Piedemonte Amazónico de Caquetá, Colombia

LandScale Baseline Assessment

2024-09-24

LANDSCALE

RAINFOREST ALLIANCE · CDP DRIVING SUSTAINABLE ECONOMIES · CLARMONDIAL · CONSERVATION INTERNATIONAL

About this Report

This report presents the main results of the landscape assessment of the Andean-Amazon Piedmont of Caquetá, Colombia, which has an area of 1,138,049.4 hectares, covering eight municipalities. The assessment was carried out using the LandScale, which facilitates validation, communication, and decision-making based on critical information to measure landscape sustainability across 4 pillars: ecosystems, productivity, human well-being, and governance.

The assessment was based on information from national and regional documents, including reports from Non-Governmental Organizations (NGOs), scientific articles; as well as first-hand information gathered during workshops with stakeholders including local communities made up of farmers and indigenous people, productive sectors public institutions and local NGOs who provided insight on the state of the territory through surveys and participatory dialogues. This information implicated a rigorous verification process to ensure the adequacy and accuracy of the landscape representation. Twenty-nine indicators and 48 metrics were identified and selected as key to determining the sustainability of the landscape.

This assessment is the initial baseline of the current state of the landscape starting in 2024. It is the responsibility of the stakeholders to take ownership and undertake environmental and social governance actions to improve the sustainability of the landscape and the well-being of its inhabitants. Further assessments will depend on the willingness of interested parties and resource availability. These future assessments have the potential to demonstrate the effectiveness of current and future interventions and management to reduce deforestation caused by unsustainable agricultural practices, thus contributing to global climate and biodiversity goals, as well as promoting local and regional investment and inclusive development. The assessment was conducted by the Rainforest Alliance's Business Case initiative with support from the Earth Innovation Institute Colombia.

Contents

Executive Summary

The Andean-Amazon Piedmont landscape of Caquetá is in the department of Caquetá. It includes the mountainous zone of the municipalities of San Vicente del Caguán, Puerto Rico, El Doncello, El Paujil, La Montañita, Florencia, Belén de los Andaquíes and San José del Fragua. It covers 1,138,049.4 hectares, with altitudes ranging from 300 to 3,600 meters above sea level (masl).

Landscape sustainability was evaluated based on 4 pillars (ecosystems, human well-being, production, and governance) to better understanding the territory and its resilience as well as facilitating informed and supported decision-making and promoting the exchange of lessons learned. Regarding the ecosystem pillar, conservation is seen mainly from two approaches, the first through protected areas of the National System of Protected Areas (SINAP), established to protect biodiversity, guaranteeing ecosystem services, and preserving areas of high natural value. The second is based on other conservation figures, such as the Municipal Natural Parks (PNM) which represents 2.3% of the total area, and the Amazon Forest Reserve Zone, which represents 53.9% of the total area of the landscape.

As of 2022, 65% of the total area of the landscape corresponded to forests, with an average annual rate of change in coverage of 0.2% for the period between 2018 and 2022, with evidence of transformations associated with production due to logging and burning of trees by the year 2023, with burning figures not exceeding 100 ha. CO_2 emissions in the landscape due to biomass loss represented between the years 2001 and 2022 an annual average of 1.20 Mt CO_2 eq (Million tons of carbon dioxide equivalent), with an average annual deforestation of 4,100 ha. However, for the period from 2019 to 2022, deforestation decreased considerably to 1,143 ha/year. This could be attributed in part to institutional and social efforts to address the adverse effects of conventional livestock practices and progress in restoration processes. As for the human well-being pillar, the approximate population of the landscape is 46,000 people of which 15.4% of the total number of men and 17.1% of the total number of women live in extreme poverty, the latter being the most limited in income to supporting their families. As a result, there are high rates of malnutrition, low schooling, and deficient access to public services. It should be noted however that households have continuous access to water thanks to aqueducts' networks and due to their proximity to streams and springs scattered across the landscape.

The results in the production pillar show that the main cash crops in the landscape are coffee, cocoa, and sugarcane which have yields below the national average: coffee reaches 1,060 kg/ha compared to the national average of 1,120 kg/ha; sugarcane produces 5,240 kg/ha compared to the national average of 6,953.8 kg/ha and cocoa yields 466.9 kg/ha compared to the national average of 538.6 kg/ha; there are however 147 ha of cocoa with organic certification which represent an opportunity for cocoa farming families to expand marketing to specialized market segments. The landscape also shows significant advancement in the adoption of agroforestry systems and the establishment of commercial plantations of forest species with high economic potential such as Cedar (Cedrella odorata), Walnut (Cordia alliodora), and Abarco (Cariniana pyriformis). These practices not only promote sustainable production, but are also environmentally friendly.

In terms of governance, the landscape is home to diverse communities, actors, regional and national institutions, productive actors, public security forces, and illegal armed actors, each with opposing visions of the territory, which generate socio-environmental and economic conflicts. These are further increased by the high-level insecurity of land tenure. Only 22.8% of registered properties are duly formalized, with land ownership documents registered with the competent authority. In addition, there is evidence of conflicts associated with land use due to

the existence of oil blocks, mining titles, and appeals for uses that differ from the principles of sustainability and community rights.

In conclusion, the landscape of the Andean-Amazon Piedmont of Caquetá retains a high percentage of healthy forest and shows a trend of reduced deforestation, possibly because of changing agricultural practices and the configuration of regional, municipal, and private conservation areas. Therefore, it is a landscape that contributes to global climate change mitigation and biodiversity conservation goals by significantly sequestering greenhouse gas emissions. It's also a viable landscape for economic investment, thanks to its favorable conditions like continuous provision of ecosystem services such as water regulation, carbon sequestration and biodiversity, development of activities such as ecotourism, and scientific research, among others.

The Landscape

The Andean-Amazon Piedmont of Caquetá is a landscape located on the eastern flank of the Eastern Cordillera made up of valleys, hills, and cliffs with a climatic variability that ranges from very humid cold to very humid warm, altitudes between 300 and 3,600 masl, and temperatures ranging between 12 and 28°C. It is an area of environmental significance given the presence of ecosystem services such as carbon storage, water regulation, and genetic exchange (fauna and flora) between the Amazon and Andean bioregions that create the Andean-Amazonian corridor (Barrera et al., 2021) [1].

Current characteristics of the landscape reflect the process of colonization of the territory during the 1960s (Arcila Niño et al., 2021) [2] and the ongoing regional socioeconomic growth model which has resulted in the loss of natural areas and richness of forests and endemic species such as the Canelo de los Andaquíes (*Ocotea quixos*). This is a declared endangered forest specie recorded in three localities in Colombia, including Belén de los Andaquíes (Barrera et al., 2021) [1]. Similarly, the transformation between 2018 and 2022 of 4,059.2 ha of natural ecosystems, mainly in the Seminatural terrestrial ecosystem of fragmented forest with pastures and crops in super-humid temperate climate on ridges and mountain beams, over an area of 162.5 ha has resulted in the loss of natural areas (SINCHI, 2022) [3].

Approximately 40% of the landscape is within the Amazon Forest Reserve Zone, created by the Law number 2 of 1959 on National Forestry Economy and Conservation of Renewable Natural Resources. This regulation encourages the forestry economy and the conservation of renewable natural resources. However, according to the families settled in the landscape, it limits the allocation of land and therefore access to certain government services and incentives, such as financial credits among others.

The landscape has various conservation designations. The National System of Protected Areas -SINAP, represented in National Natural Parks (NNP), includes the PNN Alto Fragua Indi Wasi with an area of 72,744 ha, representing 6.4% of the total area of the landscape, the Picacho Mountains NNP with 76,902 ha (6.8% of the landscape), the Serranía de los Churumbelos - Auka Wasi NNP with 1,525 ha (0.1% of the landscape) and the Cueva de los Guacharos NNP with 1,148 ha (0.1% of the landscape); a Regional Natural Park (PNR) Miraflores Picachos with 106,443 ha (9.4% of the landscape), a municipal conservation area, the Municipal Natural Park (PNM) Andakí with 26.039 hectares (2.3% of the landscape) and private areas called civil society nature reserves such as El Paraíso, Las Juntas, Los Árboles de las Mesitas, and Parque Amazónico Inti Wasi, which have a total area of 1,142.4 ha and according to the zoning of the Management Plan and cover analysis, conserves 46.9 ha of natural forests.

