$\Delta C_{BB\ tree,i} = C_{BB\ tree\ bsl,i} - C_{BB\ tree\ post,i}$$

$$\Delta C_{BB\ tree,i} = 67.13\ t\ CO_2 - e\ ha^{-1} - 9.53\ t\ CO_2 - e\ ha^{-1}$$

$$\Delta C_{BB\ tree,i} = 57.59\ t\ CO_2 - e\ ha^{-1}$$

Where:

$\Delta C_{AB\ tree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum *i*; t CO_2e ha^{-1}
$C_{AB\ tree\ bsl,i}$	Forest carbon stock in aboveground tree biomass in stratum *i*; t CO_2e ha^{-1}
$C_{AB\ tree\ post,i}$	Post-deforestation carbon stock in aboveground tree biomass in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{BB\ tree,i}$	Baseline carbon stock change in belowground tree biomass in stratum *i*; t CO_2e ha^{-1}
$C_{BB\ tree\ bsl,i}$	Forest carbon stock in belowground tree biomass in stratum *i*; t CO_2e ha^{-1}
$C_{BB\ tree\ post,i}$	Post-deforestation carbon stock in belowground tree biomass in stratum *i*; t CO_2e ha^{-1}

The sum of the baseline carbon stock changes in all pools at time *t* was calculated using equation 13 from BL-PL (VMD0006 v1.4).

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} * \left(\Delta C_{AB\ tree,i} - \Delta C_{WP,i} + \Delta C_{ABnon-tree,i} + \Delta C_{LI,i}\right) +$$

$$\left(\sum_{t-10}^{t} AA_{planned,i,t}\right) * \left(\Delta C_{BB\ tree,i} + \Delta C_{BB\ non-tree,i} + \Delta C_{DW,i}\right) * \left(\frac{1}{10}\right) +$$

$$\left(\sum_{t-20}^{t} AA_{planned,i,t}\right) * \left(C_{WP100,i} + \Delta C_{SOC,i}\right) * \left(\frac{1}{20}\right)$$

Where:

$\Delta C_{BSL,i,t}$	Sum of the baseline carbon stock change in all terrestrial pools in stratum *I* in year *t*; t CO_2e ha^{-1}
$AA_{planned,i,t}$	Annual area of baseline planned deforestation for stratum *i* in year *t*; ha
$C_{WP100,i}$	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*; t CO_2e ha^{-1}
$\Delta C_{AB,tree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{BB,tree,i}$	Baseline carbon stock change in belowground tree biomass in stratum *i*; t CO_2e ha^{-1}
$C_{AB,non-tree,i}$	Baseline carbon stock change in aboveground tree biomass in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{BB,non-tree,i}$	Baseline carbon stock change in belowground tree biomass in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{WP,i}$	Baseline carbon stock change in wood products in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{DW,i}$	Baseline carbon stock change in dead wood in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{LI,i}$	Baseline carbon stock change in litter in stratum *i*; t CO_2e ha^{-1}
$\Delta C_{SOC,i}$	Baseline carbon stock change in soil organic carbon in stratum *i*; t CO_2e ha^{-1}
i	1, 2, 3, … M strata (dimensionless)
t	1, 2, 3, … $t*$ years elapsed since the project start of the project activity

The baseline net GHG emissions was determined using equation 1 from BL-PL (VMD0006 v1.4) for APWD-REDD project activities (terrestrial carbon pools):

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t^*}\sum_{i=1}^{M}\left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t}\right)$$

Where:

$\Delta C_{BSL,planned}$	Net greenhouse gas emissions in the baseline from planned deforestation up to year $t*$; t CO_2-e

$\Delta C_{BSL,i,t}$	Net carbon stock change in all pools in the baseline stratum *i* in year *t*; c
$GHG_{BSL-E,i,t}$	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum *i* in year *t*; t CO_{2}-e yr^{-1}
i	1, 2, 3, … M strata
t	1, 2, 3, … t* years elapsed since the projected start of the project activity

4.2 Project Emissions

The net greenhouse gas emissions under the project scenario will be calculated using the following equation 1 from VCS module M-REDD (VMD0015 v2.3).

$$\Delta C_{WPS-REDD} = \sum_{t-1}^{t} \sum_{i=1}^{m} (\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,I,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t})$$

$$\Delta C_{WPS-REDD} = 0$$

Where:

$\Delta C_{WPS-REDD}$	Net GHG emissions in the REDD project scenario up to year t*; t CO2-e
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum *i* at time *t*; t CO_2e
$\Delta C_{P,Deg,I,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum *i* at time *t*; t CO_2e
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum *i* at time *t*; t CO_2e
$GHG_{P-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum *i* at time *t*; t CO_2e
i	1, 2, 3, … M strata
t	1, 2, 3, … t* years elapsed since the start of the REDD project activity

Under the project scenario there were no planned/predicted activities that caused or changed carbon stocks and/or greenhouse gas emissions.

Specifically:

1. No deforestation or harvest of any type was allowed or will be conducted under the Project scenario. Thus $\Delta C_{P,DefPA,i,t}$ = 0

2. No collection of fuel wood for direct biomass burning and/or charcoal production was allowed under the project scenario. In addition, the project was specifically designed to prevent timber poaching and thus any degradation from timber poaching. Thus $\Delta C_{P,Deg,I,t}$ = 0

3. No major disturbances (e.g. wildfire, geologic events, pest and disease outbreaks, extreme weather) occurred during the first 10 years of the project. Yacumama is in the upper Peruvian Amazon Basin, defined as the region above the confluence of the Rio Ucayali and Rio Marañon (Figure 1.13-2), and is affected by yearly flooding events that temporarily inundate large tracts of tropical forest. The annual flooding is a natural part of the system and a key component of local ecosystem processes[15]. Flood waters originating in the Andes Mountains carry large sediment loads that deposit essential plant nutrients as the flood waters recede. Thus $\Delta C_{P,DistPA,i,t}$ = 0

4. Because no forestry activities are planned, and active project activities include restricting those fuelwood and timber poaching GHG emissions involved in these activities are not anticipated. Thus $GHG_{P-E,i,t}$ = 0.

4.3 Leakage Emissions

4.3.1 Activity Shifting Leakage (LK-ASP)

Activity shifting leakage was assessed using module VMD0009 v1.3 “Estimation of emissions from activity shifting for avoided planned deforestation (LK-ASP)”. The deforestation agent was determined to be the current landowner based upon the approved Operativo Anual Para Permiso Forestal De Propiedad Privada 2009 (Annual operating plan for permission to timber private property 2009) (Appendix B of the registered PD[4]). The project proponent controls 1 additional property within Peru (Figure 3 and Table 4.2)[92] where the lodge structures are located. There was no history of deforestation or greenhouse gas emissions within the previous 5 years of the project start date and no verifiable plans for deforestation for controlled and future controlled lands existed since project start date.

Using equation 1 from LK-ASP (VMD0009 v1.3) GHG emissions from activity shifting leakage are calculated as:

$$\Delta C_{LK-AS,planned} = \sum_{t-1}^{t}\sum_{i=1}^{m}(LKA_{planned,i,t} * \Delta C_{BSL,i}) + GHG_{LK,E,i,t}$$

$$\Delta C_{LK-AS,planned} = (0 * 295.18) + 0$$

$$\Delta C_{LK-AS,planned} = 0$$

Where:

$\Delta C_{LK-AS,planned}$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation; t CO_2e
$LKA_{planned,i,t}$	The area of activity shifting leakage in stratum *i* at time *t*; ha

[92] *The parcel identified as “Yacumama” is not part of the project area and is the parcel that the remaining lodge facilities occ upy.*

$\Delta C_{BSL,i}$ Net carbon stock changes in all pools in baseline stratum *i*;

$GHG_{LK,E,i,t}$ Greenhouse gas emissions as a result of leakage of avoided deforestation activities in stratum *i* in year *t*; t CO_2e

i 1, 2, 3, … M strata

t 1, 2, 3, … t* years elapsed since the start of the REDD project activity

Step1: Determination of the Baseline Rate of Forest Clearance by the Deforestation Agent

Option 1.3b: Estimations of forest clearance are calculated using equation 4 from LK-ASP (VMD0009 v1.3) as:

$$NewR_{i,t} = (\%D_{planned,i,t,OP} * A_{planned,i,OP})$$

Where:

$NewR_{i,t}$ New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)

$\%D_{planned,i,t,OP}$ Projected annual proportion of land that will be deforested outside the project boundary in stratum *i* in year *t* (percent)

$A_{planned,i,OP}$ Total area of planned deforestation outside the project boundary over the baseline period for stratum *i* (ha)

i 1, 2, 3, … M strata

t 1, 2, 3, … t* years elapsed since the start of the REDD project activity

Step 2: Estimate new projection of forest clearance by the baseline agent of deforestation (using equation 5 in LK-ASP/VMD0009 v1.3) with project implementation if no leakage is occurring.

$$NewR_{i,t} = WoPR_{i,t} - (\%D_{planned,i,t} * A_{planned,i})$$

Where:

$NewR_{i,t}$ New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)

$WoPR_{i,t}$ Deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t* in the absence of the project (ha)

$\%D_{planned,i,t,OP}$ Projected annual proportion of land that will be deforested outside the project boundary in stratum *i* in year *t* (%)

$A_{planned,i,OP}$ Total area of planned deforestation outside the project boundary over the baseline period for stratum *i* (ha)

i 1, 2, 3, … M strata

t 1, 2, 3, … t* years elapsed since the start of the REDD project activity

Step 3: Monitor all areas deforested by baseline agent of deforestation through the years in which planned deforestation was forecast to occur. Area of activity shifting is calculated using equation 6 in LK-ASP (VMD0009 v1.3):

All areas owned by the landowner in Peru were monitored for deforestation using remote sensing data. As illustrated on the Random Forest classified imageries from 2013 and 2023[93], the landowner has not materially changed the project area as a result of the project. Within the project boundary, no intact forest was cleared for agriculture production.

$$LKA_{planned,i,t} = A_{defLK,i,t} - NewR_{i,t}$$

Where:

$LKA_{planned,i,t}$	The area of activity shifting leakage in stratum *i* at time *t*; ha
$A_{defLK,i,t}$	The total area of monitored deforestation by the baseline agent of the planned deforestation in stratum *i* in year *t*
$NewR_{i,t}$	New calculated forest clearance in stratum *i* in year *t* by the baseline agent of the planned deforestation where no leakage is occurring (ha)
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t* years elapsed since the start of the REDD project activity

Step 4: Monitor greenhouse gas emissions (e.g. biomass burning and nitrous oxide emissions) outside the project area boundary by baseline agent of deforestation using equation 7 in LK-ASP

$$GHG_{LK,E,i,t} = E_{biomassburn,i,t} + N_2 0_{direct-N,i,t}$$

Where:

$GHG_{LK,E,i,t}$	Greenhouse gas emissions as a result of leakage of avoiding deforestation activities in stratum *i* in year *t* (t CO2e).
$E_{biomassburn,i,t}$	Non-CO2 emissions due to biomass burning in stratum *i* in year *t* (t CO2e)
$N_2 0_{direct-N,i,t}$	Direct N2O emission as a result of nitrogen application on the alternative land use in stratum *i* in year *t* (t CO2e)
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t* years elapsed since the start of the REDD project activity

4.3.2 Market-Effects Leakage through Decreased Timber Harvest

Market Effects leakage (ΔC_{LK-ME}) was assessed using module VMD0011 v1.2 "Estimation of Emissions from Market Effects (LK-ME). The volume of timber projected to be extracted for commercial markets yearly for each stratum ($V_{BSL,EX,i,t}$) under the baseline scenario was calculated by multiplying the volume of merchantable trees per hectare (3.858 m^3 obtained from the approved Yacumama harvest plan

[93] *See the accompanying PDF Yacumama_RF_Modeling_Report*

Appendix B of the registered PD[4], page 29, Volume Table summarization) by the area planned of forest loss per year.

