

Building Water Resilience in Bogotá and the Region

ANNEX 6

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND MANAGEMENT PLAN (ESMP)

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Acronyms

AGM	Accountability and Grievance Mechanism
AZE	Alliance for Zero Extinction
BMP	Biodiversity Management Plan
CAR	Regional Autonomous Corporation
CHMP	Cultural Heritage Management Plan
CHSP	Community Health and Safety Plan
CI	Conservation International
EbA	Ecosystem-based Adaptation
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Safeguards / Standards
FPIC	Free, Prior, and Informed Consent
GBV	Gender-Based Violence
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMP	Gender Mainstreaming Plan
IAS	Invasive Alien Species
ICA	Colombian Agricultural Institute
ICH	Intangible Cultural Heritage
IDIGER	District Institute of Risk Management and Climate Change
ILO	International Labour Organization
IPM	Integrated Pest Management
IPP	Indigenous Peoples' Plan
IPPF	Indigenous Peoples' Planning Framework
IWRM	Integrated Water Resource Management
JAC	Community Action Boards
KBA	Key Biodiversity Areas
LMP	Labor Management Procedures
MEAL	Monitoring, Evaluation, Accountability, Learning
OHS	Occupational Health and Safety
PES	Payment for Ecosystem Services
PPE	Personal Protective Equipment
SEAH	Sexual Exploitation, Abuse, and Harassment
SEP	Stakeholder Engagement Plan
SESA	Strategic Environmental and Social Assessment

1. Executive Summary

The Bogotá region is currently facing critical climate and water resilience challenges that threaten its high-mountain ecosystems and the communities that depend on them. Climate change is increasing the variability of rainfall and temperature patterns, which in turn exacerbates water regulation problems and reduces the reliability of water provision for more than 9.5 million people. These climate pressures interact with existing land degradation in strategic moorlands and mountains, often driven by unsustainable agricultural and dairy practices that compromise soil health and water quality. In response to these threats, the project **"Building Water Resilience in Bogotá and the Region "** aims to demonstrate that coordinated, systematic investment in intervention landscapes is a cost-effective way to generate measurable results in water resilience. By restoring strategic high-mountain ecosystems and transforming production systems into sustainable, climate-resilient models, the project seeks to catalyze a replicable watershed transformation model that improves livelihoods while securing water capture and quality for both rural and urban populations.

To ensure long-term sustainability and successful replication, the project focuses on strengthening governance and unlocking additional financing through a shared Green Infrastructure Master Plan for Water Resilience. This initiative intends to validate that nature-based solutions are economically attractive, thereby incentivizing continued investment from both public and private sectors well before the project ends. By implementing farm-level transformation packages that prioritize regenerative, agroecological, and silvopastoral systems and promote value-added products, the project addresses rural poverty and the cycle of land degradation. Furthermore, by establishing innovative financial mechanisms based on volumetric water benefits, the project secures a strategic exit strategy that ensures the permanence of these environmental services.

The execution of these activities is strictly governed by CI-GEF/GCF Project Agency Environmental and Social Management Framework (ESMF). Under this framework, the development of a limited ESIA and ESMP is a fundamental requirement to ensure that all project activities are environmentally and socially sound. These instruments allow the Project Team to apply the mitigation hierarchy, prioritizing the avoidance of adverse impacts and minimizing or mitigating them only when avoidance is not possible. By conducting a thorough assessment of social and environmental risks, the project upholds the "do no harm" principle, protecting human rights and ensuring equitable distribution of benefits. This includes the implementation of measures to safeguard cultural heritage, in line with national regulations and the Colombian Chance Finds Procedure.

Furthermore, the limited ESIA-ESMP process facilitates the integration of essential cross-cutting policies, such as gender mainstreaming and robust stakeholder engagement. In alignment with CI's policies, the project identifies and addresses the specific needs of vulnerable or marginalized groups to prevent disproportionate impacts and close existing equality gaps. By establishing an accessible Grievance Redress Mechanism (GRM), the project ensures that affected stakeholders have a transparent process for voicing concerns and receiving timely responses. Ultimately, this safeguarded approach not only manages risks but also enhances the overall quality and legitimacy of the project's conservation and resilience outcomes.

Initially, the project "**Building Water Resilience in Bogotá and the Region**" focused its safeguard strategy on the protection of natural habitats (ESS 2), the recognition of traditional peoples and cultural heritage (ESS 4 & 6), and the management of community health and security (ESS 8). However, following a deeper risk analysis and in compliance with Conservation International's Environmental and Social Management Framework (ESMF), nearly all standards within the system have now been activated, with the sole exception of ESS 9, as the project does not function as a financial intermediary or engage in direct private sector capital investments. This expansion addresses the inherent complexity of the Bogotá landscape by incorporating rigorous assessments of resource efficiency and pollution prevention (ESS 5) within productive modules, alongside strict oversight of labor and working conditions (ESS 7).