The economy of the landscape is based on the primary sector at a small scale (livestock, agriculture and forestry) which is associated with deficiencies in infrastructure for efficient production, roads in poor condition or lack thereof, high transportation costs, high costs of agricultural inputs, lack of fair marketing spaces, and bottlenecks for the placement of products at points of trade or processing, among others. Given this situation it's common for some family members to also work for daily wages in other farms to generate extra family income in addition to the ones obtained from household production systems.

With the support of international cooperation projects and other donors, the communities have received technical assistance to improve their productive practices, become more competitive, and maintain ecosystem resilience. These projects have also strengthened organizational processes and defined collective commitments for the well-being of families. Despite these efforts and advances, there is still a wide gap between production and the market, i.e., a significant difference between the number of products or goods produced and the amount that

is sold in the market, along with fair prices, quality, and stable demand, among other variables. This situation puts environmental sustainability at risk because villagers cut down the forest and expand their crops within protected areas and the agricultural boundaries to obtain greater production and income.

Andean-Amazon Piedmont boundary of Caquetá

Own elaboration

Finally, the landscape has been hard hit by the internal armed conflict, a factor that has increased the gaps between inequality and high levels of poverty (DANE, 2021) [4]. This means that about 14% of the organizations participating in the evaluation process have suffered some episode in which one or more leaders have been threatened for defending collective rights or natural resources situations are rarely denounced by the threatened people displacement or violent retaliation.

Andean-Amazon Piedmont boundary of Caquetá.
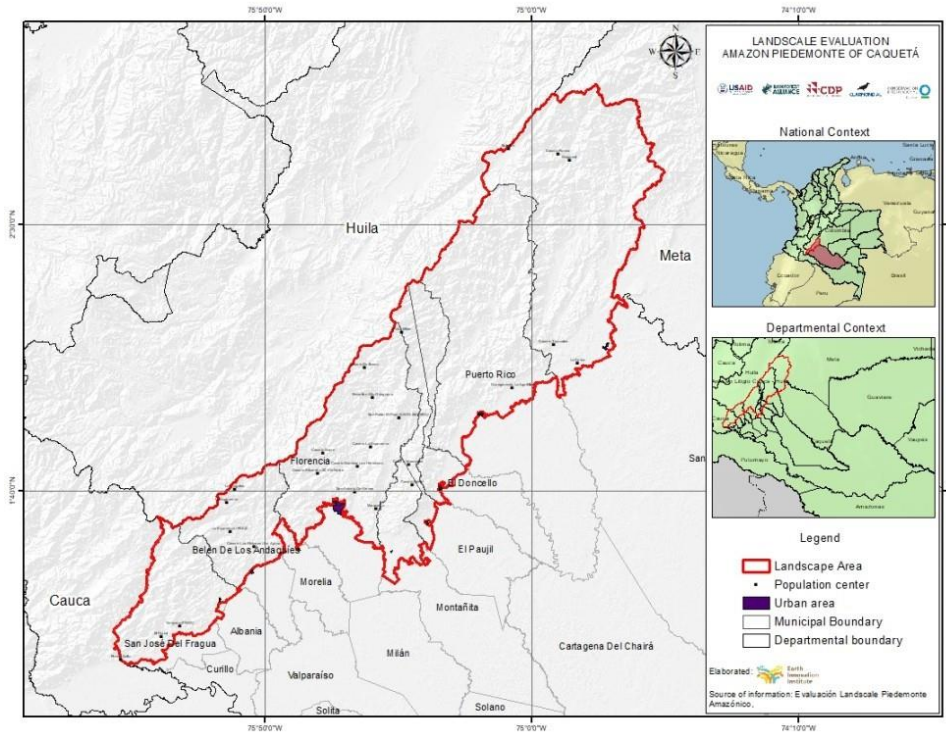
Own elaboration.

Landcover distribution.

Landcover	Km2
Urban fabric	5
Industrial, commercial and transport units	1
Arable land	7
Pastures	1 843
Heterogeneous agricultural areas	1 413
Forests	6 748
Scrub and/or herbaceous vegetation associations	1 293
Inland waters	64
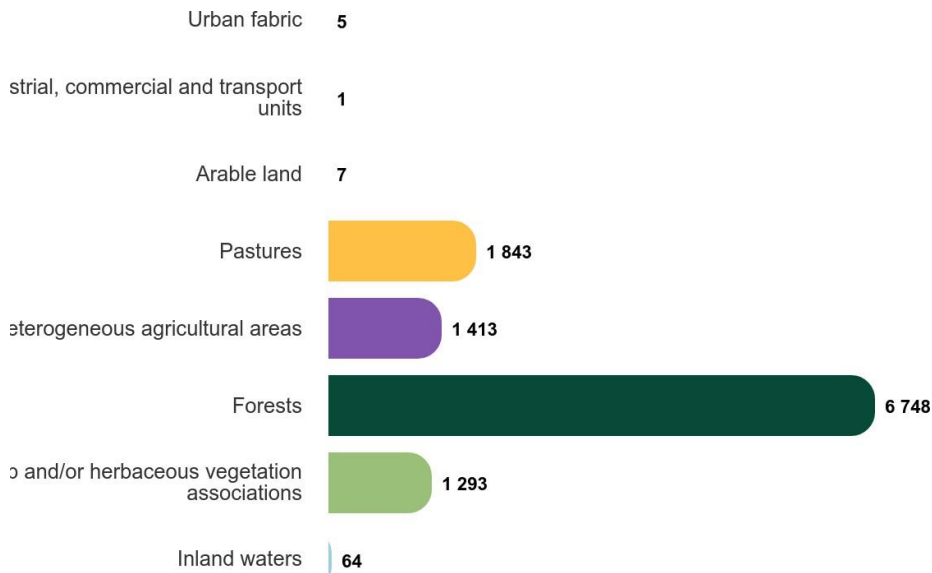
Landcover distribution in Km2.

Natural Ecosystems

750,227 hectares

There are 37 types of natural terrestrial ecosystems in the Andean-Amazon Piedmont of Caquetá, and 750,227 hectares in forest cover in 2022, correspon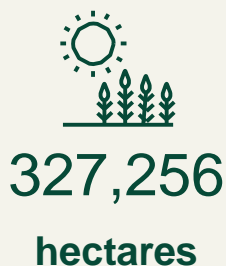ding to 65.9% of the total area of the landscape. This shows the degree of landscape well-being as a result of the different conservation designations and strategies for ecosystem connectivity and restoration processes implemented to ensure and maintain biodiversity, ecosystems, and the ecosystem services they provide in the long run.
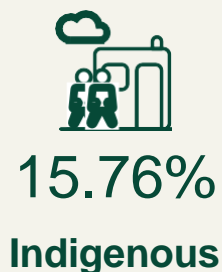
Communities

15.76% Indigenous

The population with the greatest presence in the landscape are peasants. The young population predominates with children aged between 0 and 10 years being the largest age group (21% of the estimated total population of 46,000 people) (DANE, 2021) [4]. 15.7% of the population are indigenous people settled in 23 indigenous reservations and 29 cabildos (Directive or traditional indigenous authority, Decree 1088 of 1993) distributed in the 8 municipalities. It is important to note that according to national legislation, the Indigenous communities and peoples have their own autonomous government with voice and vote. Therefore, their active participation in the workshops and willingness to share their ancestral knowledge and practices for the use and management of the territory and natural resources was key to the development of this assessment.

Production

327,256 hectares

Landscape conversion between 2020 and 2022 for the development of agricultural activities was 327,256 ha corresponding to 0.3% of the total area of the landscape (SINCHI, 2022) [3]. The main activities are livestock and cash crops such as coffee, cocoa (through agroforestry systems), and sugarcane among others, grouped in Peasant, Family, and Community Agriculture – ACFC systems. Coffee crops are present in 115 villages, while cocoa in 181 and sugarcane in 42. The yields of these crops are below the national average, producing 1,060 kg/ha in average for coffee against a national average of 1,120 kg/ha, for cocoa the national average is 538.6 kg/ha and in the landscape, it is 466.9 kg/ha, and finally for sugarcane, there is a production of 5,240 kg/ha in the landscape compared to the national average of 6,953.8 kg/ha. It's worth noting that cocoa and coffee-producing families have begun to position themselves in differentiated markets by obtaining organic certifications.