The 7 commercial tree species listed in the approved Yacumama harvest plan were used to determine the "mean wood density of commercially harvested species" in the project area (Table 5.3-1). Densities were obtained from Brown (1997)[94] and Zane et al. (2009)[95]. If multiple values were provided among studies, a mean value was calculated. The mean of the 7 species densities resulted in a tree density of 0.55 (i.e. D_{MN}).

Table 4.3-1 Seven commercial species listed in the approved Yacumama deforestation plan and their wood densities. Wood densities were obtained from Brown (1997)[96] and Zane et al. (2009)[97].

Common Name	Scientific Name	Density (t dry mass m^{-3} green volume)	Notes
Moena	*Aniba sp.*	0.54	Average value applied (0.38 and 0.6)
Lagarto caspi	*Calophyllum brasiliense*	0.53	Average value applied (0.51, 0.54 and 0.55)
Andiroba	*Carapa guianensis*	0.52	
Almendro	*Caryocar macrocarpon*	0.65	*C. glabrum* is synonymous
Shiringa	*Hevea guianensis*	0.53	Used figure for *Hevea indet* a closely related species. Some authorities do not recognize as a separate species.
Mari-mari	*Hymenolobium sp.*	0.58	
Quillosisa	*Vochysia sp.*	0.49	Quillosisa is recognized *Vochysia lanceoloata* by ITTO (http://www.tropicaltimber.info/)
	Mean Density	**0.55**	

Yearly carbon emission due to displaced timber harvests in the baseline scenario was calculated using the equation 5 from LK-ME (VMD0011 v1.1) in the following manner:

$$C_{BSL,XBT,I,t} = \left(\left(V_{BSL,XE,it} * D_{MN} * CF\right) + \left(V_{BSL,XE,it} * LDF\right) + \left(V_{BSL,XE,it} * LIF\right)\right) * 44/12$$

[94] *Brown, S. 1997. Estimating biomass and biomass change of tropical forests: a primer (Vol. 134). Food & Agriculture Org..*
[95] *Zanne, A.E., Lopez-Gonzalez, G., Coomes, D.A., Ilic, J., Jansen, S., Lewis, S.L., Miller, R.B., Swenson, N.G., Wiemann, M.C., and Chave, J. 2009. Global wood density database. Dryad. Identifier: http://hdl.handle.net/10255/dryad.235.*
[96] *Brown, S. 1997. Estimating biomass and biomass change of tropical forests: a primer (Vol. 134). Food & Agriculture Org..*
[97] *Zanne, A.E., Lopez-Gonzalez, G., Coomes, D.A., Ilic, J., Jansen, S., Lewis, S.L., Miller, R.B., Swenson, N.G., Wiemann, M.C., and Chave, J. 2009. Global wood density database. Dryad. Identifier: http://hdl.handle.net/10255/dryad.235.*

Where:

$C_{BSL,XBT,I,t}$	Carbon emission due to timber harvests in the baseline scenario in stratum *i* at time *t*; t CO_2e
$V_{BSL,XE,it}$	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum *i* at time *t*; m^3
D_{MN}	Mean wood density of commercially harvested species; t d.m.m^{-3}. The value must be the same as that used in the module CP-W if this pool is included in the baseline.
CF	Carbon fraction of biomass for commercially harvested species *j*; t d.m.$^{-1}$. The value must be the same as that used in the module CP-W if this pool is included in the baseline.
LDF	Logging damage factor; t C m^{-3} (default 0.53 t C m^{-3} for broadleaf)
LIF	Logging infrastructure factor; t C m^{-3} (default 0.29 t C m^{-3}).
i	1, 2, 3, … M strata
t	1, 2, 3, … t* years elapsed since the start of the REDD project activity

PMP_i is defined as the merchantable biomass as a proportion of the total aboveground tree biomass in stratum *i* at time t in the project area. PMLFT is defined as the proportion of total biomass that is merchantable for each forest type in the project area. Because there is a single strata and forest type in the project area (i.e. they are exactly the same) PMP_i = PML_{FT}. Thus, PML_{FT} is equal (± 15%) to PMP_i; therefore LF_{ME} = 0.4.

Since there is only one stratum, the summed carbon emission due to yearly timber harvests in the baseline case potentially displaced through implementation is $AL_{T,i}$ =4,370. LK_{MAF} was not applied since no leakage management activities were established within areas under the control of the project proponent in order to minimize the displacement of land use activities to areas outside the project area. Thus, annual market effects leakage through decreased timber harvest was calculated using equation 2, 3 and 4 of LK-ME (VMD0011 v1.2):

$$LK_{MarketEffects,timber} = \sum(LF_{ME} * LK_{MAF} * AL_{T,i})$$

Where:

$LK_{MarketEffects,timber}$	Total GHG emission due to market-effects leakage through decreased timber harvest; t CO_2e
LF_{ME}	Leakage factor to market-effects calculations (dimensionless)
LK_{MAF}	Leakage management adjustment factor (dimensionless)
$AL_{T,i}$	Summed emissions from timber harvest in stratum *i* in the baseline case potentially displaced through implementation of the project; t CO_2e

i — 1, 2, 3, … M strata (dimensionless)

$$LK_{MAF} = 1 - \left({PRODMB_{LMA,t}} \middle/ {PRODMB_{BL,t}} \right)$$

Where:

LK_{MAF} — Leakage management adjustment factor (dimensionless)

$PRODMB_{LMA,t}$ — Production biomass in commercial species that is merchantable in year *t* in leakage management areas (t per year)

$PRODMB_{BL,t}$ — Production biomass in commercial species that is merchantable in year *t* in the baseline case (t per year)

t — 1, 2, 3, … $t*$ time elapsed since the start of the project activity (years)

$$AL_{T,i} = \sum_{t=1}^{t} \left(C_{BSL,XBT,i,t} \right)$$

Where:

$AL_{T,i}$ — Summed emissions from timber harvest in stratum *i* in the baseline case potentially displaced through implementation of the project; t CO_2e

$C_{BSL,XBT,i,t}$ — Carbon emission due to displaced timber harvests in the baseline scenario in stratum *i* in year *t*; t CO_2e

i — 1, 2, 3, … M strata (dimensionless)t *1, 2, 3, … t* time elapsed since the project start of the REDD project activity (years)*

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Prior to final summary, each of the GHG emissions and carbon pools were tested for significance using T-SIG [98].Table 4.4-1 summarizes the relative contribution of carbon pools measured and/or calculated in the baseline and project scenarios for this monitoring period (2014 - 2022). These pools are above ground tree biomass, below ground tree biomass, long lived wood products, market leakage and activity shifting leakage. Based upon T-SIG, long lived wood products can be treated as de-minimis and thus are excluded from further analyses.

Table 4.4-1 Summary of the relative contribution of carbon pools and GHG emission sources calculated using T-SIG.

Carbon Pool/GHG Emission Source	Average GHG Emissions (t CO2e/ha)	Total GHG Emissions (t CO2e)	Relative Contribution (%)
Above-ground Tree Biomass (ΔC_{AB})	17,688	530,641	77
Below-ground Tree Biomass (ΔC_{BB})	4,850	145,497	21

[98] *See the accompanying MS-excell document Yacumama ERR calcs.*

Long Lived Wood Products (HWP_{Stored})	0	-1	0
Long Lived Wood Products ($HWP_{Decomposed}$)	0	0	0
Activity Shifting Leakage (ASP)	0	0	0
Market-effects Leakage (ME)	466	13,985	2
Total	**3,834**	**690,122**	**100**

The total net GHG reductions of the REDD project activity were calculated following Section 8.4.2 of the VM0007 v1.7.

$$NER_{REDD} = \Delta C_{BSL-REDD} - \Delta C_{WPS-REDD} - \Delta C_{LK-REDD}$$

$$\Delta C_{BSL-REDD} = \Delta C_{BSL,planned}$$

$$\Delta C_{LK-REDD} = \Delta C_{LK-AS,planned+} \Delta C_{LK-ME}$$

Where:

NER_{REDD}	Total net GHG emission reductions of the REDD project activity up to year t^* (t CO_2e)
$\Delta C_{BSL-REDD}$	Net GHG emissions in the REDD baseline scenario up to year t^* (t CO_2e)
$\Delta C_{WPS-REDD}$	Net GHG emissions in the REDD project scenario up to year t^* - from Module *M-REDD* (t CO_2e)
$\Delta C_{LK-REDD}$	Net GHG emissions due to leakage from the REDD project activity up to year t^* (t CO_2e)
$\Delta C_{BSL,planned}$	Net GHG emissions in the baseline scenario from planned deforestation up to year t^*- from Module *BL-PL* (t CO_2e)
$\Delta C_{LK-AS,planned}$	Net GHG emissions due to activity shifting leakage for projects preventing planned deforestation to year t^* - from Module LK-*ASP* (t CO_2e)
ΔC_{LK-ME}	Net GHG emissions due to markets-effects leakage up to year t^* - from Module LK-*ME*(t CO_2e)

Table 4.4-2 Requested information for projects required to assess permanence risk.

State the non-permanence risk rating (%)	24
Has the non-permanence risk report been attached as either an appendix or a separate document?	☒ Yes ☐ No
For ARR and IFM projects with harvesting, state, in tCO_2e, the Long-term Average (LTA).	Not applicable
Has the LTA been updated based on monitored data, if applicable?	Not applicable
State, in tCO_2e, the expected total GHG benefit to date.	427,524[99]
If a loss occurred (including a loss event or reversal), state the amount of tCO_2e lost:	No loss event occurred since project start date

The net GHG emissions for planned deforestation in the Project scenario, before reductions for a risk buffer, are conservatively estimated at 237,978 t CO_2e for the next 10-year baseline (2022-2031) (Table 4.4-3). This value represents the cumulative loss cap (estimated to be reached in 2023, year 19 of the Project) and the decomposition of the belowground biomass from the baseline harvesting activities (2012-2021). The overall project risk buffer from planned deforestation was obtained from the analysis performed using AFOLU Non-Permanence Risk Tool v4.2[100].