This technical evolution strengthens the project's commitment to water resilience by integrating additional standards such as ESS 10, which is essential for ensuring that restoration measures are "climate-proofed" to prevent maladaptation. By activating this extended suite of safeguards (ESS 1-8 and ESS 10), the project ensures that the transformation of production systems and the rehabilitation of high-Andean ecosystems are carried out in accordance with principles of transparency, gender inclusion, and long-term sustainability. Consequently, the resulting Environmental and Social Management Plan (ESMP) is far more robust, allowing for the mitigation of accidental or cumulative impacts while maximizing hydrological benefits for the region.

Following, a summary of the updates of environmental and social safeguards (ESS) triggered in relation to the project is presented:

According to the ESS Screening report, the project has been classified as a B Category, and following the Safeguard Screening Form, with this category, both limited ESIA and limited ESMP are required.

Category B: A proposed project is classified as Category B if its potential adverse environmental and social impacts on human populations or environmentally or socially important areas are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases, mitigation measures can be designed more readily than for Category A projects. A full or limited ESIA is required, depending on the type, degree and extent of the impacts;

ESS2: Protection of Natural Habitats and Biodiversity Conservation

The ESS2 standard is applied because the project directly intervenes in ecosystems of high ecological sensitivity, such as high-Andean forests and páramos. Restoration actions will prioritize the recovery of ecological functions while mitigating the risk of introducing invasive or non-native species through strict biosecurity protocols. The project addresses risks associated with high plant mortality by ensuring the use of suitable, high-quality species for each site. To protect local fauna, any support equipment—such as fencing—must follow connectivity criteria, strictly avoiding materials like barbed wire that pose a physical risk to wildlife.

Also, under this standard, the potential impacts from supporting sustainable and resilient livelihood activities, such as installing Ecosystem-based Adaptation (EbA) equipment, such as rainwater harvesting

systems and poultry production modules, will be assessed to prevent habitat fragmentation, negative impacts on natural habitats, or alteration of local water dynamics.

ESS3: Economic Displacement

ESS3 is proactively activated to manage potential economic displacement arising from water governance and conservation agreements. While the project does not involve physical resettlement, it recognizes that strengthening regulations and implementing voluntary conservation agreements could restrict traditional access to natural resources, impacting the livelihoods of small-scale farmers with formal or informal land tenure. This standard ensures that land insecurity and access restrictions are managed through transparent, participatory processes to compensate for any loss of income or food security. Furthermore, ESS3 addresses legal insecurity regarding land tenure and boundaries, acknowledging that the lack of clear titles or overlapping limits could generate operational bottlenecks and social conflicts. This standard ensures the application of the mitigation hierarchy to prevent activities from being interrupted by legal disputes or claims over traditional land-use rights, protecting the rights of landowners and users.

ESS4: Indigenous Peoples

ESS4 was initially activated during the preliminary screening due to the presence of the Muisca indigenous community in El Tunjo wetland. However, following technical adjustments to the project's scope and results, this specific geographic area was excluded from the final intervention zones. However, another Muisca group was identified in Sesquilé. Considering this adjustment, an Indigenous Peoples' Plan (IPP) has been developed in accordance with CI and GCF policies to safeguard the broader landscape. The IPP ensures that the project acknowledges potential impacts on ancestral territories, governance systems, and social structures. It guarantees the right to Free, Prior, and Informed Consent (FPIC) to prevent interference with sacred sites or the loss of traditional knowledge, ensuring that any intervention is co-created to promote balanced intercultural dialogue and prevent social tensions.

ESS5: Resource Efficiency and Pollution Prevention

The ESS5 standard is activated to manage agricultural inputs, waste, and water use, particularly in connection with restoration efforts and the support of livelihood activities. The project focuses on three critical areas of pollution prevention:

- Chemical Pesticides: Transitioning producers to Integrated Pest Management (IPM) to minimize reliance on chemical pesticides, as well as for restoration activities
- EbA Equipment Waste: Implementing strict protocols for the segregation, transport, and final disposal of solid waste and surplus materials generated by EbA equipment to prevent soil and water contamination.
- Water Management: Mitigating the compromise of ecological flows due to excessive water extraction for climate resilience or restoration activities.

ESS6: Cultural Heritage

ESS6 is activated to protect the tangible and intangible cultural values in the intervention landscapes. The project will establish exclusion zones for **sacred sites and ancestral paths** identified by the Muisca community to prevent disturbances during EbA and restoration works. Additionally, a **Chance Find**

Procedure will be implemented for all physical works, such as installing EbA equipment or performing restoration activities, to manage incidental archaeological discoveries. Traditional agricultural knowledge will be safeguarded under the principle of non-commodification.

ESS7: Labour and Working Conditions

ESS7 ensures a safe and fair environment for all project personnel. It addresses occupational accidents and biological risks inherent to high-mountain restoration. Critically, the project manages the risk of improper use of Personal Protective Equipment (PPE) by subcontracted personnel, establishing that non-compliance compromises worker integrity and creates legal contingencies. Furthermore, it addresses risks of impersonation or inappropriate behavior by field personnel through a mandatory Labor Management Procedure that promotes integrity and ethics.