Landscape Partners & Stakeholders

Relationships were established with stakeholders during the seven months of the development of the landscape assessment, such as environmental, productive, and social organizations, local and regional public institutions, and private and trade associations. In total, 134 organizations with direct and indirect intervention in the territory were identified highlighting those with a significant environmental focus, such as the Tierra Viva Foundation, followed by the productive ones such as the Association of Alternative Agroforestry Producers of Belén (ASPROABELEN) and the Committee of Cocoa Growers of the municipalities of El Paujil and El Doncello (COMCAP), and social organizations, such as the Association of Indigenous Councils of El Wala (ASSOTEWALA) and the Association of Community Action Boards (ASOJUNTAS).

The needs of the landscape stakeholders were identified to the extent that they participated and provided inputs, which is key to consolidating a resilient and sustainable landscape. Both opportunities and threats were evaluated, resulting in proposals for joint actions aimed at conservation and sustainable development.

Similarly, it's important to highlight the active participation of the ethnic population, primarily from the Indigenous population during the multi-stakeholder dialogue spaces for decision-making. Considering their unique worldview, they contributed significantly to the definition and relevance of landscape conservation. The role played by women leaders in these spaces deepened the analysis with their unique perspective, and strengthened the position of their vision towards sustainability and equity.

Featured Results

The evaluation of the landscape of the Andean-Amazon Piedmont of Caquetá was carried out through the analysis of 48 metrics selected from the criteria proposed in the LandScale Framework version 1.0. 18 metrics correspond to the ecosystem pillar, 9 metrics to the productive pillar, 9 metrics to governance, and 12 metrics to the human well-being pillar. This selection provides a comprehensive view of the sustainability performance of the landscape, combining data from reliable secondary sources with primary data and feedback collected during the participatory process. The most relevant results of the assessment are presented by pillar. Full details of the assessment can be found at
https://platform.landscale.org/profile/piedemonte-amazonico-de-caqueta/overview

Ecosystems

Conserve and restore natural ecosystems

Effective conservation and protection of natural ecosystems

Natural ecosystem conversion

Natural ecosystem degradation

Ecosystem restoration

Natural ecosystem connectivity

Protect and restore biodiversity

Threats to species

Biodiversity habitat conversion

Biodiversity habitat degradation

Biodiversity habitat restoration

Biodiversity habitat protection

Maintain and enhance ecosystem services

Water quality

Agriculture, forestry & other land use (AFOLU) sector GHG sources and sinks

Human Well-Being

Improve standard of living, especially for vulnerable and/or marginalized groups

Household income & assets

Health & nutrition

Education

Water, sanitation & hygiene

Basic infrastructure

Respect, protect, and fulfill human rights

Indigenous peoples' and other marginalized groups' right

○ CORE ○ LANDSCAPE-DEPENDENT ○ OPTIONAL ○ CUSTOM INDICATOR ✓ RESULT AVAILABLE

Governance

Recognize and protect rights to land and resources, and reduce related conflicts

Land tenure	⊘
Land conflicts	⊘

Promote transparency, participation, inclusion, and coordination in landscape policy, planning, and management

Land-use plan adoption & enforcement	⊘
Coordination of government agencies in land-use policy, planning & management	⊘
Stakeholder participation and inclusion in land-use policy, planning, and management	⊘
Climate change vulnerability and adaptation	⊘

Production

Promote regenerative, agricultural, agroforestry, and tree production systems

Agricultural, agroforestry & tree plantation productivity	⊘
Input use efficiency in agricultural, agroforestry & tree production systems	⊘
Adoption of sustainable land management practices	⊘
Adoption of sustainable waste management practices	⊘

Promote sustainability of other natural resource-based production sectors

User-defined indicator(s)	⊘

Validated Result: Ecosystem conserved and restored

The evaluation of the landscape of the Andean-Amazon Piedmont of Caquetá shows that the conserved ecosystems are protected under different conservation and protection categories (Figure 1)."Biodiversity conservation" is represented through the SINAP areas such as the National Natural Parks (Alto Fragua Indi Wasi, Cordillera de los Picachos, Cueva de los Guacharos and Serranía de los Churumbelos), the Regional National Parks (Parque Natural Regional Miraflores Picachos) and the RNSC (El Paraíso, Las Juntas, Los Árboles de las Mesitas, and Parque Amazónico Inti Wasi) (Figure 2) (RUNAP, 2023) [5]. These areas cover approximately 258.810 ha, which represents 22.7% of the total surface and were established with the purpose of conserving the natural supply of ecosystem services, the preservation of the natural environment, and the safeguarding of the areas with high intrinsic value for biodiversity due the presence of species and/or ecosystems that are relevant on a national or global scale, including their contribution to mitigating the impacts of climate change. Other conservation designations include the Amazon Forest Reserve Zone which represents 53.9% of the total area of the landscape with 322,899 ha in Type A, and 255,485 ha in Type B. (SIAC, 2023) [6], and the Andakí Municipal Park. The latter is the result of a social initiative where approximately 26,030 hectares have been restored.

Concerning landscape restoration, connectivity corridors have been identified as a complementary form of conservation and natural restoration contributing to the maintenance of the stability and integrity of the natural ecosystems. Connectivity corridors ensure species dispersal, and gene flow necessary to maintain populations and ecological functions at the landscape level (SINCHI, 2020) [7]. The total area of these corridors is 198,258.1 ha, corresponding to 17.4% of the total landscape area (CORPOAMAZONIA, 2022) [8], including the Amazon Forest Reserve Zone and the Andakí Municipal Natural Park (in Belén de los Andaquíes).

Fig 1. Conservation areas.
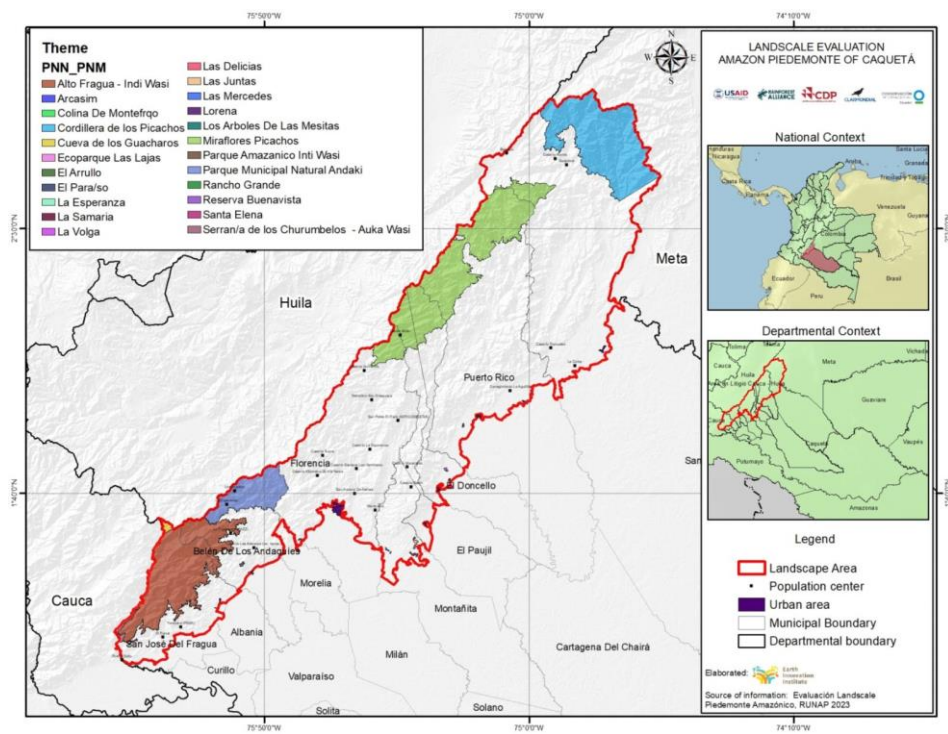
Own elaboration based on RUNAP 2023.

Fig 2. Biodiversity Conservation Areas.