The number of Verified Carbon Units (VCUs) for the crediting period was estimated using equation 18 of VM0007 v1.7.

$$\mathrm{VCU_t} = \left(\mathrm{Adjusted\_NER_{REDD+,t_2}} - \mathrm{Adjusted\_NER_{REDD+,t_1}}\right) - \mathrm{Buffer_{Total}}$$

Where:

VCU_t	Number of Verified Carbon Units for the monitoring period $t = t_2 - t_1$
$Adjusted\_NER_{REDD+,t_2}$	Total net GHG emission reductions in the REDD+ project activity up to year t_2 and adjusted to account for uncertainty (t CO_2e)
$Adjusted\_NER_{REDD+,t_1}$	Total net GHG emission reductions in the REDD+ project activity up to year t_1 and adjusted to account for uncertainty (t CO_2e)
$Buffer_{Total}$	Total permanence risk buffer withholding (t CO_2e)

The precision of uncertainty met the allowable level set by the VM0007 v1.7 of +/- 15% of NER_{REDD} at 90% confidence level, as indicated on Section 4.1.3. Therefore, no deduction was necessary.

$$\mathrm{Adjusted\_NER_{REDD+}} = NER_{REDD}$$

[99] Value refers to the 2012-2022 crediting period before buffer deduction (GHG benefit to date = Baseline – Project – Leakage)
[100] See accompanying MS-word document VCS Non-Permanence Risk Report Project1133.

Table 4.4-3 GHG Emissions for the baseline, project, and total VCU issuance after deductions for the risk buffer.

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Buffer pool allocation (tCO_2e)	Reductions VCUs (tCO_2e)	Removals VCUs (tCO_2e)	Total VCU issuance (tCO_2e)
01-Jan-2012 to 31-Dec-2012	66,978	0	1,748	22,103	43,127	0	43,127
01-Jan-2013 to 31-Dec-2013	68,312	0	1,748	22,543	44,021	0	44,021
01-Jan-2014 to 31-Dec-2014	32,295	0	738	7,751	23,807	0	23,807
01-Jan-2015 to 31-Dec-2015	32,858	0	738	7,886	24,235	0	24,235
01-Jan-2016 to 31-Dec-2016	33,421	0	738	8,021	24,663	0	24,663
01-Jan-2017 to 31-Dec-2017	33,985	0	738	8,156	25,091	0	25,091
01-Jan-2018 to 31-Dec-2018	34,548	0	738	8,291	25,519	0	25,519
01-Jan-2019 to 31-Dec-2019	35,111	0	738	8,427	25,946	0	25,946
01-Jan-2020 to 31-Dec-2020	35,674	0	738	8,562	26,374	0	26,374
01-Jan-2021 to 31-Dec-2021	36,237	0	738	8,697	26,802	0	26,802

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Buffer pool allocation (tCO_2e)	Reductions VCUs (tCO_2e)	Removals VCUs (tCO_2e)	Total VCU issuance (tCO_2e)
01-Jan-2022 to 31-Dec-2022	28,053	0	551	6,733	20,770	0	20,770
01-Jan-2023 to 31-Dec-2023	27,987	0	551	6,717	20,719	0	20,719
01-Jan-2024 to 31-Dec-2024	28,029	0	551	6,727	20,752	0	20,752
01-Jan-2025 to 31-Dec-2025	28,072	0	551	6,737	20,784	0	20,784
01-Jan-2026 to 31-Dec-2026	28,114	0	551	6,747	20,816	0	20,816
01-Jan-2027 to 31-Dec-2027	28,156	0	551	6,757	20,848	0	20,848
01-Jan-2028 to 31-Dec-2028	28,198	0	551	6,768	20,880	0	20,880
01-Jan-2029 to 31-Dec-2029	28,241	0	551	6,778	20,912	0	20,912
01-Jan-2030 to 31-Dec-2030	12,844	0	182	3,083	9,580	0	9,580
01-Jan-2031 to 31-Dec-2031	4,871	0	0	1,169	3,702	0	3,702
01-Jan-2032 to 31-Dec-2032	4,352	0	0	1,044	3,307	0	3,307

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Buffer pool allocation (tCO_2e)	Reductions VCUs (tCO_2e)	Removals VCUs (tCO_2e)	Total VCU issuance (tCO_2e)
01-Jan-2033 to 31-Dec-2033	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2034 to 31-Dec-2034	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2035 to 31-Dec-2035	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2036 to 31-Dec-2036	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2037 to 31-Dec-2037	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2038 to 31-Dec-2038	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2039 to 31-Dec-2039	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2040 to 31-Dec-2040	4,352	0	0	1,044	3,307	0	3,307
01-Jan-2041 to 31-Dec-2041	4,352	0	0	1,044	3,307	0	3,307
Total	**695,500**	**0**	**13,985**	**179,096**	**502,419**	**0**	**502,419**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	Project Forest Cover Benchmark Map
Data unit	ha
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event.
Source of data	The 2012 land use/land cover (LULC) map (figure 6) was derived from a cloud free Landsat 5, 2011 (Julian Day 219) image as downloaded from the United States Geographic Survey's (USGS) Global Visualization Viewer (GloVis) (http://glovis.usgs.gov).
Value applied	Used in equation 3,8 in VCS module M-REDD
Justification of choice of data or description of measurement methods and procedures applied	Required by methodology. The minimum map accuracy should be 90% for the classification of forest/non-forest in the remote sensing imagery.
Purpose of Data	Calculation of baseline emissions
Comments	No additional comments

Data / Parameter	R
Data unit	t root d.m. t^{-1} shoot d.m.
Description	Root to shoot ratio appropriate to biome applied as belowground biomass per unit area.
Source of data	$C_{AB\_tree,I}$ multiplied by a root to shoot ratio available in the IPCC GL AFLOU. Global ecoregion specific from IPCC GPG-LULCF [101].
Value applied	0.20 for ABG < 125 t. ha^{-1}, 0.24 for ABG > 125 t. ha^{-1}
Justification of choice of data or description of measurement methods and procedures applied	Tropical ratio provided in IPCC GPG-LULUCF.

[101] *Penman, J., Gytarsky, M., Hiraishi, T., Krug, T., Kruger, D., Pipatti, R., ... & Wagner, F. (2003). Good practice guidance for land use, land-use change and forestry. Good practice guidance for land use, land-use change and forestry. Available at https://www.ipcc.ch/site/assets/uploads/2018/03/GPG_LULUCF_FULLEN.pdf*

Domain	Ecological Zone	Aboveground biomass	Root-to-shoot ratio	Range
Tropical	Tropical rainforest	<125 t.ha-1	0.20	0.09-0.25
		>125 t.ha-1	0.24	0.22-0.33
	Tropical rainforest	<20 t.ha-1	0.56	0.28-0.68
		>20 t.ha-1	0.28	0.27-0.28
Subtropical	Subtropical humid forest	<125 t.ha-1	0.20	0.09-0.25
		>125 t.ha-1	0.24	0.22-0.33
	Subtropical dry forest	<20 t.ha-1	0.56	0.28-0.68
		>20 t.ha-1	0.28	0.27-0.28

Purpose of Data	Calculation of baseline and project emissions
Comments	Used in the calculation in Below-ground biomass.

Data / Parameter	fj(X,Y)
Data unit	Kg tree^{-1}
Description	Allometric equation for species *j* linking measured tree variable(s) to aboveground biomass of living trees, expressed as Kg tree^{-1}
Source of data	Pearson, T., Walker, S. and Brown, S. 2005. Sourcebook for Land Use, Land-Use Change and Forestry Projects. Winrock International and the World Bank Biocarbon Fund. 57pp
Value applied	Used in to estimate above ground biomass of individual trees. Tree (AGB) Tropical Wet Forest >4000 (Pearson et al., 2005) AGB= 21.297 – 6.953 * (D) + 0.740 * (D2)
Justification of choice of data or description of measurement methods and procedures applied	The equation was selected based upon the total inputs of moisture received via rainfall and yearly flood events.
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	Allometric equation was validated using the limited measurements approach.

Data / Parameter	$\Delta C_{BSL,i}$
Data unit	t CO_2-eha^{-1}
Description	Net carbon stock changes in all pools in the baseline stratum *i*
Source of data	VCS BL-PL module (VMD0006 v1.3)

Value applied	295.18
Justification of choice of data or description of measurement methods and procedures applied	See VCS BL-PL module (VMD0006 v1.3)
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	$A_{planned,i}$
Data unit	ha
Description	The total area under the baseline scenario planned for deforestation.
Source of data	Updated proxy areas selection and analysis outlined in Sections 3.6.1 and 4.1.3
Value applied	2,290.4ha
Justification of choice of data or description of measurement methods and procedures applied	Value represents the 80% deforestation cap under the baseline established through an empirical analysis of 20 years of deforestation trends (2002–2021) in proxy areas, focusing on landscapes that have nearly completed their deforestation cycle. Four of seven proxies (Proxies 4, 5, 6 and 7) exhibited advanced agricultural expansion with cumulative forest loss between 80% and nearly 100%, providing evidence for a realistic upper bound on forest conversion under comparable conditions.
Purpose of Data	Calculation of baseline emissions
Comments	No additional comments

Data / Parameter	$D\%_{planned,i,t}$
Data unit	% year^{-1}
Description	Projected annual proportion of project area deforested.
Source of data	Updated proxy area selection and analysis outlined in Section 4.1.3
Value applied	From 2012 to 2013: 10% From 2014 to 2021: 4.22%

	From 2022 to 2031: 3.15%
Justification of choice of data or description of measurement methods and procedures applied	Identified through common practice analysis and the most conservative figure that will result in the project being deforested within 19 years of the start date.
Purpose of Data	Calculation of baseline emissions
Comments	No additional comments

Data / Parameter	$AA_{planned,i,t}$
Data unit	ha year^{-1}
Description	Annual area of baseline planned deforestation for stratum *i* at time *t*;
Source of data	Updated proxy areas selection and analysis outlined in Sections 3.6.1 and 4.1.3
Value applied	From 2012 to 2013: 286.3 ha year^{-1} From 2014 to 2021: 121 ha year^{-1} From 2022 to 2029: 90 ha year^{-1} 2030: 30 ha year^{-} From 2031 to 2041: 0 ha year^{-1}
Justification of choice of data or description of measurement methods and procedures applied	This figure represents the most conservative figure that will result in the project being deforested within 19 years of the start date. Based upon a common practice analysis.
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	No additional comments

Data / Parameter	$L\text{-}D_{,i}$
Data unit	%
Description	% Likelihood of deforestation in stratum *i*.
Source of data	Operativo Anual Para Permiso Forestal De Propiedad Privada (Annual operating plan for forest permit on private property)
Value applied	100%

Justification of choice of data or description of measurement methods and procedures applied	From BL-PL “For all other planned deforestation areas (i.e., areas not under both government control and zoned for deforestation), $L\text{-}D_{,i}$ shall be equal to 100%”
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	No additional comments

Data / Parameter	D_{mn}
Data unit	t d.m.m^{-3}
Description	Mean wood density of commercially harvested species.
Source of data	Species specific values from the literature Brown (1997) and Zane et al. (2009). Appendix A of registered PD[4] summarizes values from local publications in Peru.
Value applied	0.55 t dry mass m^{-3} green volume
Justification of choice of data or description of measurement methods and procedures applied	The 7 commercial tree species listed in the approved Yacumama harvest plan (Appendix B of registered PD[4]) were used to determine the “mean wood density of commercially harvested species” in the project area (Table 16). Densities were obtained from Brown (1997) and Zane et al. (2009) and are available Appendix A of registered PD[4]. The mean of the 7 species densities resulted in a tree density of 0.55.
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	No additional comments

Data / Parameter	Project Area
Data unit	ha
Description	Area in which the project occurs
Source of data	Remote sensing data, COFOPRI maps, and original survey maps.
Value applied	2,863 ha
Justification of choice of data or description of measurement methods and procedures applied	Use remote sensing data to eliminate water bodies from the project area. Original survey maps and remote sensing were used to confirm project area boundaries.

Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	No additional comments

Data / Parameter	PML_{FT}
Data unit	%
Description	Mean merchantable biomass as a proportion of total above ground tree biomass for each forest type.
Source of data	Field data from Yacumama harvest plan.
Value applied	+/- 15
Justification of choice of data or description of measurement methods and procedures applied	Use field data collected in support of Yacumama harvest plan.
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	PMP_i
Data unit	%
Description	Proportion of total biomass in commercial species that is merchantable.
Source of data	Field data from Yacumama harvest plan.
Value applied	+/- 15
Justification of choice of data or description of measurement methods and procedures applied	Use field data collected in support of Yacumama harvest plan.
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	CF

Data unit	t C t d.m^{-1}
Description	Carbon fraction of dry matter
Source of data	IPCC
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	Species specific values from the literature (eg, IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3)
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	LDF
Data unit	t C m^{-3}
Description	Factor for calculating the biomass of dead wood created during logging operations m^{-3} extracted.
Source of data	Default value provided in VCS LK-ME (VMD0011 v1.2)
Value applied	0.53
Justification of choice of data or description of measurement methods and procedures applied	Used default value reported in VCS LK-ME (VMD0011 v1.2)
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	LIF
Data unit	t C m^{-3}
Description	Factor for calculating emissions arising from the creation of logging infrastructure during logging operations m^{-3} extracted.
Source of data	Default value provided in VCS LK-ME (VMD0011 v1.2)
Value applied	0.29
Justification of choice of data or description of	Used conservative default value.

measurement methods and procedures applied	
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	$V_{BSL,EX,i,t}$
Data unit	m^3
Description	Volume of timber projected to be extracted from within the project boundary during baseline in stratum i at time t
Source of data	Estimates derived from field measurements
Value applied	From 2012 to 2013: 1,105.12 From 2014 to 2021: 466 From 2022 to 2029: 348 2030: 115 From 2031 to 2041: 0
Justification of choice of data or description of measurement methods and procedures applied	Used estimates derived from field measurements conducted in support of the development of the Yacumama forest harvest plan.
Purpose of Data	Calculation of leakage emissions
Comments	No additional comments

Data / Parameter	$E_{REDD\_BSLSS, i, pool \#}$
Data unit	t CO2e
Description	Carbon stock or GHG sources (e.g. trees, dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the baseline case (EBSL SS,i, pool#)
Source of data	The terms denoting significant carbon stocks, GHG sources or leakage emissions from baseline modules used to calculate net emission reductions.
Value applied	$C_{AB\ tree}$ 81,668 $C_{BB\ tree}$ 19,219 C_{DW} 0 C_{WP} 10

	GHG 0
Justification of choice of data or description of measurement methods and procedures applied	The terms denoting significant carbon stocks, GHG sources, or leakage emissions from models used to calculate net emission reductions.
Purpose of Data	Calculation of uncertainty
Comments	No additional comments

Data / Parameter	$U_{REDD\ BSLSS,\ i,\ pool\ \#}$
Data unit	%
Description	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the baseline case (1,2…n represent different carbon pools and/or GHG sources) (UBSL,SS,i,pool#)
Source of data	Calculations from Field Measurements
Value applied	$C_{AB\ tree}$ 7.90 $C_{BB\ tree}$ 7.11 C_{DW} 0 C_{WP} 1.71 GHG 0
Justification of choice of data or description of measurement methods and procedures applied	Uncertainty in pools derived from field measurements.
Purpose of Data	Calculation of uncertainty
Comments	No additional comments

Data / Parameter	WW_{ty}
Dta unit	Dimensionless
Description	Fraction of extracted biomass effectively emitted to the atmosphere during production by class of wood product ty.

Source of data	Winjum et al. 1998[102]
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	Default value for developing countries from the CP-W v1.2 module (VMD0005)
Purpose of Data	Calculation of baseline emissions
Comments	Parameter values to be updated if new empirically based peer-reviewed findings become available.

Data / Parameter	SLF_{ty}
Data unit	Dimensionless
Description	Fraction of wood products that will be emitted to the atmosphere within 5 years by class of wood product.
Source of data	Winjum et al. 1998[73]
Value applied	0.2
Justification of choice of data or description of measurement methods and procedures applied	Default value for sawnwood from the CP-W v1.2 module (VMD0005)
Purpose of Data	Calculation of carbon stock entering the wood products pool at the time of deforestation
Comments	No additional comments

5.2 Data and Parameters Monitored

Data / Parameter	Project Forest Cover Monitoring Map
Data unit	ha
Description	Map showing the location of forest land within the project area at the beginning of each monitoring period, and after every five-year. If within the Project Area some forest land is cleared, the benchmark map (from 2012) must show the deforested areas at each monitoring event

[102] *Winjum,J.K., Brown,S. and Schlamadinger,B. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44: 272-284.*

Source of data	Remote sensing in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied	The minimum map accuracy should be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less or more than every 5 years examination must occur prior to any verification event
Value applied	100% of project area
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image.
QA/QC procedures to be applied	Document outlining the Standard Operating Procedures (SOP) for measuring monitoring plots is shared with the inventory crew. The QA/QC section of the SOP describes crew training, data records, data verification, non-conformance, and data archiving. See Section 5.3.2
Purpose of data	Calculation of baseline and project emissions
Calculation method	See Section 4.3
Comments	If stratification is required in the future due to ex-post monitoring, then new strata will be identified using module X-STR.

Data / Parameter	Degradation Participatory Rural Appraisal results
Data unit	ha and m
Description	Semi structured interviews to obtain information on the area that is potentially subject to degradation ($ADeg,i$) and the distance of degradation penetration from access buffer.
Source of data	Participatory rural appraisal
Description of measurement methods and procedures to be applied	Consists of semi structured interviews that assess whether the following activities are occurring in the project area: -Harvesting of fuel wood -Harvesting of wood for charcoal production

	-Timber harvest If ≥10% of those interviewed/surveyed believe that degradation or any of the above may be occurring, then a limited field sampling must be undertaken.
Frequency of monitoring/recording	Every 2 years
Value applied	0
Monitoring equipment	Surveying several transects of known length and width across the access-buffer area
QA/QC procedures to be applied	See Section 5.2.3 of M-REDD (VMD0015 v2.3)
Purpose of data	Calculation of baseline and project emissions
Calculation method	See Section 5.2.3 of M-REDD (VMD0015 v2.3)
Comments	An estimation was made in the Project case. In the current project the parameter is set to "0" since there is an infrastructure, hiring, and policies in place to prevent deforestation.

Data / Parameter	$A_{DefPA,i,u,t}$
Data unit	ha
Description	Area of recorded deforestation in the project area in stratum i converted to land use u at time t (if any occurs)
Source of data	Remote sensing imagery
Description of measurement methods and procedures to be applied	Supervised landcover classification was performed to differentiate between three landcover classes in the Project area: water, non-forest and forest areas.
Frequency of monitoring/recording	Must be monitored at least every 5 years or, if verification occurs at a frequency of less than every 5 years, examination must occur prior to any verification event.
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image

QA/QC procedures to be applied	See Section 5.3
Purpose of data	Calculation of baseline and project emissions
Calculation method	See Section 5.3
Comments	This was presumed to be zero ex ante. The project has in place a clear management strategy, infrastructure, and personnel in place to restrict access to the Project area for the purposes of harvesting trees.

Data / Parameter	PMP_i
Data unit	%
Description	Merchantable biomass as a proportion of total above ground tree biomass for stratum *i*
Source of data	Onsite measurements
Description of measurement methods and procedures to be applied	Merchantable biomass is equal to merchantable volume multiplied by wood density determined from Yacumama forest harvest plan.
Frequency of monitoring/recording	Monitored every 5 years prior to verification event.
Value applied	0
Monitoring equipment	Direct measurement. See Section 5.3.1
QA/QC procedures to be applied	See Section 5.1 of LK-ME (VMD0011 v1.2)
Purpose of data	Calculation of market leakage
Calculation method	See Section 5.1 of LK-ME (VMD0011 v1.2)
Comments	Ex-ante a time zero measurement shall be made of this factor.

Data / Parameter	A_i
Data unit	ha
Description	Total Area of project stratum *i*
Source of data	Own assessment (direct forest inventory of the Project area)

Description of measurement methods and procedures to be applied	This parameter is updated at baseline renewal when aboveground biomass is re-inventoried as per module CP-AB (at least every 10 years).
Frequency of monitoring/recording	At a minimum every time the baseline is updated (at least every 10 years)
Value applied	2,863
Monitoring equipment	GPS
QA/QC procedures to be applied	See CP-W (VMD0005 v1.2)
Purpose of data	Calculation of baseline and project emissions
Calculation method	Equation 3 of CP-W (VMD0005 v1.2)
Comments	Ex-ante it shall be assumed that strata area will remain constant.

Data / Parameter	A_{sp}
Data unit	ha
Description	Area of forest carbon monitoring plots,
Source of data	Nested plot design published in Pearson et al (2005).
Description of measurement methods and procedures to be applied	See Section 5.3.1.
Frequency of monitoring/recording	Monitoring must occur at least every ten years for baseline renewal.
Value applied	Tree Class / Plot Radius / Plot Area / Proportion of Hectare: ≥5.0cm / 4.0m / 50m² / 0.005 ≥20.0cm / 14.0m / 616m² / 0.062 ≥50.0cm / 20.0m / 1256m² / 0.125
Monitoring equipment	30m fiberglass tape, DBH tape
QA/QC procedures to be applied	See Section 5.3.1.
Purpose of data	Calculation of baseline and project emissions

Tree Class	Plot Radius	Plot Area	Proportion of Hectare
≥5.0cm	4.0m	50m²	0.005
≥20.0cm	14.0m	616m²	0.062
≥50.0cm	20.0m	1256m²	0.125

Calculation method	See Sections 4.1 and 4.2
Comments	Where carbon stock estimation occurs only for determination of the baseline, this parameter shall be known ex-ante. Where part of project monitoring, ex-ante the number and area of sample plots shall be estimated based on projected sample effort relative to projections of growth and emissions.