ESS8: Community Health, Safety, and Security

ESS8 is activated to manage risks to local communities' health and safety. The standard has been disaggregated to address two distinct security risks:

- GBV AND SEAH (Sexual Exploitation, Abuse, and Harassment): Preventing Gender-Based Violence and Harassment by legitimate contractor personnel through strict codes of conduct.
- Impersonation: Mitigating fraud and security risks from external actors or criminal groups impersonating project personnel to gain access to private properties.
- Public Order and General Security: Strengthening protocols for coordinating with local authorities regarding risks to public order and potential threats from criminal groups in the intervention landscapes.

ESS9: Private Sector Direct Investments and Financial Intermediaries

ESS9 is triggered as some project activities will be developed through sub-grants provided to local organizations and by supporting Payments for Ecosystem Services. A primary focus is on preventing perverse incentives and environmental impact leakage, ensuring that financial incentives do not lead beneficiaries to expand the agricultural frontier elsewhere, or the risk that sub-grantees don't follow the CI-GEF/GCF ESMF requirements. Rules for resource use, excluded activities, and the ESS screening process will be detailed in the Grants Manual. Furthermore, the project addresses the risk of misalignment in third parties' safeguard commitments, ensuring that subcontractors and consultants adhere to CI's rigorous environmental and social standards to prevent gaps in human rights or biodiversity protection.

ESS10: Climate and Natural Disaster Risk

ESS10 is activated to ensure the project's long-term resilience. It focuses on preventing maladaptation of EbA equipment and ensuring that designs account for future climate variability to avoid functional failure. Additionally, the standard addresses the risk of ineffective restoration and livelihood measures, requiring that interventions be designed with a climate adaptation approach to withstand extreme weather events and temperature shifts, thereby securing the projected Volumetric Water Benefits (VWBs). It is recognized that severe weather events can cause road closures and logistical delays, affecting the restoration and technical assistance timeline. The standard requires integrating these

variables into budgetary and operational planning, ensuring that the most marginalized and vulnerable communities do not face discrimination in accessing benefits in the event of natural disasters.

Environmental and social risks and impacts, along with mitigation plans and instruments, are summarized in the table below. Further details and specific activity-level risks are expanded in each of the sub-sections of the ESMP with the corresponding mitigation measures.

Table 1. Risks and impacts of the project.

No.	Potential Impacts	Related activities	Explanation
ESS 2. Protection of Natural Habitats and Biodiversity Conservation			
1	Impacts of the EbA equipment in ecologically important areas	1.1.2, 1.2.3	The installation of Ecosystem-based Adaptation (EbA) equipment ¹ , such as rainwater harvesting systems and poultry production modules, can cause habitat fragmentation, displacement of native vegetation in ecologically important areas, or alteration of local water dynamics.
2	Introduction of invasive or non-native species that alter ecosystem balance.	1.1.2, 1.2.1.1	Restoration and productive transformation activities in high-Andean forests and páramo areas risk introducing invasive alien species if strict biosecurity protocols are not implemented
3	High plant mortality due to poor-quality inputs or unsuitable species.	1.1.2	Restoration success depends on the use of appropriate species; using plant material unsuitable for the site can lead to the failure of ecological function recovery actions.
4	Harm to wildlife due to the use of unsuitable materials.	1.1.2, 1.2.1.2	The use of support infrastructure, such as barbed-wire fences, poses a physical risk to local fauna; therefore, connectivity criteria must be followed.
ESS 3. Resettlement and Physical and Economic Displacement			
5	Tensions due to water use regulations that ignore traditional rights.	2.1.1, 1.1.1	Strengthening water governance and conservation zoning could restrict traditional access to natural resources, affecting the livelihoods of small-scale farmers under both formal and informal land tenure systems.
6	Land insecurity and economic displacement.	1.2.1, 1.1.1	Although there is no physical resettlement, limitations on land or water use resulting from management decisions can lead to economic displacement

¹ The implementation of Adaptation-based Ecosystem (AbE) equipment and the promotion of sustainable production are proposed. This initiative involves deploying rainwater-harvesting systems to ensure access to resources during dry periods. Furthermore, poultry production modules and protected agriculture units (covered backyard gardens) will be established, integrating technologies for the comprehensive management of organic waste.