Name Park	Category	Area hectares	%
Alto Fragua - Indi Wasi	National Natural Park	72.744,3	6,4
Picacho Mountain Range		76.902,1	6,8
Guacharos Cave		1.148,5	0,1
Churumbelos Mountain Range - Auka Wasi		1.524,9	0,1
Arcasim	Civil Society Nature Reserve	2,9	0,0003
Montefrio Hill		0,5	0,00004
El Paraíso		1,0	0,0001
Las Juntas		28,4	0,002
Las Mesitas Trees		3,7	0,0003
St. Helena		3,5	0,0003
Inti Wasi Amazon Park		6,9	0,001
Miraflores Picachos	Regional Natural Parks	106.443,0	9,4
Andaki Municipal Natural Park	Municipal Natural Park	26.029,8	2,3
TOTAL		**284.839,5**	**25,0**

Own elaboration based on RUNAP 2023.

Fig 3. Landscape areas that form connectivity corridors.
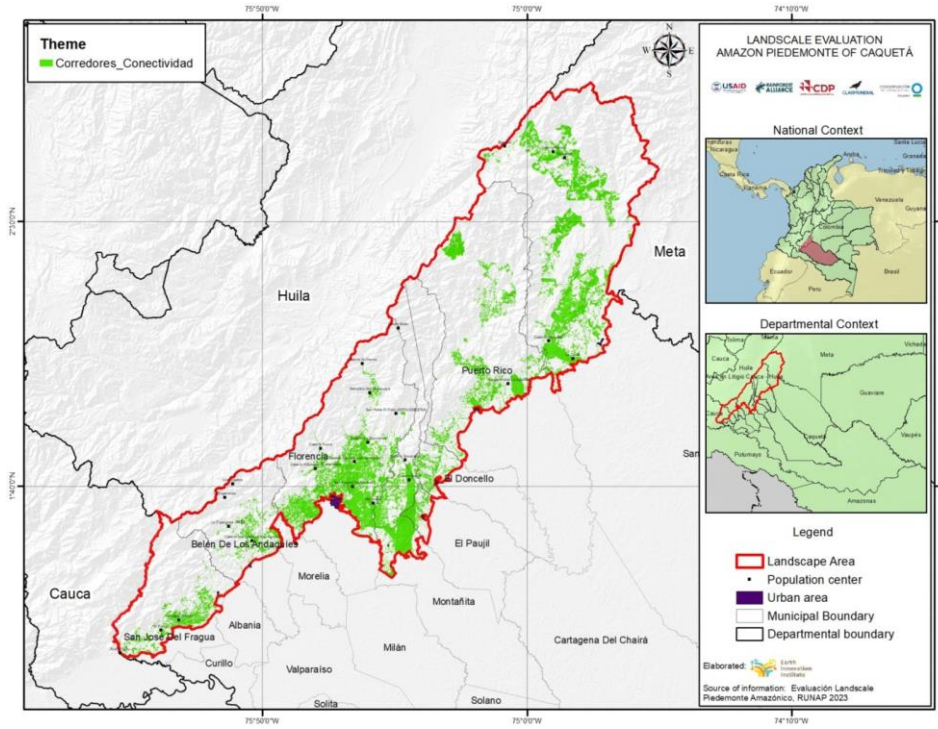
Own elaboration based on the Environmental Determinant "Forests at risk of deforestation" CORPOAMAZONIA 2022.

Validated Result: Deforestation in the Landscape

The Andean-Amazon Piedmont landscape of Caquetá had 750,227 ha of forest cover in 2022, equivalent to 65% of the total area of the landscape (Figure 4). Between 2001 and 2022, the accumulated deforestation in the landscape was 90,202 ha with an annual average deforestation of 4,100 ha. However, it is important to highlight that in recent years (between 2019 and 2022) the annual rate of deforestation was reduced to an average of 1,143 ha. (SINCHI, 2022) [3].

During the same period between 2001 and 2022 the total value of net Greenhouse Gas (GHG) emissions from biomass loss was 26.4 Mton CO2 Eq, where 86.70% of emissions came from the forestry sector, 11.56% from the agricultural sector and 1.74% from other sectors (IDEAM, 2018) [9]. From 2018 to 2022, emissions in the landscape were 2.4 Mton CO2 Eq with an annual average of 0.4 Mt CO2 eq (Figure 5) (IDEAM, 2022) [10]. This reduction is largely attributed to social and institutional interventions aimed at addressing the challenges of vulnerability to climate change such as the creation of Municipal Natural Parks, the implementation of sustainable and low-emission production systems, such as cocoa agroforestry systems and silvopastoral systems, and watershed restoration.

Fig 4. Estimated forest and non-forest areas in 2022.
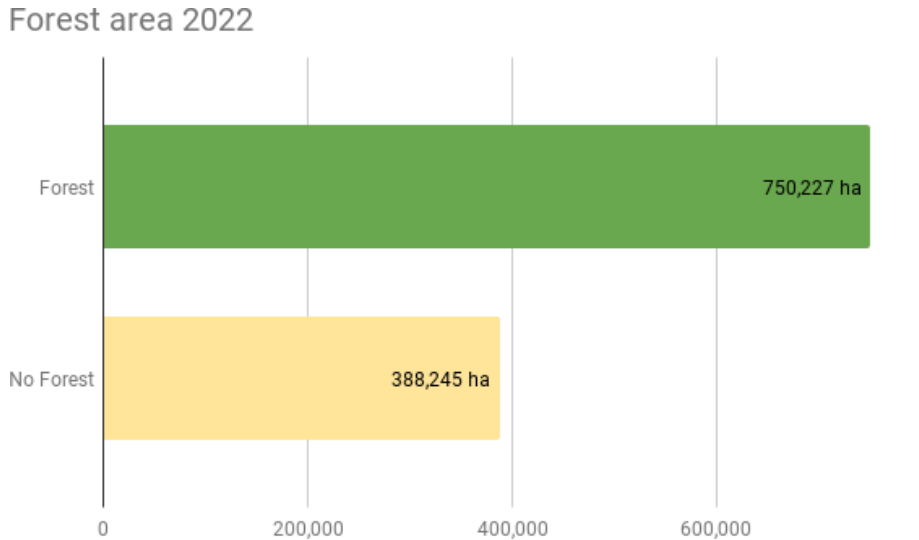
Own elaboration based on SINCHI 2022.

Fig 5. Annual emissions from deforestation Mt Co2eq years 2001-2022.
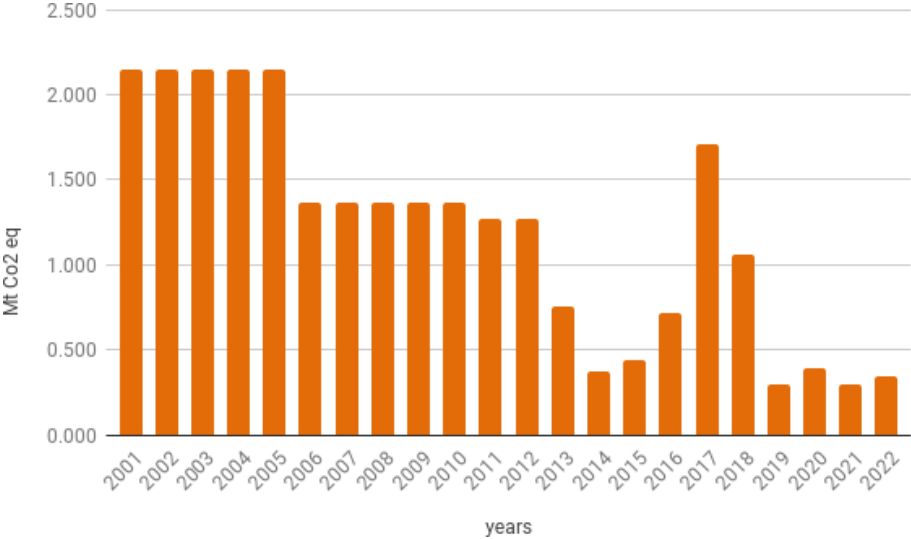
Own elaboration based on IDEAM 2018 and 2022.