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height (1.3m) of a tree in cm
Source of data	Field measurements in forest carbon monitoring plots
Description of measurement methods and procedures to be applied	Measured at 1.3m above-ground unless tree has buttresses or irregular growth. Minimum diameter is 5cm. See field methods section for detailed procedures.
Frequency of monitoring/recording	Monitoring will occur at minimum every 10 years or more frequently if events dictate a reset of the baseline.
Value applied	See database for tree measurements.
Monitoring equipment	Diameter tape incremented in centimeters, 1.3m staff, 30m fiberglass tape, GPS to navigate to permanent plots
QA/QC procedures to be applied	See Section 5.3.1
Purpose of data	Calculation of baseline and project emissions
Calculation method	Direct observation
Comments	Key variable used to calculate with project carbon stocks and year by year growth rate.

Data / Parameter	N
Data unit	Dimensionless
Description	Number of sample points

Source of data	Published forest biomass and standard deviation from Nebel et al (2001)[103].
Description of measurement methods and procedures to be applied	Information from Nebel et al (2001) was entered into Winrock Sampling Calculator to determine total number of plots needed. Must be monitored at least every 5 years or if verification < 5 years, or a major event occurs monitoring must take place more frequently.
Frequency of monitoring/recording	Minimum of every 10 years for baseline renewal.
Value applied	25 forest plots
Monitoring equipment	See Section 5.3.1
QA/QC procedures to be applied	See Section 5.3.1
Purpose of data	Calculation of baseline and project emissions
Calculation method	Winrock Sampling Calculator
Comments	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known ex-ante. Where part of project monitoring, ex-ante the number of sample plots shall be estimated based on projected sample effort relative to projections of growth and emissions.

Data / Parameter	$\Delta A_{P,DistPA,q,i,t}$
Data unit	ha
Description	Area impacted by natural disturbance in project stratum I, converted to natural disturbance stratum q at time t; ha
Source of data	Remote sensing imagery combined with ground verification points and/or GPS coordinates.
Description of measurement methods and procedures to be applied	Required by M-REDD module (VMD0015 v2.3)
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.

[103] *Nebel, G., J. Dragsted, and A.S. Vega. 2001a. Litter fall, biomass and net primary production in flood plain forests in the Peruvian Amazon. Forest Ecology and Management 150: 93-102.*

Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3.3
Purpose of data	Calculation of project emissions
Calculation method	See Section 4.2
Comments	No major ecological disturbance is predicted within the project area under the Project scenario.

Data / Parameter	$\Delta C_{P,Def,i,t}$
Data unit	t CO2e
Description	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t; t CO2e
Source of data	Calculated
Description of measurement methods and procedures to be applied	Required by M-REDD module (VMD0015 v2.3)
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3.2. Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al., 2003)[104].

Purpose of data	Calculation of project emissions
Calculation method	See Section 5.3.2
Comments	No deforestation is planned or allowed within the project area under the Project scenario.

Data / Parameter	$\Delta C_{P,DistPA,i,t}$
Data unit	t CO2e
Description	Net carbon stock change as a result of disturbance in the project area in the project case in stratum i at time t; t CO2e
Source of data	Calculated
Description of measurement methods and procedures to be applied	Required by methodology.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3 Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003)[105].
Purpose of data	Calculation of project emissions
Calculation method	See Section 5.3
Comments	No additional comments

Data / Parameter	$\Delta C_{P,Deg,I,t}$
Data unit	t CO2-e
Description	Net carbon stock change as a result of degradation in the project area in the project case in stratum i at time t; t CO2-e
Source of data	Calculated
Description of measurement methods and procedures to be applied	Required by M-REDD module (VMD0015 v2.3)
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3. Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).
Purpose of data	Calculation of project emissions
Calculation method	See *Section 5.3*
Comments	No major ecological disturbance is predicted within the project area under the Project scenario.

Data / Parameter	$GHG_{P-E,i,t}$
Data unit	t CO2-e
Description	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum i in year t; t CO2-e
Source of data	Calculated

Description of measurement methods and procedures to be applied	Required by methodology M-REDD (VMD0015 v2.3).
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3. Quality control and quality assurance (QA/QC) will follow standard professional practices related to data processing, handling, and reporting. Generally, the entity responsible for data collection will review the data collection methods, check the data to ensure that they are collected correctly, assure that data are summarized and analyzed using accepted scientific principles, and cross-check the data with other data sources and with previous years to ensure that the data are realistic, complete and consistent over time (Penman et al. 2003).
Purpose of data	Calculation of project emissions
Calculation method	See Section 5.3
Comments	No major ecological disturbance is predicted within the project area under the Project scenario.

Data / Parameter	$C_{AB\_tree,i}$
Data unit	t CO2-e ha^{-1}
Description	Carbon stock in above-ground biomass in trees in the baseline stratum, *i*
Source of data	Field measurements monitored with allometric equation published in Pearson et. al. (2005)[106]
Description of measurement methods and procedures to be applied	See Section 5.3.1.

[106] *Pearson, T., S. Walker and S. Brown. 2005. Sourcebook for land use, land-use change and forestry projects. Winrock International and the BioCarbon Fund of the World Bank.*

Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	In 2013, 276.95 t CO2-e ha^{-1} In 2023, 285.25 t CO2-e ha^{-1}
Monitoring equipment	Computer and spreadsheet software.
QA/QC procedures to be applied	Independent 3rd party audit of field measurements utilizing re-measurement of a sample of plots
Purpose of data	Calculation of baseline emissions
Calculation method	Calculation method follows Pearson et. al. 2005.
Comments	Key variable used to calculate with project carbon stocks and year by year growth rate

Data / Parameter	$C_{BB\_tree,i}$
Data unit	t CO2-e ha^{-1}
Description	Carbon stock in below-ground biomass in trees in the baseline stratum, i
Source of data	$C_{AB\_tree,I}$ multiplied by a SA ratio available in the IPCC GL AFLOU
Description of measurement methods and procedures to be applied	See Section 5.3.1.
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	In 2013, 56.14 t CO2-e ha^{-1} In 2023, 68.46 t CO2-e ha^{-1}
Monitoring equipment	Computer and spreadsheet software
QA/QC procedures to be applied	Independent 3rd party audit of field measurements utilizing re-measurement of a sample of plots
Purpose of data	Calculation of baseline emissions
Calculation method	Calculation method follows CP-AB
Comments	Key variable used to calculate with project carbon stocks and year by year growth rate

Data / Parameter	Leakage (Activity Shifting) $\Delta C_{LK\text{-}AS,planned}$
Data unit	t CO2-e ha^{-1}
Description	Activity shifting leakage resulting from Project implementation and will include an assessment of acreage harvested and greenhouse gas emissions (Biomass burning and N_2O)
Source of data	Remote sensing and ground surveys
Description of measurement methods and procedures to be applied	Remote sensing will be used to monitor property controlled by project proponent to ensure no harvest of forest resources occurs or emissions of greenhouse gases (biomass burning and N_2O).
Frequency of monitoring/recording	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3.3
Purpose of data	Calculation of leakage emissions
Calculation method	See Section 4.3
Comments	The likelihood of activity shifting leakage is considered very low since the Project proponent plans to maintain the Yacumama as a base for project related operations and thus undisturbed from its' current state.

Data / Parameter	$A_{defLK,i,t}$
Data unit	ha
Description	The total area of deforestation by the baseline agent or class of agent of the planned deforestation in stratum *i* in year *t*
Source of data	Remote sensing and/or legal records and/or survey information.
Description of measurement methods and procedures to be applied	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation.

Frequency of monitoring/recording	Will be reexamined at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied	0
Monitoring equipment	Landsat imagery (or higher resolution) using multiple images to get a cloud free image
QA/QC procedures to be applied	See Section 5.3.3
Purpose of data	Calculation of leakage emissions
Calculation method	See Section 4.3
Comments	No additional comments

5.3 Monitoring Plan

The Yacumama Monitoring Plan follows requirements established by the VCS Standard v4.7, Section 9.3 of VM0007, Part 1 of LK-ASP (VMD0009 v1.3) and LK-ME (VMD0011 v1.2). It was designed to ensure the avoidance of 681,516 t CO2e emissions from land clearing and conversion to agriculture. The following tasks are implemented:

5.3.1 Monitoring project implementation

a. *Technical description of the monitoring task*

- Bi-weekly boat patrols along the Yarapa River and its tributaries, Sabalillo and Yanayacu.
- 5-year interval measurement of the forest carbon monitoring plots, in total 25 plots.

b. *Data to be collected*

- Signs of intrusion along the riverbanks, considering the 50-meter from the stream's center buffer zone. Placement of signs for identification of private property.
- Live tree's distance to plot center, tree species common, and diameter at breast height/DBH (1.3 m above the ground). Trees are included in three sub-plots according to the inclusion criteria:

Tree DBH Class (cm)	Plot Radius (m)	Plot Area (m^2)	Proportion of hectare
≥ 5	4	50	0.005
≥ 20	14	616	0.062
≥ 50	20	1256	0.125

c. Overview of data collection procedures

Further information on the steps for including and measuring trees is available on Standard Operating Procedure for carbon plot measurement available in separate document[107].

d. Quality control and quality assurance procedure

If signs of intrusion are encountered, guardians must: 1. Photograph and document, 2. Report to the manager and landowner, 3. The manger or landowner decides the next course of action: 2a) providing guidance and if needed, 2b. the manger or landowner flies to Peru to resolve the issue.

Further information on crew training, data recording, data verification and non-conformances is available on Standard Operating Procedure for carbon plot measurement available in separate document[83].

e. Data archiving

Further information on data archiving is available on Standard Operating Procedure for carbon plot measurement available in separate document[83].

f. Organization and responsibilities of the parties involved in all the above

Monitoring tasks happen at least every 5 years, or if verification occurs on a frequency of less/more than every 5 years examination must occur prior to any verification event over the crediting period. The Project proponent (Yacumama Management/Aaron Bishop) is responsible for contracting qualified organization to perform the monitoring tasks[108]. In concert with Yacumama management, the selected organization collects, summarizes, analyzes, and archives all of data required to perform the monitoring tasks. Yacumama management secures a third-party auditor to verify that the monitoring follows all VCS requirements.