			requiring compensation or livelihood restoration measures.
7	Legal insecurity regarding land tenure and boundaries.	1.2.1.1 1.2.3 2.1.2.	The lack of clear land titles or overlapping geographical boundaries in the intervention landscapes creates operational bottlenecks and risks of social conflict. Without prior tenure validation and boundary consensus, activities may be interrupted by legal disputes or claims over traditional land-use rights, significantly impacting the implementation schedule
ESS 4. Indigenous Peoples (A more detailed risk identification and mitigation measures are included in the Indigenous Peoples Plan)			
8	Impact on ancestral territories and social structures of the Muisca community.	1.2.3.1 1.1.2	Project activities may affect ancestral territories and Indigenous governance systems, including impacts on traditional decision-making processes and culturally defined territorial use. There is also a risk of misalignment between project timelines and Indigenous cultural calendars, which may affect participation processes (further details provided in the IPP).
9	Interference with sacred sites and loss of traditional knowledge.	1.2.3.1 1.1.2	Project interventions may interfere with sacred sites, ritual routes and ceremonial practices, and may pose risks related to the inappropriate use of traditional knowledge without the consent of Indigenous authorities. Activities may also affect culturally significant natural elements that support spiritual and cultural practices (further details provided in the IPP).
ESS 5. Resource Efficiency and Pollution Prevention			
10	Pollution from the use of chemical pesticides.	1.1.2 1.2.1.2	Productive transformation activities could involve the use of chemical pesticides, necessitating a transition to Integrated Pest Management (IPM).
11	Pollution from inadequate management of EbA equipment waste.	1.1.2.2 1.2.1.1 1.2.1.3 1.2.3.1 1.2.3.3	The installation and operation of nature-based solutions (NbS) generate solid waste and surplus materials. If these are not managed through strict segregation, transport, and final-disposal protocols, there is a risk of contaminating soils and freshwater habitats, thereby compromising the integrity of the ecosystems the project aims to protect or restore.
12	Soil and water contamination from inadequate waste management.	1.2.3.3 1.2.1.2	The operation of equipment generates waste and discharges that, if not managed through segregation, can contaminate freshwater habitats and soils.

13	Compromise of ecological flows due to excessive water extraction.	1.2.3.3, 1.2.1.2	Irrigation or consumption needs for climate resilience could compromise ecological flows or affect downstream users if extraction risks are not mitigated.
ESS 6. Cultural Heritage			
14	Disturbance of tangible cultural heritage and archaeological finds.	1.2.3.1 1.1.2	Due to the high density of cultural values in the intervention landscape, physical works, such as installing EbA equipment or performing restoration activities, may affect ancestral paths or lead to incidental archaeological discoveries that require a Chance Find Procedure. Through consultation with Indigenous authorities, three sacred sites and two ancestral paths have been identified within the area of direct influence. The project will establish exclusion zones and physical protection measures to prevent disturbances.
ESS 7. Labour and Working Conditions			
15	Occupational accidents and biological risks in the field.	1.1.2	High-mountain restoration personnel face significant physical risks, including extreme weather, biological hazards, and tool-related accidents, making the use of personal protective equipment (PPE) indispensable.
16	Health and safety risks due to improper use of PPE	1.1.2 1.2.3	Subcontracted personnel performing restoration and water equipment activities in high-mountain areas (páramos and Andean forests) may face injuries, occupational accidents, or biological and climate-related hazards (hypothermia) if Personal Protective Equipment (PPE) is not used correctly. Non-compliance with occupational health and safety protocols by third parties not only compromises workers' physical integrity but also creates legal contingencies and non-compliance risks related to the project's safeguard standards.
17	Impersonation or inappropriate behavior by field personnel.	1.2.3 2.1.1	A lack of integrity and ethics in contracted personnel can negatively affect community relations and the dignified labor environment.
ESS 8. Community Health, Safety and Security			
18	Gender-Based Violence and Harassment (GBV AND SEAH (SEXUAL	1.1.2 1.2.3.1	The mobilization and entry of non-local workers (legitimate employees of contractors and subcontractors) for equipment works or restoration in rural areas increases the risk of harassment,

	EXPLOITATION AND HARASSMENT)) by contractor personnel.		exploitation, and sexual abuse incidents toward the local community, exacerbated by power asymmetries and the isolation of work areas.
19	Fraud and security risks due to impersonation of project personnel.	Output 1.1 Output 1.2	Given the regional public order context, external actors or criminal groups may impersonate project employees, subcontractors, or promoters to gain access to private properties, obtain sensitive information from the community, or commit acts of theft, extortion, or harassment, affecting the physical safety of beneficiaries and the reputation of the implementing institutions.
20	Public order risks and threats from criminal groups.	All field activities	The regional context may expose personnel and the community to criminal dynamics, necessitating strengthened displacement protocols and coordination with local authorities in accordance with the "do no harm" principle.
21	Occupational health and safety risks due to new tools and lack of PPE	Output 1.1 Output 1.2	The introduction of new tools and technical equipment for active restoration, silvopastoral systems, and the modernization of community water systems increases the likelihood of physical accidents or health impacts for producers and local beneficiaries. This risk is heightened by a potential lack of specialized technical training in tool handling and the absence or incorrect use of Personal Protective Equipment (PPE) during the execution of field activities.
ESS 9. Private Sector Direct Investment and Financial Intermediaries			
22	Risk of perverse incentives and environmental impact leakage.	1.1.1.2 1.2.1	The disbursement of financial incentives to producers carries the risk that resources may be used inappropriately or generate counterproductive effects. For instance, a beneficiary might conserve the area restored under the project while expanding the agricultural frontier in other parts of the farm or adjacent areas (leakage).
23	Misalignment in Safeguard Implementation Commitment by Third Parties.	2.1.2	There is a risk that subcontractors or individual consultants may not share the same level of institutional commitment or technical capacity as CI regarding the implementation of environmental and social safeguards. This operational inconsistency could lead to a lax application of field protocols, creating gaps in the protection of human rights or biodiversity and compromising the project's compliance with required international standards.