Validated Result: Natural Ecosystem Degradation

Since 2002, anthropogenic actions have notably decreased the net area of native forests in the Amazon. In the Andean-Amazon Piedmont landscape of Caquetá 4,059 ha of forests have been converted to pastures and crops between 2018 and 2020 (Figures 6 and 7). Between 2020 and 2022, a total of 3,394.3 ha has been converted with an annual rate of conversion of 2,484.5 ha/year (Figure 8 and 9), (SINCHI, 2022) [3]. As a result of these dynamics, 6% of the landscape has been deforested, or the equivalent of 68,575 ha, causing the loss of ecological integrity, and affecting vital connections between the Andes and the Amazon with direct implications on biological, genetic, and ecological flows responsible for maintaining hydro-climatic security (SINCHI, 2020) [7]. Likewise, it has generated ecosystem degradation which limits the consolidation of a green and sustainable economy.

In this context, priority must be given to the prevention of deforestation. Some proposed actions are the productive restoration of 388,245 degraded hectares in the landscape to promote the development of a bioeconomy district that generates agreements across the supply chains and value networks of biodiversity products such as fruits, fibers, medicines, ecotourism, and others (Government of Caquetá, 2024) [11]. Likewise, sustainable management of natural resources is proposed based on community forestry, improvement of agrifood systems, adoption of livestock practices based on regenerative processes, and strengthening the productive and organizational capacities of the population living in the landscape.

Fig 6. Ecosystem areas with changes between 2018 and 2020.

Exchange Rate	Change Category	Area in hectares	total % of landscape
Areas of high dense forest from upland to cultivated areas	Natural to Seminatural	1077,3	0,09
Areas of high dense upland forest to clean grasslands	Natural to Seminatural	1242,8	0,1
Other exchange rates		1739,1	0,15
TOTAL		4.059,0	0,34

Own elaboration based on SINCHI 2020.

Fig 7. Ecosystem transformation map for the period 2018 - 2020.
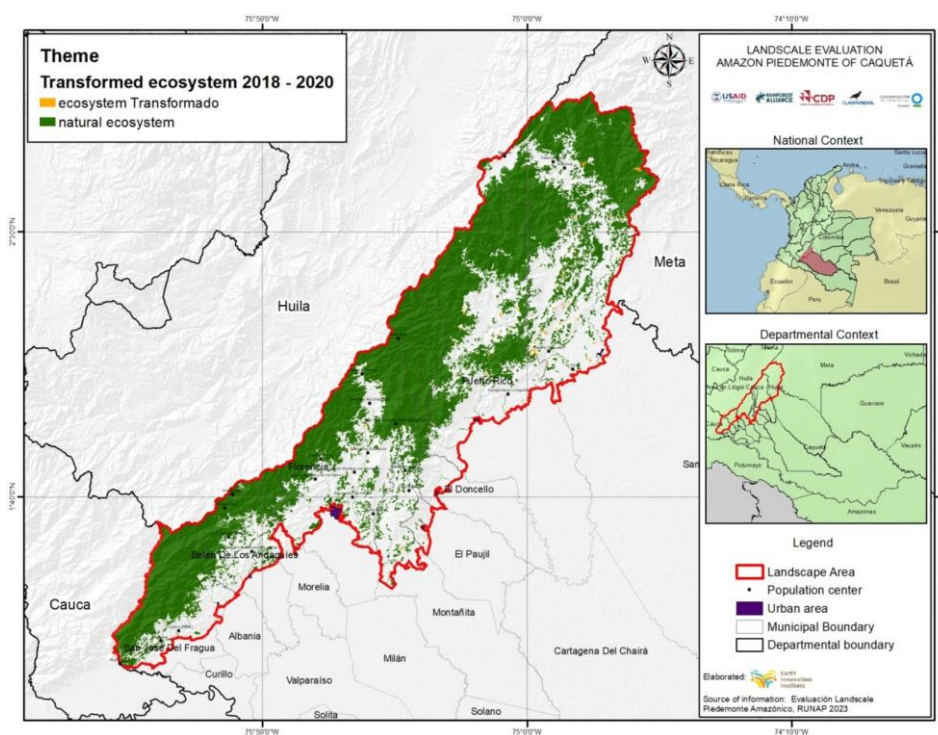
Own elaboration based on SINCHI 2020.

Fig 8. Ecosystem areas with changes between 2020 and 2022.

Exchange Rate	Change Category	Area in hectares	total % of landscape
Areas of high dense forest from upland to cultivated areas	Natural to Semi-natural	880,5	0,08
Areas of high dense upland forest to clean grasslands	Natural to Semi-natural	2.136,3	0,19
Other exchange rates		377,5	0,03
TOTAL		3.394,5	0,3

Own elaboration based on SINCHI 2022.

Fig 9. Ecosystem transformation map for the period 2020 - 2022.

Own elaboration based on SINCHI 2022.

Validated Result: Land tenure and conflicts

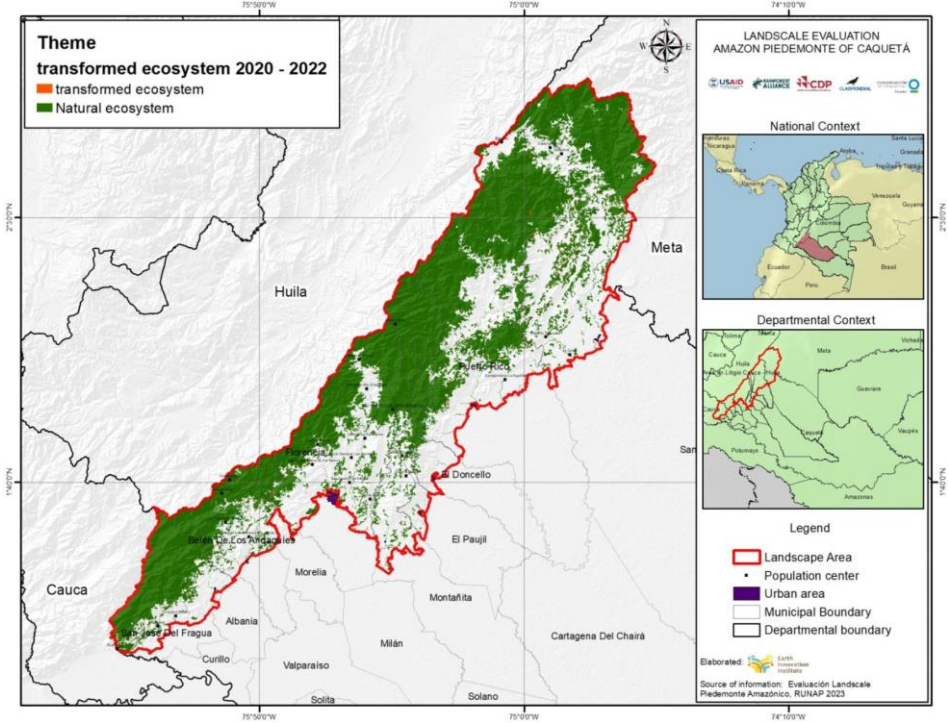Access to land in Colombia has historically been a significant issue of political power and social conflict. It has also been a key determinant in the productivity of the rural economy, characterized by underutilization of land and a tendency towards land concentration. This concentration has led to increased environmental risks due to excessive land use for cattle grazing, a persistent issue in the landscape. This has caused the expansion of the agricultural boundaries with natural areas turning them into fragile lands and generating serious environmental risks and social problems (Vargas Rivera, 2007) [12].

Only 259,911.9 hectares of the landscape equivalent to 22.8% of the total landscape, are formally registered (Figure 10) (IGAC, 2022) [13]. According to perceptions gathered during the workshops this low percentage of formalization, makes it difficult for rural families to access certain incentives while discouraging private investment.

It is also important to mention the existence of mining and oil blocks concessions and pending approvals which total 56,960.4 ha that correspond to 4.9% of the total area of the landscape. These areas overlap with areas of major human settlement, which have given rise to social, economic, cultural, political, and environmental conflicts in the context of a weak presence of the State. (Figure 11) (ANH, 2024) [14] and (ANM, 2024) [15].