5.3.2 Monitoring actual carbon stock changes and greenhouse gas emissions

a. Technical description of the monitoring task

This monitoring task was designed to assess changes in forest cover (if any) in the Project area. These changes are measured prior to each verification as part of the overall monitoring program. Methods follow and are consistent with VCS M-REDD (VMD0015 v2.3).

b. Data collected

Forest cover data (water, non-forest, forest land) for the entire Project area should be available at the beginning of the monitoring period, every five years after, and the year of baseline renewal. If within the Project area some forest land is cleared, the Project Forest Cover Monitoring Map must show the changes in forested area (if any) areas at each verification event.

c. Overview of data collection procedures

Supervised landcover classification is performed to differentiate between three landcover classes in the Project area: water, non-forest and forest areas. These landcover classes represent major components of the landscape and are feasible to differentiate in terms of spectral properties. Supervised landcover classification has historically been performed for many environmental management and forestry

[107] *See PDF file Yacumama_SOP for field data collection (Moist Tropical Forests)*
[108] *ClimeCo was selected to perform the monitoring task for the period of 2014 to 2022.*

purposes[109] [110]). Supervised classification involves four general steps: 1) collecting training samples representative of the different landcover classes; 2) training a classifier algorithm to develop relationships between spectral signatures and landcover classes; 3) implementing the classification algorithm on the target imagery; 4) performing an accuracy assessment of the classification (Stehman & Foody, 2019). The classifier algorithm applied is Random Forest using Google Earth Engine (GEE). Further information on the supervised landcover classification with the Random Forest algorithm is available in a separate document[111].

d. Quality control and quality assurance procedure

In landcover classification, accuracy assessment involves the creation of a confusion matrix, which summarizes whether each pixel in the validation data was classified correctly or incorrectly by the classifier algorithm. Further information on the supervised landcover classification with the Random Forest algorithm is available in a separate document[87].

e. Data archiving

All data collected and documents created as part of the monitoring program are archived electronically on secure servers. Final tabular data is compiled in MS-excel compatible spreadsheets, and final documents are maintained in MS-word. Geo-spatial data is compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents are kept for at least two years after the end of the project. A mirror copies of the databases on secure portable hard drives are also housed with Yacumama management.

f. Organization and responsibilities of parties involved in the above

Monitoring tasks happen at least every 5 years, or if verification occurs on a frequency of less/more than every 5 years examination must occur prior to any verification event over the crediting period. The Project proponent (Yacumama Management/Aaron Bishop) is responsible for contracting qualified organization to perform the monitoring tasks. In concert with Yacumama management, the selected organization collects, summarizes, analyzes, and archives all of data required to perform the monitoring tasks. Yacumama management secures a third-party auditor to verify that the monitoring follows all VCS requirements.

5.3.3 Monitoring leakage carbon stock changes and greenhouse gas emissions

a Technical description of the monitoring task

In the registered PD[4], ex-ante “Activity Shifting Leakage” and “Market Effects Leakage” relative contribution as a carbon source were considered insignificant. However, where the lodge property is located, that parcel could be considered a source of activity leakage as it is also controlled by the Project proponent, the identified baseline deforestation agent. This monitoring task was designed to assess changes in forest cover (if any) in the Yacumama parcel. These changes are measured prior to each verification as part of the overall monitoring program. Methods follow and are consistent with VCS

[109] *Ahmed, O. S., Franklin, S. E., & Wulder, M. A. (2014). Integration of lidar and landsat data to estimate forest canopy cover in coastal British Columbia.* Photogrammetric Engineering & Remote Sensing, 80*(10), 953–961.*

[110] *Matasci, G., Hermosilla, T., Wulder, M. A., White, J. C., Coops, N. C., Hobart, G. W., & Zald, H. S. J. (2018). Large-area mapping of Canadian boreal forest cover, height, biomass and other structural attributes using Landsat composites and lidar plots.* Remote Sensing of Environment, 209*, 90–106. https://doi.org/https://doi.org/10.1016/j.rse.2017.12.020*

[111] *See accompanying PDF file Yacumama_Monitoring GHG_ RF Classification_Report*

modules M-REDD (VMD0015 v2.3), Section 5.1 Part 1 of LK-ASP (VMD009 v1.3) and LK-ME (VMD0011 v1.2).

b. Data collected

Forest cover data (water, non-forest, forest land) for the entire Project area should be available at the beginning of the monitoring period, every five years after, and the year of baseline renewal. If within the Project area some forest land is cleared, the Project Forest Cover Monitoring Map must show the changes in forested area (if any) areas at each verification event.

c. Overview of data collection procedures

Supervised landcover classification is performed to differentiate between three landcover classes in the Project area: water, non-forest and forest areas. These landcover classes represent major components of the landscape and are feasible to differentiate in terms of spectral properties. Supervised landcover classification has historically been performed for many environmental management and forestry purposes[85][86]. Supervised classification involves four general steps: 1) collecting training samples representative of the different landcover classes; 2) training a classifier algorithm to develop relationships between spectral signatures and landcover classes; 3) implementing the classification algorithm on the target imagery; 4) performing an accuracy assessment of the classification (Stehman & Foody, 2019). The classifier algorithm applied is Random Forest using Google Earth Engine (GEE). Further information on the supervised landcover classification with the Random Forest algorithm is available in separate document[87].

d. Quality control and quality assurance procedure

In landcover classification, accuracy assessment involves the creation of a confusion matrix, which summarizes whether each pixel in the validation data was classified correctly or incorrectly by the classifier algorithm. Further information on the supervised landcover classification with the Random Forest algorithm is available in separate document[87].

e. Data archiving

All data collected and documents created as part of the monitoring program are archived electronically on secure servers. Final tabular data is compiled in MS-excel compatible spreadsheets, and final documents are maintained in MS-word. Geo-spatial data is compiled in ESRI or ARC compatible geodatabases with appropriate meta-data that meets Federal Geographic Data Committee standards. All data and documents are kept for at least two years after the end of the project. A mirror copies of the databases on secure portable hard drives are also housed with Yacumama management.

f. Organization and responsibilities of parties involved in the above

Monitoring tasks happen at least every 5 years, or if verification occurs on a frequency of less/more than every 5 years examination must occur prior to any verification event over the crediting period. The Project proponent (Yacumama Management/Aaron Bishop) is responsible for contracting qualified organization to perform the monitoring tasks[84]. In concert with Yacumama management, the selected organization collects, summarizes, analyzes, and archives all of data required to perform the monitoring tasks. Yacumama management secures a third-party auditor to verify that the monitoring follows all VCS requirements.

6 APPENDIX

6.1 2014 to 2022 Landcover Change

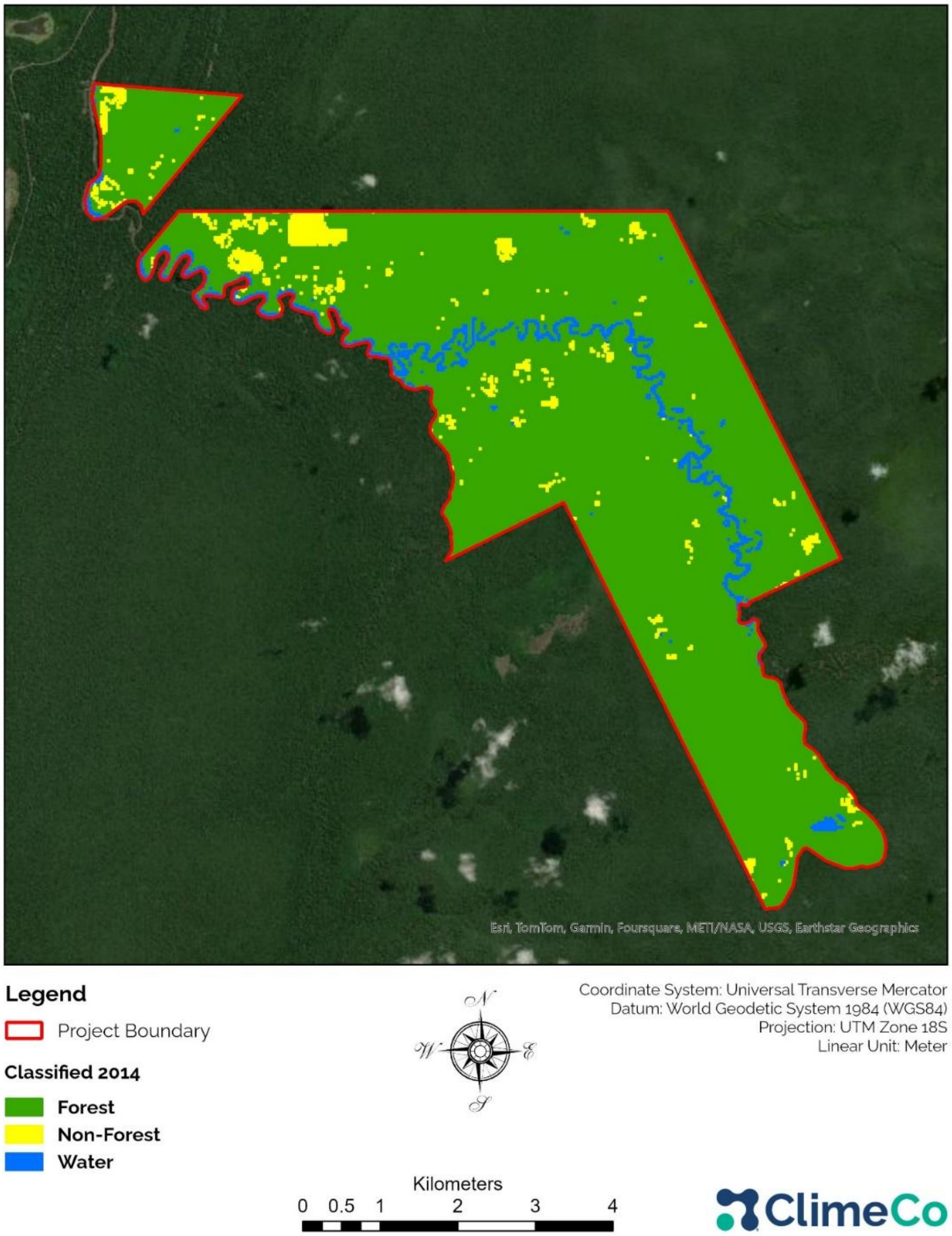

Figure 6.1-1 Random Forest (RF) classified Landsat-8 imagery showing the distribution of the predicted landcover classes for Yacumama project area in 2014.