ESS 10. Climate and Natural Disaster Risk			
24	Maladaptation of EbA equipment.	1.2.1 1.2.3	If the design of equipment for Nature-based Solutions (NbS) does not account for future environmental factors and climate variability, there is a risk of functional failure when faced with climate hazards. This would result in maladaptation, increasing long-term vulnerability rather than reducing it, and potentially compromising the project's intended Volumetric Water Benefits (VWBs)
25	Ineffectiveness of restoration and livelihood measures due to climate change.	Output 1.1 Output 1.2	Ecological restoration interventions and livelihood transformation activities risk becoming ineffective if they are not designed with a climate adaptation and resilience approach. The occurrence of extreme weather events or shifts in precipitation and temperature regimes may exceed the tolerance thresholds of the selected species or implemented production systems, leading to a loss of investment and a failure to generate the projected Volumetric Water Benefits (VWBs).

In accordance with the CI-GEF/GCF ESMF, all projects must have a Gender Mainstreaming Plan (GMP), an Accountability and Grievance Mechanism (AGM), and a Stakeholder Engagement Plan (SEP). These instruments, while presented separately for ease of use, are intrinsic and cross-cutting components of the project's Environmental and Social Management Framework (ESMF).

Table 2A. SEP, AGM and GMP

Document	Description	Observations
Stakeholder Engagement Plan (SEP)	The central objective is to systematically seek and integrate the knowledge and input of rights holders and partners to ensure lasting results in conservation and human well-being. This plan proactively identifies and engages key stakeholders and vulnerable groups from the initial design stages to understand their needs, avoid negative impacts, and ensure that consultations are meaningful, transparent, and free from coercion. Furthermore, it ensures that all relevant information on risks and benefits is disseminated promptly and in formats accessible to all communities involved.	It is delivered separately from this document
Accountability and Grievance Mechanism (AGM)	The objective of this mechanism is to ensure compliance with CI safeguards through a formal system for receiving, registering, and promptly resolving the concerns of people affected by the project. It provides a free, independent, and culturally appropriate process that seeks amicable solutions at the local level, utilizing pre-existing practices or project-specific procedures to efficiently address	It is delivered separately from this document.

	grievances. Furthermore, it guarantees confidentiality and protects whistleblowers from retaliation, allowing unresolved or high-risk complaints to be escalated to CI's Global Complaints Committee.	
Gender Assessment and Action Plan (GAAP)	This plan aims to incorporate a cross-cutting and intersectional gender perspective into all phases of the project cycle, from design to evaluation. Its objective is to assess the specific risks and opportunities for men and women and to implement concrete actions to close equity gaps in access to and control of natural resources. Furthermore, the plan seeks to guarantee safe and equitable spaces for diverse women and men to participate in decision-making, prioritizing the prevention of and response to any form of gender-based violence, harassment, or sexual exploitation related to project activities.	It is delivered separately from this document.

Disseminating information is a fundamental pillar for ensuring accountability and facilitating meaningful and effective community participation. Therefore, all plans and instruments derived from this framework will be made available to stakeholders in a timely manner, using formats and languages appropriate to the local context (for example, by publishing them in multiple locations and presenting them during stakeholder engagement activities at the start of project implementation). In situations where confidentiality is strictly necessary to protect the integrity or security of the actors involved, data protection protocols will be implemented, with recording and publishing limited to aggregated, anonymized information.

2. Project Description

The ultimate goal of GCF “Building Water Resilience in Bogotá and the Region” is increased freshwater resilience. The project’s objective is to deliver a proof of concept for mobilizing and unlocking long-term public and private finance at scale for water resilience, under existing regulations. This is achieved by proving that effective, combined watershed interventions yield quantifiable water benefits that begin at the plot level and gradually scale at the watershed level. The proof of concept aims to generate verifiable hydrological results to justify, attract and deploy additional financing from private and public actors.

The project’s core impact indicator, avoided or reduced runoff, is used intentionally because it is already recognized by the private sector as an investable metric to transparently quantify, compare, and report hydrological improvements, in terms of Volumetric Water Benefits (VWBs). It captures the effects of ecosystem restoration, conservation, and sustainable land-use practices on infiltration, retention, and baseflow stability. Proving credible and investable VWBs is therefore central to project design, as these results provide the foundation to unlock and scale financing through instruments and mechanisms enabled by current regulations and private water stewardship goals.

Component 2 is paramount and drives the project logic, with Component 1 deliberately structured to enable its deployment. Component 1 delivers the proof of concept for VWBs at watershed scale, resulting from targeted ecosystem-based adaptation and productive systems transformations. Building on these verified results, Component 2 deploys financial solutions that mobilize significantly higher and sustained financial flows for water resilience, particularly from the private sector.