With this context in mind, it is essential to advance towards a multipurpose cadastral tenure system in the department of Caquetá, moving beyond the traditional model. This involves creating territorial information that guarantees legal property security and ensures adherence to associated rights and responsibilities. This approach is crucial for supporting decision-making regarding land use, particularly in allocating mining titles and areas designated for hydrocarbon exploration and exploitation. The multipurpose cadastre is a tool that takes force with the Peace Agreement in Colombia in 2016 and in the current National Development Plan of Colombia 2022-2026 "Colombia Power of Life". This tool seeks to provide greater legal security, real estate market efficiency, development and land management, with many benefits for the territory and to achieve peace. However, in the Amazon of Colombia there is still no evidence in this regard.

Recommendations include developing a decentralized registry, recognizing it as a tool that provides territorial information to citizens and all levels of the State. This will support land use planning, productive land use, formalization and restitution of property rights, and the management and reduction of land use conflicts, among others.

Fig 10. Areas with cadastral registration.
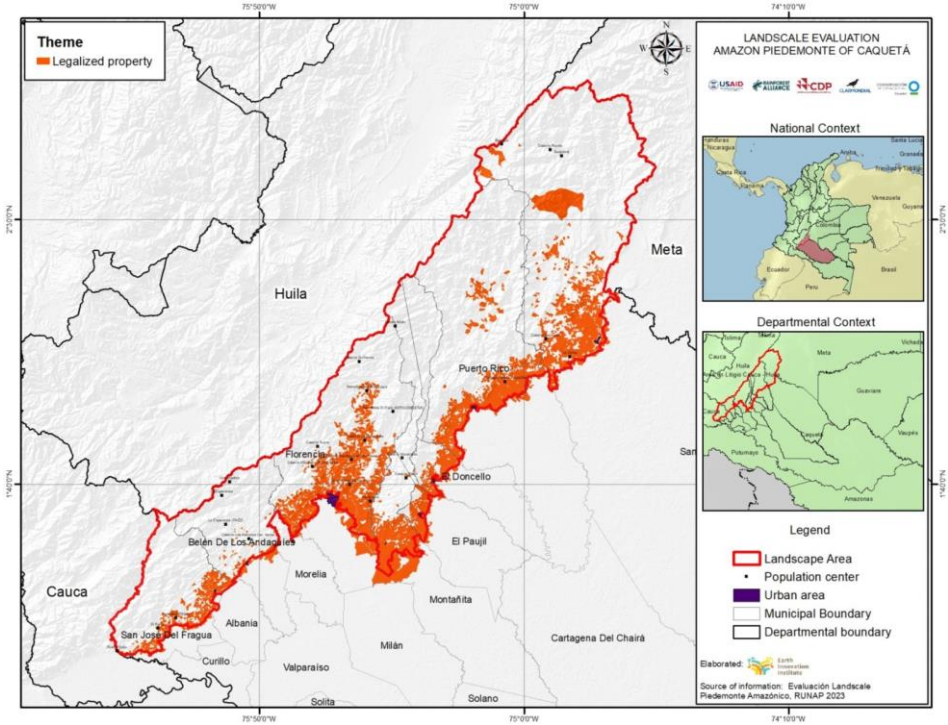
Own elaboration based on IGAC 2022.

Fig 11. Map of land and mining polygons.
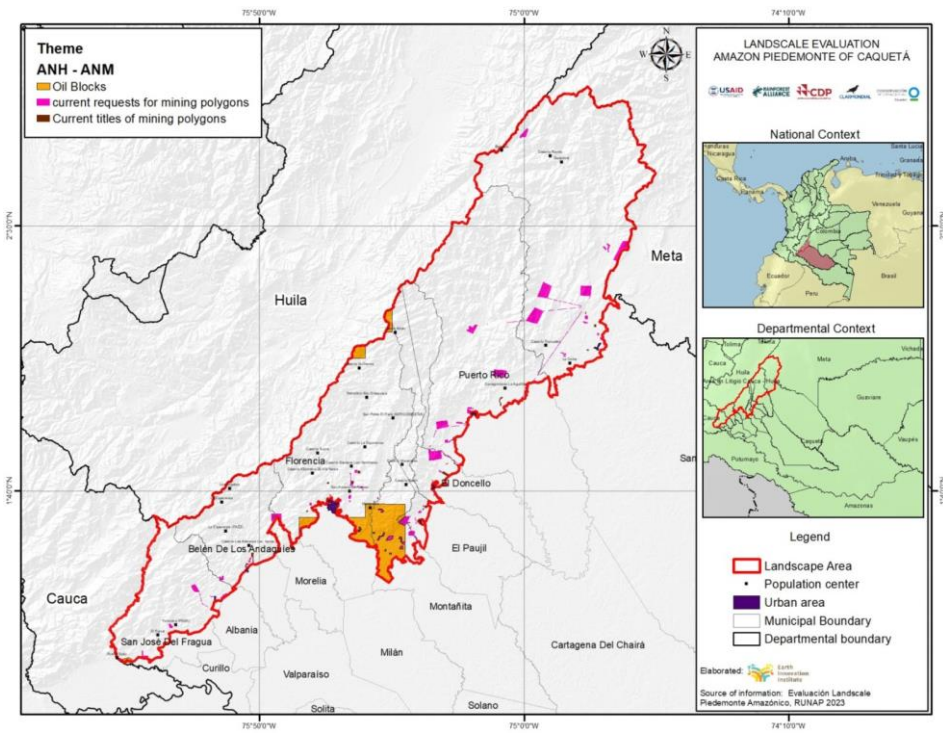
Own elaboration based on ANH and ANM 2024.

Validated Result: Landscape planning and management

In the department of Caquetá, various scenarios for social and institutional participation have been developed at different scales and times to discuss and propose territorial planning and management instruments. Since the enactment of Law 388 of 1997, known as the "Territorial Development Law," public policies on rural development have been issued. Notably, the Strategic Public Policy Guidelines for the Sustainable Rural Development of Caquetá were adopted through Departmental Decree No. 1355 of 2019 (Government of Caquetá, 2019) [16]. These guidelines promote the equitable and rational use of land, the preservation and defense of ecological and cultural heritage, risk and disaster management, the promotion of sustainable economies, and the strengthening of governance, all while respecting the autonomous exercise of municipalities.

The analysis of the Land Management Plans and Arrangements reveals two critical aspects: first, the lack of evidence of a participatory and inclusive process of all stakeholders in land use policy, planning, and management; second, the absence of government coordination in these areas among the different sectors. Regarding the participatory process, not only is participation in decision-making meetings limited, but also partisan interests and those of some economic sectors are generally prioritized, for example, among the problems identified are outdated instruments and land use allocations that benefit only a few actors.

Similarly, there is no evidence of effective coordination and articulation between the planning instruments of the different sectors at the national level. This deficiency creates conflict in the territory, an example of this being the titling of non-permitted areas in the Amazon Forest Reserve Zone.

Validated Result: Territorial Governance

The identification and understanding of the conflicts that coexist in the territory was one of the determining aspects in the construction of the action plan for the Andean-Amazon Piedmont landscape of Caquetá. This landscape is made up of Afro-Colombian, Indigenous, and peasant communities that have established their particular relationships with the territory and have given the region a multicultural character.

Institutions, public entities, private companies, and illegal armed actors converge in the landscape, with different visions of the territory based on legal and illegal systems, which represent different territorial planning figures and categories. This diversity generates disagreements and conflicts within the communities due to the political, social, economic, and environmental relations established between them.

Three types of territorial conflicts have been identified due the overlapping of land use, zoning, and management plans between actors.

First, the intercultural conflicts over land use planning and access to land arise from the overlapping aspirations and requests for community land-use planning, intercultural conflicts over special jurisdictions, and conflicts over access to land (Figure 12). The conflicts between the indigenous reserves of La Cerinda (Embera Katío) and El Portal (Nasa) with the Alto Fragua Indi Wasi PNN stand out (ANT, 2024) [17], (RUNAP, 2023) [5], (SIAC, 2023) [6].

Second, the environmental conflicts over the use and management of natural resourcescreate tensions derived from the presence of peasant communities in protected areas; conflicts related to mining titles and concessions; and tensions over land use and its impact on water and the environment. A clear example of this scenario is the one presented in Alto Fragua Indi Wasi NP with the peasant farmers occupying the northeastern zone of the protected area.