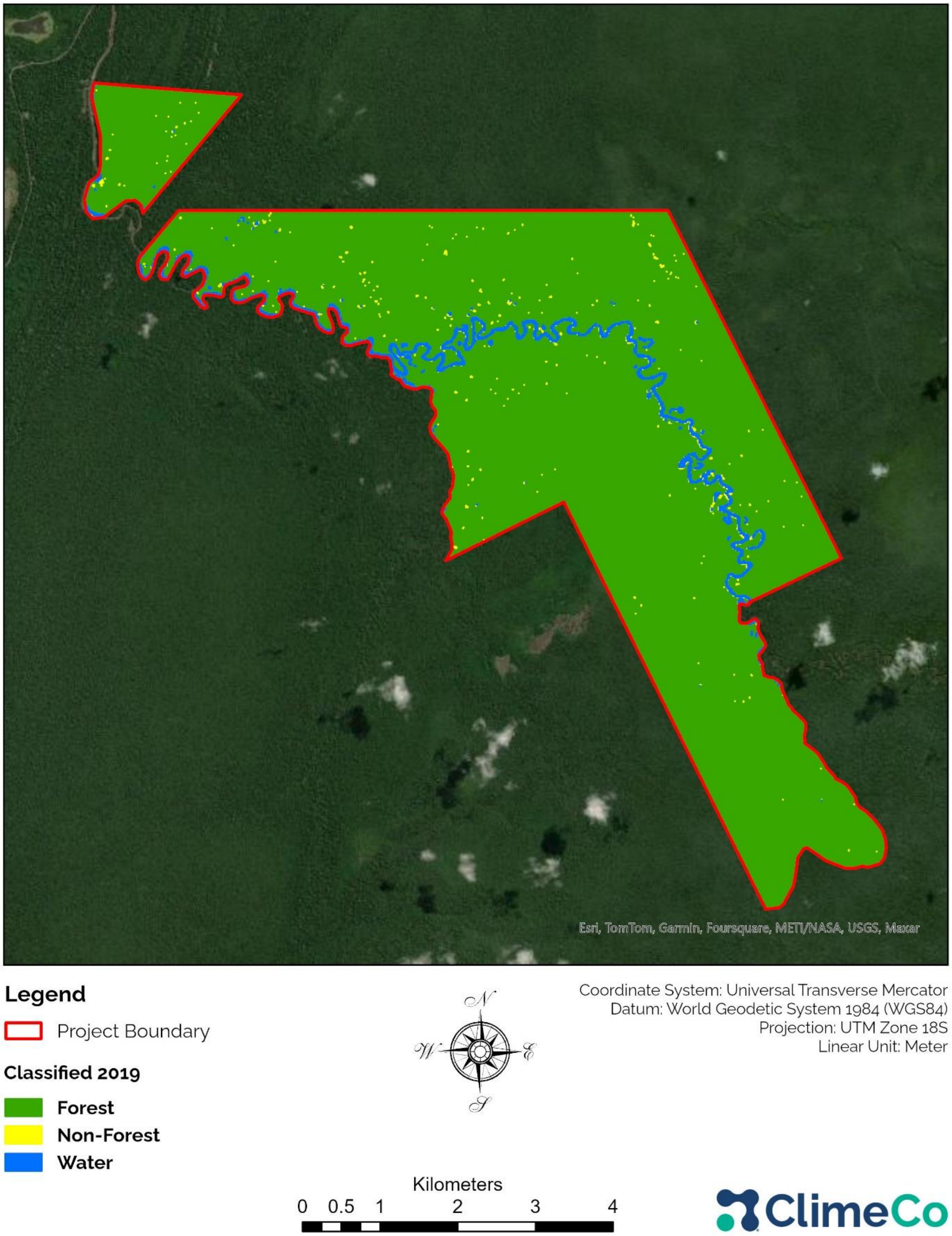

Figure 6.1-2 Random Forest (RF) classified Landsat-8 imagery showing the distribution of the predicted landcover classes for Yacumama project area in 2019.

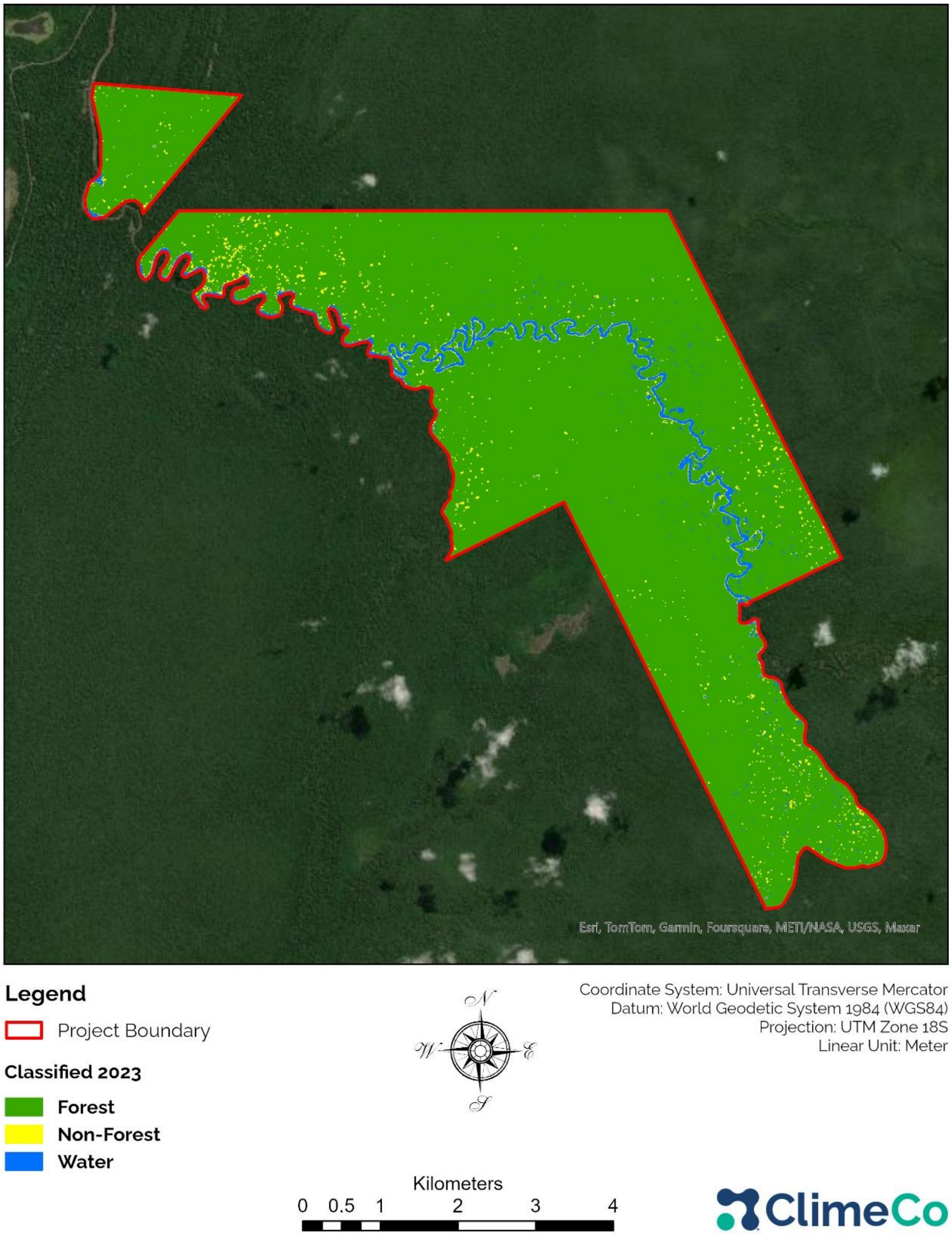

Figure 6.1-3 Random Forest (RF) classified PlanetScope imagery showing the distribution of the predicted landcover classes for Yacumama project area. This classification had an overall accuracy of 0.97, with a Kappa coefficient of 0.95.

6.2 Rare, Threatened, and Endangered species

The following table provides information on the potential species that could be found in the Yacumama project area and adjacent habitats to the property utilizing the IUCN Red List of Threatened Species mapping [112].

Scientific Name	Common Name	Species Classification	IUCN Redlist Category	Habitat
Diospyros dolmen	Dolmen Wood	Tree	Endangered	Primary forests on sandy laterite, white clay, and/or well-drained soils, at 130-200 m elevation
Orthemis faaseni	Odonata species	Insect	Endangered	Streams within primary forest subcanopy
Inia geoffrensis	Amazon river dolphin	Mammal	Endangered	Rivers and flooded forests in the high-water seasons
Sotalia fluviatilis	Tucuxi (river dolphin)	Mammal	Endangered	All three types of water in the Amazon basin: white water, clear water, and black water
Otocinclus cocama	Zebra oto	Fish	Endangered	Medium size creek, with clear water and lots of marginal vegetation, or small ponds (cochas)
Guatteria revoluta	Guatteria revoluta	Tree	Endangered	Non-inundated forest, on sandy to clayey soil at elevations of 100-150 m
Duguetia nitida	Duguetia nitida	Tree	Endangered	Non-inundated forests at elevations from 120-150 m
Ateles belzebuth	White-bellied spider monkey	Mammal	Endangered	High primary forest, generally associated with clay soil forests; visit flooded forests when fruit productivity is high
Ocotea minutiflora	Ocotea minutiflora	Tree	Endangered	Lowland forests between 100-110 m altitude
Crax globulosa	Wattled curassow	Bird	Endangered	Lowland, riverine, humid forest and várzea
Bolitoglossa altamazonica	Nauta salamander	Amphibians	Near Threatened	Primary terra firme forest and white-sand forest
Speothos venaticus	Bush dog	Mammal	Near Threatened	Habitat generalist, occurring generally near water sources
Atelocynus microtis	Short-eared dog	Mammal	Near Threatened	Undisturbed rainforest in the Amazonian lowlands
Leontocebus illigeri	Illiger's saddle-back tamarin	Mammal	Near Threatened	Amazonian lowland forest, both in tierra firme forest and in seasonally flooded forest
Vampyrum spectrum	Spectral bat	Mammal	Near Threatened	Lowland, evergreen forest, and occasionally in cloud or deciduous forest or swampy areas