- A robust selection of activities and intervention sites in the upper Bogotá River, were identified and prioritized based on a multicriteria assessment designed to ensure maximum climate impact and water benefits at scale. The upper Bogota River, including the Tomine and Neusa reservoirs, supplies the north system of the Bogota Water Utility with the capability to serve 60% of the water demand of Bogota and eleven other municipalities when operating at maximum capacity. This system was instrumental in attending the 2024 water shortage in Chingaza. The project’s intervention sites were selected to deliver credible proof of concept by concentrating interventions where hydrological outcomes can be maximized during the project implementation period. Watersheds were prioritized based on their capacity to tackle climate-induced shifts in temperature and precipitation patterns that alter evapotranspiration and runoff regimes, influencing both drought risk and high-flow events in the watersheds. To achieve this goal the following factors have been decisive for intervention sites selection:
- Water regulation impact (current and future runoff): potential changes in vegetation cover and land management to maximize the reduction of runoff peaks and sustain baseflows, strengthening watershed level water regulation under current and future climate scenarios.
- Climate: Environmental: prioritizing current condition and connectivity of paramos, forests and riparian ecosystems, reflected in habitat quality, biodiversity, soil stability and capacity to regulate flows.
- Socioeconomic diversity: Areas that feature varied agricultural activities and socioeconomic contexts, enabling concept testing across different configurations in the Bogota Region.

- Engagement: CI's prior projects in the Bogotá Region that have built strong relationships with territorial actors that are already familiar with proof of concept, as an advantage for successfully mobilizing of a broad set of stakeholders for achieving impact at scale during project implementation.
- Institutional: presence of different types of local and regional authorities presents in the Bogotá Region to successful implementation, replication and scaleup.

Intervention landscapes and prioritized watersheds:

Intervention landscapes	Prioritized watersheds
Guandoque	Guandoque-Salitre-Susagua
Villapinzón	Upper Bogotá River-Quebrada Quincha
Tominé	San Francisco-Aves-Chipata
Tunjuelo	Paso Colorado Peñas Blancas, La Requilina-El Uval, Los Soches, and Quiba.

Component 1. Proof of concept to achieve the highest hydrological benefits at the Watershed scale. The objective is to generate robust territorial evidence of VWB, that begins at the plot scale and gradually scale to the watershed level, to trigger long-term financing under Component 2. Outputs under Component 1 prove that i) Restoration and conservation interventions in headwaters areas, along water streams and farms, together with ii) climate-resilient transformation of productive practices leads to better livelihoods, reduced pressure on strategic ecosystems and, ultimately, yields water benefits. Activities under this component will be implemented in a) Public Protected Areas, b) Private Protected Areas (Civil Society Natural Reserves), and c) public and private property lands benefiting farmers, landowners, producer associations and local organizations.

Output 1.1. Strategic High Andean ecosystems restored and conserved to yield hydrological benefits.

Activity 1.1.1. Conserve high Andean ecosystems: High-Andean ecosystems conservation will cover selection of beneficiaries based on predefined criteria in selected private and public lands.

1.1.1.1. Implement control and surveillance, monitoring and climate training in Protected Areas

1.1.1.2. Reduce ecosystem loss through conservation agreements and payments for landowners

Activity 1.1.2. Restore high Andean ecosystems: High-Andean ecosystems restoration will cover selection of key sites and landowner beneficiaries based on predefined criteria in selected private and public lands.

1.1.2.1 Implement passive restoration of moderately degraded lands allowing natural regenerative processes 1.1.2.2. Implement active restoration of highly degraded lands

Output 1.2. Climate-resilient transformation of productive practices to yield hydrological benefits and resilient livelihoods.

Activity 1.2.1. Implement climate-resilient production systems at farm level: Farmers, who will implement measures to achieve farm-level resilience for water regulation, will be selected based on predefined criteria in prioritized agricultural lands.

1.2.1.1. Implement silvopastoral systems in place of traditional dairy production

1.2.1.2. Implement agroecological practices in traditional potato production systems

1.2.1.3. Implement efficient use and water saving at farm level

1.2.1.4. Implement and diversify agrifood systems

Activity 1.2.2. Commercialization and opening of markets that value rural products that contribute to water regulation: Producer associations and local organizations, whose affiliated producers are already implementing climate-resilient production practices in selected watersheds, will be selected based on predefined criteria.

1.2.2.1. Develop business models for climate-resilient production systems.

1.2.2.2. Implement commercialization and market access initiatives through producer associations

Activity 1.2.3. Implement efficient water use measures efficiency in community-run water supply systems in prioritized watersheds: Beneficiary associations will be selected based on predefined criteria in selected watersheds.

1.2.3.1. Install macro-metering and upgrade community-run water supplies systems to cut losses.

1.2.3.2 Apply efficient water use practices in water supply community-run systems

1.2.3.3. Implement drinking-water treatment in water supply community-run systems

Component 2. Finance mobilization and scale-up. The objective is to widen the use of existing regulations to mobilize and scale public and private financing for water resilience in the Bogotá Region by establishing financing pathways for VWBs that can sustain and expand investments beyond GCF's initial support.

This component operationalizes i) an environmental investment component into Bogotá's water tariff by providing evidence of water benefits for the Bogotá's Water Utility users, and ii) a mechanism for private companies to invest in VWBs results linked to their corporate stewardship and compensation goals.