Third, conflicts over development models and land use are generated by the pressure to meet different visions of landscape development and land use. These conflicts have led to a very high degree of vulnerability in an estimated area of 33,321.10 ha (Figure 13) corresponding to 2.9%, high in 449,593.78 ha equivalent to 39.5% and medium in 655,134.52 ha, that is, in 57.6% of the total area of the landscape (SIAC, 2023) [18].

Fig 12. Map of overlapping conservation figures with respect the indigenous reserves.
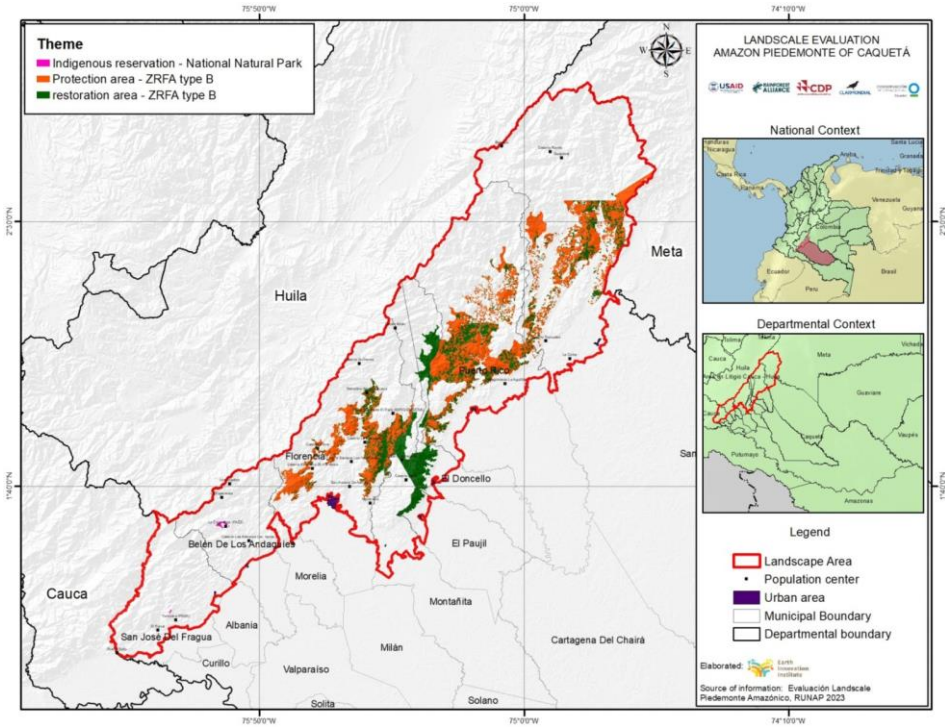
Own elaboration based on ANT 2024, RUNAP and SIAC 2023.

Fig 13. Areas vulnerable to climate change.
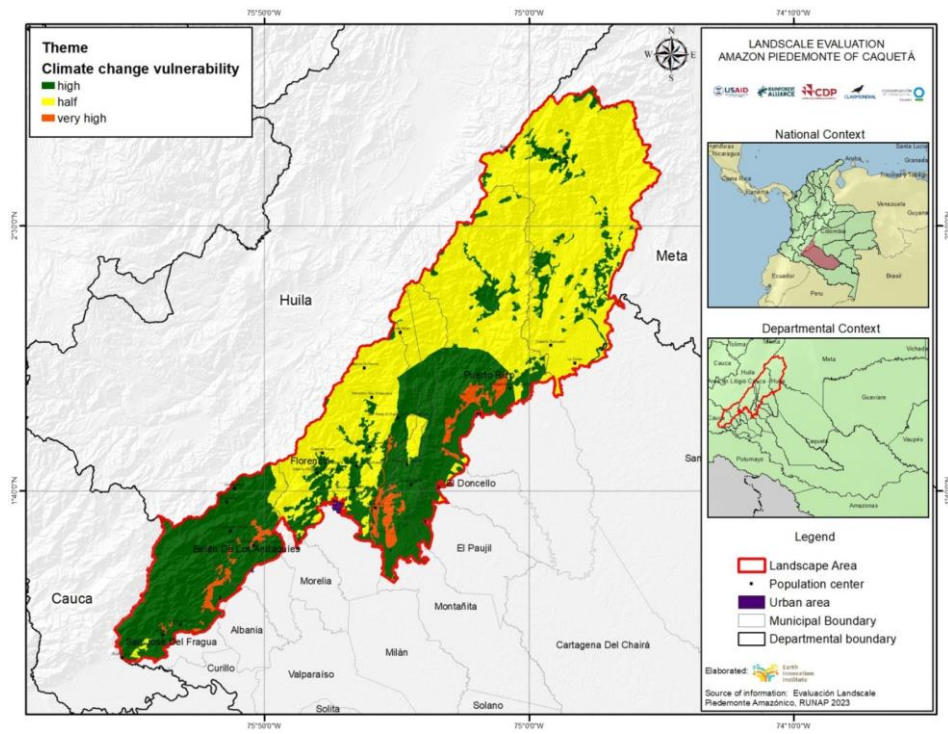
Own elaboration based on SIAC 2023.

Validated Result: Landscape Productivity

Efficient use of natural resources and innovative production practices are key to improving people's livelihoods while conserving the natural environment. However, between 2016 and 2022 yield figures for the main cash crops, such as cocoa, coffee, and sugarcane, show yields below the national average (Figure 14) (AGRONET, 2022) [19] and (FEDEPANELA, 2023) [20]. Coffee presents the closest yield to the national average for the period, reaching 94.6%, followed by cocoa with 86.7%, while sugarcane shows a significantly lower yield of only 75.3%.

Organic certification represents an opportunity for coffee and cocoa crops (Figure 15) as it opens doors to differentiated and international markets and generates greater economic and social benefits for producers in the landscape. In addition to promoting environmentally friendly practices, certification can help guarantee the production of healthy, high-quality food. Currently, 100.5 hectares of cocoa have been certified organic in the landscape, 67.5% of which are in the municipality of Belén de los Andaquíes (Figure 14). As for coffee, although workshops with the community and organizations report that the certification process has begun detailed figures on certified areas in the landscape are not yet available.

Timber species of high market value are being established in five (5) municipalities of the evaluated landscape (El Doncello, El Paujil, Florencia, Puerto Rico and San José del Fragua), although the area of commercial plantations has not been determined. Tree species such as Cordia alliodora and Cariniana pyriformis, can reach a timber production of 140 and 160 cubic meters per hectare respectively at the end of a 20-year cycle (UGRA, 2018) [21]. It is important to note that the Colombian Forestry Incentive Certificate (CIF) created by Law 139 of 1994, grants the establishment and maintenance of commercial plantations of certain forest species, including those mentioned above (FINAGRO, 2020) [22].

Fig 14. Yields per crop in the landscape versus national average.
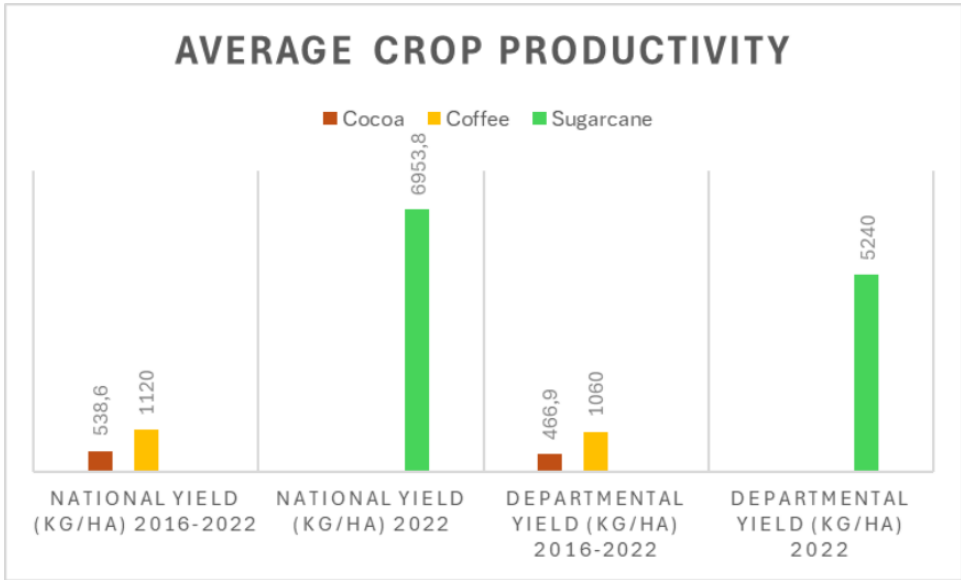
Own elaboration based on Agronet, Ministry of Agriculture and rural development 2016-2022 and FEDEPANELA 2023