[112] IUCN Red List of Threatened Species

Scientific Name	Common Name	Species Classification	IUCN Redlist Category	Habitat
Leopardus wiedii	Margay	Mammal	Near Threatened	Continuous forest habitat and tree cover, ranging from continuous forest to small forest fragments in savanna ecosystems, both evergreen and deciduous
Neochen jubata	Orinoco geese	Bird	Near Threatened	Forest-covered banks of tropical rivers and damp clearings, wet savannas and muddy and sandy margins of large freshwater wetlands
Deconychura pallida	Southern long-tailed woodcreeper	Bird	Near Threatened	Primary terra firme forest (with no flooding), but also in permanently flooded forest
Contopus cooperi	Olive-sided flycatcher	Bird	Near Threatened	Forest edges and openings, semi-open forest, water edges and harvested forest where some structure has been retained
Dendroplex kienerii	Zimmer's woodcreeper	Bird	Near Threatened	This species occurs below 200 m in the "várzea" (seasonally flooded forest) and "igapó" (permanently flooded forest)
Calidris subruficollis	Buff-breasted sandpiper	Bird	Near Threatened	Wintering grounds in northern South America in a variety of habitats, including lowland forest, cloudforest, secondary growth, forest edges and plantations
Morphnus guianensis	Crested eagle	Bird	Near Threatened	Lowland tropical and subtropical forest
Setophaga striata	Blackpoll warbler	Bird	Near Threatened	Wintering grounds in northern South America in a variety of habitats, including lowland forest, cloudforest, secondary growth, forest edges and plantations
Tinamus guttatus	White-throated tinamou	Bird	Near Threatened	Primary tropical rainforest, generally 'terra firme' (without flooding), up to altitudes of 500 m, but may also tolerate secondary forest
Agamia agami	Agami Heron	Bird	Near Threatened	Swampy stream and lake margins within tropical forest, and in seasonal marshes and coastal mangroves, under 300 m in elevation
Mitu tuberosum	Razor-billed curassow	Bird	Near Threatened	Lowland forest, including terra firme forest, gallery forest, seasonally flooded forest and lake margins
Spizaetus ornatus	Ornate hawk-eagle	Bird	Near Threatened	Humid forest, tall gallery forest, rainforest, cloudforest and deciduous forest

Scientific Name	Common Name	Species Classification	IUCN Redlist Category	Habitat
Pourouma herrerensis	Pourouma herrerensis	Tree	Near Threatened	Non-inundated rainforests
Myrmoborus melanurus	Black-tailed antbird	Bird	Near Threatened	Understory of flooded lowland (várzea) forest along rivers, streams, oxbow lakes and on river islands
Plesiotrygon iwamae	Long-tailed river stingray	Fish	Vulnerable	Freshwater systems
Trichechus inunguis	Amazonian manatee	Mammal	Vulnerable	Lowland tropical areas below 300 m asl, restricted to freshwater systems, can be found in the three types of water in Amazonian rivers (white, black and clear)
Tayassu pecari	White-lipped peccary	Mammal	Vulnerable	Primarily humid tropical forests, but can be found across diversity of habitats including wet and dry grasslands and woodlands, Gran Chaco, tropical dry forests, and coastal mangroves
Tapirus terrestris	South American tapir	Mammal	Vulnerable	Lowland South American moist swamp forests, dry and moist shrublands and grasslands and a wide variety of wetlands
Myrmecophaga tridactyla	Giant anteater	Mammal	Vulnerable	Tropical moist forest, dry forest, savanna habitats and open grasslands
Priodontes maximus	Giant armadillo	Mammal	Vulnerable	Close to water within undisturbed primary rain forest habitats
Leopardus tigrinus	Oncilla	Mammal	Vulnerable	Broad range of forested habitats
Brachyplatystoma rousseauxii	Gilded catfish	Fish	Vulnerable	Demersal species (living at or near the bottom of the water body)
Apistogramma cinilabra	Cichlid species	Fish	Vulnerable	Small ponds situated in dense, primary rainforest
Heliotrygon rosai	Rosa's round ray	Fish	Vulnerable	Demersal species (living at or near the bottom of the water body) in freshwater systems
Cedrela odorata	Spanish cedar	Tree	Vulnerable	Humid or dry lowland forest, preferring well-drained soil
Aotus nancymaae	Nancy Ma's night monkey	Mammal	Vulnerable	Flooded and un-flooded tropical forest
Percnostola arenarum	Allpahuayo antbird	Bird	Vulnerable	Dense terra firme forest on white sandy soil
Conirostrum margaritae	Pearly-breasted conebill	Bird	Vulnerable	Broad range of forested habitats

Scientific Name	Common Name	Species Classification	IUCN Redlist Category	Habitat
Pseudoxandra cauliflora	Pseudoxandra cauliflora	Tree	Vulnerable	Non-inundated forests at low elevations up to 150 m
Doliocarpus verruculosus	Doliocarpus verruculosus	Tree	Vulnerable	Riparian forests and flooded areas, between 100 and 200 m elevation
Callimico goeldii	Goeldi's monkey	Mammal	Vulnerable	Habitat specialist concentrating on bamboo forests and disturbed forests (secondary growth) but can also be found in more open, mature forest
Cebuella niveiventris	Eastern pygmy marmoset	Mammal	Vulnerable	Restricted to river-edge forest
Primolius couloni	Blue-headed macaw	Bird	Vulnerable	Edge of humid lowland evergreen forest, along rivers and by clearings and other breaks in continuous canopy, from lowlands to 1,550 m
Endlicheria arachnocome	Endlicheria arachnocome	Tree	Vulnerable	Seasonally flooded (tahuampa) lowland forests, between 90-140 m altitude
Cebuella pygmaea	Western pygmy marmoset	Mammal	Vulnerable	Restricted to river-edge forest
Cacajao ucayalii	Uakari	Mammal	Vulnerable	Occurs in flooded forests, low to medium hill and high terrace forests, and palm swamps.
Adelobotrys macranthus	Adelobotrys macranthus	Tree	Vulnerable	Primary forests between 0-500 m
Lagothrix lagothricha	Common woolly monkey	Mammal	Vulnerable	Lowland primary forest, and occasionally also in secondary and disturbed/fragmented habitats. They enter flooded forests at certain times of the year to feed on fruits

6.3 Main Risks Identified by the AFOLU Non-Permanence Risk Tool

6.3.1 Payback Period

A potential internal risk assessed is that the payback period is directly related to the sale of credits. To mitigate this risk, the management team established a robust financial monitoring plan. It is imperative to have readily available financial resources. Specifically, a percentage of the total cash required to cover project expenses until revenue from credits sale.

It is important to note that the credits generated from the first monitoring period (2012 to 2013), and verified in 2017, were not sold completely. This highlights the necessity for diligent financial management and strategic planning for the next baseline period.

To ensure a steady income for the project, the management team has decided to include two more verifications, allowing credits to be issued at four-year intervals (2027 and 2031). This adaptation will help stabilize the project's financial inflow.

The Project Proponent will be responsible for the following:

I. Monitoring Project Expenses/Cash Flow Annually: Annual reviews of project expenses and cash flow will be conducted to ensure financial stability and to anticipate any shortfalls that may arise before reaching breakeven.
II. Ensuring Credible Sellers: The Project Proponent will identify and engage credible sellers, such as aggregators, brokers, or traders, who can facilitate the marketing and sale of carbon credits. This includes seeking advisors to guide the relationship with buyers.
III. Monitoring Carbon Credit Price: Continuous monitoring of carbon credit prices will be carried out to optimize the timing and strategy for credit sales, ensuring maximum financial returns.

6.3.2 Project Longevity

Another significant risk concerns project longevity as it reflects the number of years, since the start date, that project activities will be maintained.

The project proponent has committed to a minimum 30-year project longevity (2012 to 2041). While Verra has since updated the VCS standard, requiring a minimum longevity of 40 years for any projects registered after January 1, 2024, the Yacumama project, by virtue of being registered prior to Jan 1, 2024, is allowed to keep the 30-year length. Furthermore, there is a binding agreement in place with a project development partner (made available to the audit team), committing the proponent to maintain project activities and project permanence for a minimum of 30 years.

6.3.3 Additional Risks

6.3.3.1 Illegal Logging

Illegal logging poses a serious threat to the project's objectives. To combat unauthorized timber harvesting, bi-weekly boat patrols are conducted along the Yarapa River and its tributaries, Sabalillo and Yanayacu, focusing on easily accessible riverbanks. Furthermore, 24 strategically placed signs along the riverbank reinforce the conservation message. Engaging local community members as project guardians is also vital for monitoring and reporting any illegal activities.

6.3.3.2 Community Engagement

Engaging positively with the community is another critical area of focus. The project has learned from Participatory Rural Appraisal (PRA) findings that meaningful engagement with local communities is essential to prevent illegal logging. By involving respected community members in project activities, the initiative fosters local support for conservation efforts.

6.3.4 Monitoring Progress and Documenting Lessons

To ensure effective monitoring, a lesson learned was that a better patrol reporting system needed to be established. The implemented system enables systematic reporting of patrol results through a dedicated WhatsApp channel, allowing the manager to make prompt judgment calls regarding any incidents of trespassing or illegal logging. An annual review meeting will also be conducted each year with staff, the manager, and the project proponent. This meeting will serve as a platform to discuss the effectiveness of current strategies, share lessons learned, and explore potential improvements.

The forest carbon monitoring program will continue to include periodic measurements of the 25 permanent plots every ten years. These measurements will document changes in aboveground carbon stocks and provide valuable data for future decision-making.

Tracking community engagement will involve recording interactions with local community members and documenting their feedback and suggestions. This information will be crucial for adapting strategies to better meet community needs. Additionally, the performance of credit sales will be monitored closely in collaboration with the specialized marketing company. By analyzing market trends and buyer preferences, the project can adjust its approach to maximize revenue.

6.3.5 Adaptation Plan

The adaptation plan includes a flexible patrolling strategy, which will allow adjustments in patrol frequency and routes based on identified hotspots of illegal activities. The guardians are responsible for identifying those hotspots. This responsiveness is crucial for maintaining effective oversight of the project area. Moreover, dynamic community engagement strategies will be implemented to regularly reassess community needs and adapt engagement efforts accordingly. This ensures that local voices are heard and considered in project decisions. Finally, to remain competitive in credit sales, the project will adopt a market-responsive approach. Working closely with the specialized company, strategies for pricing and selling credits will be adjusted based on market demand to optimize revenue generation.

6.4 Deforestation Rate Update: supporting files

The following supporting files accompany the report shared with the auditors:

1. **Yacumama Proxy Suitability Summary.xlsx**- Contains tabulated eligibility calculations and summary statistics comparing the project and proxy areas across soil, slope, elevation, and ecoregion parameters.
2. **Suitability Reference Layers.gdb** - Geodatabase with all spatial reference layers used for the suitability analysis, including soil, slope, elevation, and ecoregion datasets.
3. **2002_Treecover.zip** - Layer representing baseline tree cover in 2002, used to establish pre-deforestation forest extent for proxy areas.
4. **TreeLoss_2002-2021.zip**- Hansen et al. global forest loss dataset clipped to the proxy areas, used to quantify observed deforestation rates over the 2002–2021 period.
5. **Yacumama_ProxyArea_Final.zip**- Shapefile delineating the seven selected proxy areas used in the analysis.
6. **Yacumama_Rate of Deforestation.xlsx**- Calculation file summarizing annual deforestation rates derived from remote sensing analysis for each proxy, consistent with Section 5.1.3 of VMD0006.
7. **Peru Spatial Dataset Bibliographic Review.xlsx**- A summary matrix of the spatial data sources consulted and their relevance to the tenure assessment.
8. **WRIDataset_PermanentAgri.tif-** Raster layer representing permanent agriculture from the *WRI Tree Cover Loss by Dominant Driver* dataset.