Output 2.1 Financing instruments and mechanisms for scaling water volumetric benefits

Activity 2.1.1 Incorporate an environmental investment component to the water tariff: The Bogotá Water Utility will test investments in water benefits to be recovered through the water tariff.

2.1.1.1. Define and validate indicators and methodologies to demonstrate the cost-effectiveness of water-resilience investments.

2.1.1.2. Implement systematic reporting for authorities that measure investments effectiveness in hydrological outcomes.

2.1.1.3. Develop replication models for other water utilities.

Activity 2.1.2 Operationalize a long-term financial mechanism for private investments: A long-term financial mechanism will direct private-sector investments into the watershed transformation model,

enabling companies to finance prioritized interventions that generate measurable and verified Volumetric Water Benefits (VWBs):

2.1.2.1. Develop automatic tools for spatial prioritization of investments, monitoring and quantification of water volumetric benefits

2.1.2.2. Establish the administrative, operational, and financial structure of the mechanism.

A. Project location, biophysical and socio-economic characteristics relevant to the safeguard analysis:

The proposed project is in the Bogotá Region of Colombia, a socio-ecological territory that links Bogotá D.C. with surrounding municipalities in Cundinamarca through hydrological and ecological connections associated with the Eastern Andes and the Chingaza-linked supply systems (IDOM, 2025; Conservation International Colombia, 2023). For the purposes of safeguard analysis, the most relevant spatial features are the project's intervention landscapes and micro-watersheds, which are prioritized because they combine strategic water regulation functions, climate vulnerability, productive land-use pressures, and the presence of rural communities whose livelihoods depend directly on land and water resources (IDOM, 2025; Conservation International Colombia, 2023).

Project location

The project area is framed as part of a wider Bogotá Region landscape that integrates urban, peri-urban, and rural territories connected through watershed processes, ecological corridors, and shared water infrastructure. At the landscape scale, the project rationale is anchored in four prioritized intervention landscapes: Guandoque, Villapinzón, Tominé and Tunjuelo, associated respectively with the Guandoque-Salitre-Susagua watershed, the Upper Bogotá River watershed, and the San Francisco-Aves-Chipata watershed, while Tunjuelo is associated to the Curubital-mid-Tunjuelo watersheds.

The project is situated within a region of major hydrological importance for Bogotá and neighboring municipalities. The Chingaza system provides around 70% of Bogotá's drinking water supply, while the North System and South System contribute approximately 25% and 5%, respectively; in addition, the upper Bogotá River system, including the Tominé and Neusa reservoirs, is strategically important for regional supply and played a critical role during the 2024 water shortage linked to low storage in Chingaza (IDOM, 2025; Conservation International Colombia, 2023). This upstream-downstream interdependence is central to safeguard analysis because project activities in high mountain and rural landscapes can affect water regulation, erosion, runoff, and water quality outcomes that matter to both local communities and large downstream user populations.

Biophysical characteristics

The project is located in the Eastern Andean mountain chain, within a highly heterogeneous topographic setting characterized by high mountain ecosystems, piedmont slopes, valleys, headwaters, and plateau areas. Elevation in the project region ranges from roughly 2,600 meters in the Bogotá savanna to above 3,300 meters in surrounding mountains and páramo summits, creating strong altitudinal gradients that shape hydrology, soils, land use, and ecosystem sensitivity. The region is organized by five major watersheds—Bogotá, Guavio, Guayuriba, Guatiquía, and Sumapaz—and more than 30 micro-basins, with the Bogotá River basin functioning as the dominant hydrographic structure for much of the project area.

Climatically, the region presents marked spatial variability driven by altitude, slope orientation, and Andean orographic effects. Source documents indicate annual precipitation broadly ranging from about 500 to 1,400 mm and temperatures from approximately 4°C to 23°C, with bimodal rainfall regimes on the Andean side and monomodal regimes toward the eastern foothills; the El Niño-Southern Oscillation is a major driver of climate variability, increasing drought and water stress during El Niño periods and flooding and landslide risk during La Niña periods. Climate change projections point to rising temperatures and significant precipitation shifts, with implications for páramo extent, runoff regulation, agricultural productivity, and exposure to floods, droughts, landslides, and wildfires across different municipalities (Bejarano, Grünwaldt, & Andrade, 2022; IDEAM, 2022; IDOM, 2025).

The safeguard-relevant ecosystems are páramos, high Andean forests, wetlands, riparian systems, and associated agroecosystems. These ecosystems perform critical functions for water storage, slow release, infiltration, erosion control, carbon storage, slope stabilization, and habitat provision, and they are also highly sensitive to climate stress and land-use change (Banco Interamericano de Desarrollo, CI Colombia, & Ministerio de Ambiente y Desarrollo Sostenible, 2022). The Chingaza, Sumapaz, Guerrero, and Guacheneque páramo complexes as strategic “water factories,” while wetlands and high Andean forests are highlighted for flood regulation, biodiversity support, and ecological connectivity across the landscape.