Fig 15. Percentage of areas with organic certification by landscape municipality.
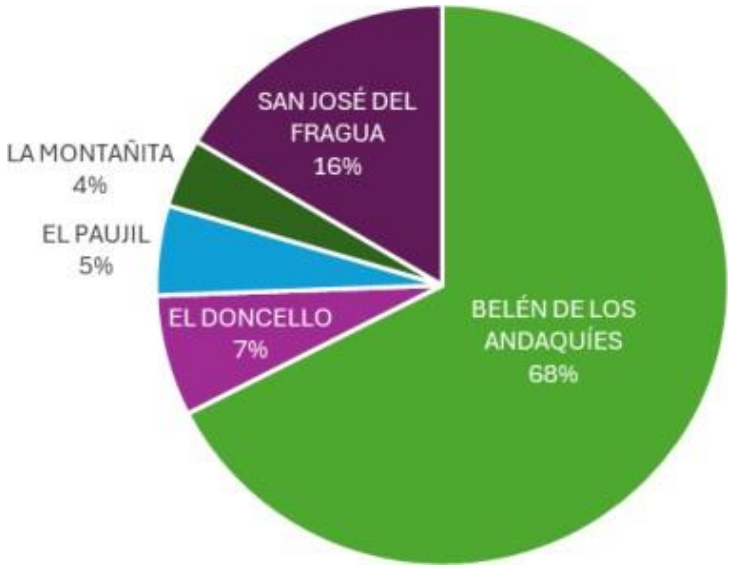
Own elaboration based on Asociación Agrícola Orgánica de Cacaoteros del Municipio de San José del Fragua - ASOACASAN, Asociación de Productores Agroforestales Alternativos de Belén de los Andaquíes - ASPROABELEN & Comité de Cacaoteros de los Municipios de El Paujil y El Doncello - COMCAP 2024.

Validated Result: Population Health in the Landscape

The analysis of the population's health in the Andean-Amazon Piedmont landscape of Caquetá reveals a complex situation regarding access to health care, especially in early childhood. According to data from the Department of Epidemiological Surveillance System (SIVIGILA) (Epidemiological bulletin, 2023) [23] the incidence of malnutrition in children under 5 years of age varies across municipalities. In Belén de los Andaquíes, the rate is 0.20%; in El Doncello, it is 0.46%; in San José del Fragua, it is 0.54%; in Florencia, it is 0.39%; in La Montañita, it is 0.27%; in Puerto Rico, it is 0.39%; in San Vicente del Caguán, it is 0.48%; and in El Paujil, it is 0.67%, the highest figure recorded in the landscape municipalities (Figure 16). Overall, 59.44% of cases occur in municipal capitals, 27.2 in dispersed rural areas, and 13.33% in populated centers.

Given the available data, it is crucial for healthcare entities, such as the Colombian Health Department, to take urgent action. This population group which forms the base of the population pyramid in the landscape represents 21% of the total population. (Information taken from DANE-Terridata and averaged with the population of the landscape).

Regarding infant mortality average rates in the landscape, in the last five years in children under five years of age between 14.6 and 31.4 deaths per 1,000 live births have been recorded (Figure 17) with the municipality of El Paujil having the highest average infant mortality rate with 31.4 deaths, followed by San Vicente del Caguán with 21.9, Puerto Rico with 21.6 and Belén de los Andaquíes with 21.3 according to official information from the 2018 national population and housing census (DANE, 2018) [24]. The main causes of death are associated with infectious diseases, including pneumonia, diarrhea, and malaria, along with premature birth, asphyxia, perinatal trauma, and congenital malformations, coupled with barriers to access to health services for the rural population. The average national infant mortality rate since 1998 has shown a downward trend. For the year 2023 (preliminary data) the infant mortality rate was 10.82 deaths per thousand live births (DANE, 2018) [24]). However, compared to the report for the municipalities in the landscape, deficiencies in the provision of services by the State persist.

Finally, 36.3% of the population in the landscape has unsatisfied basic needs (UBN) due to the State's insufficient presence. The municipality with the highest malnutrition rate is El Paujil with 0.67% in children under five years of age; 18% of the adult population in the landscape has not completed primary school (DANE, 2021) [4]. On the other hand, water purification is not registered in the dispersed rural sector; however, it was learned that families have access to this service through different artisanal mechanisms such as the veredal aqueducts and direct access to water sources to supply their homes, which in turn nourish rivers such as Bodoquero, Pescado, Fragua Chorroso, Pescado, Fragua Chorroso, Caguán, Orteguaza and others that supply the municipal aqueducts of San Vicente del Caguán, Puerto Rico, El Doncello, El Paujil, La Montañita, Florencia, Morelia, Belén de los Andaquíes, San José del Fragua and Albania.

Fig 16. Percentage of the population under 5 years with malnutrition.

Malnutrition under 5 years of age	
Municipality	**Incidence**
Belén de los Andaquíes	0,20%
El Doncello	0,46%
El Paujil	0,67%
Florence	0,39%
La Montañita	0,27%
Puerto Rico	0,39%
San José del Fragua	0,54%
San Vicente del Caguán	0,48%

Own elaboration based on Epidemiological bulletin 2023.

Fig 17. Average mortality rate over the last 5 years.

Average mortality rate last 5 years (1,000 live births)	
Municipality	**Incidence**
Belén de los Andaquíes	21,3
El Doncello	19,9
El Paujil	31,4
Florence	14,6
La Montañita	18,6
Puerto Rico	21,6
San José del Fragua	19,2
San Vicente del Caguán	21,9

Own elaboration based on DANE 2018.

Conclusion

The evaluation of the Andean-Amazon Piedmont landscape of Caquetá reveals that the area is in a good state of conservation, thanks to the existing management plans (National Natural Parks, Regional National Park, Civil Society Natural Reserves, Municipal Natural Parks, and Forest Reserve Zone) and the joint efforts of communities and institutions to keep the forests standing.

Although the rate of deforestation in the landscape is low compared to other areas of the department, such as the Amazonian plain adjacent to the Serranía del Chiribiquete National Natural Park, significant concerns remain. Climate vulnerability is a tangible reality in the region, underscoring the urgency of concrete actions to strengthen resilience to future environmental and climate impacts. These actions include the implementation of low-carbon production models, the integration of natural capital into supply chains based on bioeconomy principles (e.g. cacao established in agroforestry systems with chestnut or acai), the promotion of social and institutional (e.g. public-private) agreements and alliances at the landscape level, and the promotion of clean energy use.

From a social perspective, local communities face a high level of unsatisfied basic needs that should be addressed promptly by the State. It is essential to develop and implement public policies designed to inclusively address social inequalities, especially targeting the most vulnerable groups. Likewise, the strengthening of governance structures in terms of the formulation and implementation of the Landscape Action Plan – LAP is needed.

It is equally important to improve the legal security of land tenure to close the identified gaps and attract private sector investment, incorporating a gender focus in this process given that women play a fundamental role in the management of agrobiodiversity and act as caretakers and providers of food and water for their families. Local women have cultivated an extensive body of knowledge associated with the responsible use of biodiversity and the management of their territory.

These visions can only be achieved through the integration of local knowledge, technology, and the capacities of all the actors involved, establishing organizational and institutional structures that clearly define the relationships between each actor. This approach will prevent the fragmentation of efforts and resources while enabling the effective management of environmental challenges. By leveraging the unique opportunities and addressing the specific needs of the territory, a more cohesive and impactful strategy can be developed.

Appendices

- Validated Metric Results

- Sustainable Landscape Partnership/Stakeholders

- Adjacency Analysis

- Landscape Overview

- Indicator and Metric Selection

- Data Evaluation

- Stakeholder Engagement

Endnotes

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