The region also contains an extensive network of protected and conservation areas that is highly relevant to safeguard screening. Across the wider intervention zones, project documents report approximately 64,036 hectares under protection across different categories, including National Natural Parks, Regional Natural Parks, Integrated Management Districts, protective forest reserves, and Civil Society Nature Reserves. This protected area mosaic increases both the opportunity for ecosystem-based adaptation and the need for careful safeguard management, because interventions may occur in or near sensitive habitats, ecological corridors, riparian buffers, and legally protected zones with specific management plans and use restrictions.

Environmental pressures are already significant for soil erosion and land degradation associated with deforestation, overgrazing, potato monoculture on steep slopes, and expanding agricultural frontiers, as well as water-source contamination from agrochemicals, sediment, and livestock waste. Urban expansion, infrastructure development, mining pressures in some broader regional ecosystems, and fragmentation of wetlands and high Andean forests further reduce ecosystem integrity and water regulation capacity, while transformed areas show declining hydrological performance and stronger seasonal flow variability.

Biodiversity values are also material to the safeguard analysis. 5,757 recorded species in the Bogotá Region, including about 1,126 endemic species, together with significant numbers of threatened plant and animal species and a documented presence of invasive species that can affect restoration success and ecosystem resilience (SiB Colombia, 2025a; UICN, 2025). The available prioritization work indicates that Tominé and Guandoque contain particularly important concentrations of endemic species and highly threatened ecosystems, while Villapinzón plays a complementary role in landscape connectivity. For the ESMP, these patterns imply that biodiversity risk management, restoration protocols, invasive-species monitoring, and site-specific exclusion criteria should be especially rigorous in high-priority habitats and ecological corridors.

Given the ecological sensitivity of the project intervention landscapes, particularly in páramos, high Andean forests, wetlands, riparian systems and ecological corridors, the project will apply site-specific exclusion criteria to ensure that no activities supported under the project result in the degradation of critical habitats, biodiversity loss or reduced ecosystem functionality.

These exclusion criteria will be applied systematically during the screening, selection and implementation of all project-supported activities as part of the ESMS process and will guide the identification of non-eligible interventions in environmentally sensitive areas.

Under this framework, the project will not support activities that result in the conversion, degradation or direct impact on páramo ecosystems, high Andean native forests or other ecosystems with recognized conservation status. Similarly, activities will be excluded where they take place within legally protected areas in which interventions are not permitted under applicable management plans, or where they affect wetlands, riparian buffers or water source protection zones.

In addition, the project will exclude any activity that may interrupt or fragment ecological connectivity, including interventions that introduce incompatible land-use changes or that reduce habitat quality for endemic, threatened or sensitive species. Attention will be given to areas identified as ecological corridors, where maintaining connectivity is essential for landscape-level biodiversity conservation.

Activities that may generate biodiversity risks will also be considered ineligible. This includes those that affect known habitats of endemic or threatened species, introduce invasive species or non-native biological materials outside approved restoration protocols, or modify natural hydrological processes that sustain ecosystem functions.

From a land-use perspective, the project will exclude interventions that promote the expansion of agricultural frontiers into natural or semi-natural ecosystems, the conversion of native vegetation into monoculture systems, or the use of intensive agricultural practices or agrochemicals in sensitive ecosystems such as wetlands, páramos or water recharge areas.

Finally, all activities must comply with applicable legal and planning frameworks. Activities that are not aligned with national or regional environmental regulations, protected area management instruments or land-use planning tools, or that are in areas with explicit environmental restrictions, will not be eligible for support under the project.

All proposed activities will be screened against these criteria prior to approval. Any activity that meets one or more exclusion conditions will be either rejected or redesigned to ensure full compliance with the CI-GEF/GCF ESMF. These site-specific exclusion criteria are also reflected in the Grants Manual Annex.

Socio-economic characteristics

The broader Bogotá Region is one of Colombia's most important socio-economic territories. The Bogotá region concentrates a very large urban population in Bogotá D.C. and its metropolitan belt, alongside smaller dispersed rural populations in upper-basin and high mountain areas where the project's direct interventions are expected to occur. Approximately 9.82 million inhabitants across the broader regional landscape, with about 97% living in urban areas, while the rural population is concentrated in headwaters and high-Andean zones that coincide with the ecological core of the project. This urban-rural asymmetry is highly relevant for safeguards because the project's environmental and social risks will be locally experienced in rural territories, whereas a substantial share of the project's benefits, especially improved water regulation, will accrue downstream to urban populations.

Rural livelihoods in the intervention landscapes are based primarily on agriculture, livestock, small-scale resource use, and localized market linkages. The socioeconomic baseline highlights the importance of potato cultivation, dairy and cattle production, vegetables, maize, beans, and smallholder mixed systems, often under conditions of small landholdings, limited diversification, and high dependence on local natural

resources and water availability. In the characterized production systems, livestock accounts for a large share of economic activity, potato-based systems are common, and many farms are smallholdings; one source indicates that 43% of characterized farms are smaller than one hectare and 38% are between 2 and 5 hectares, while 53% of productive units depend on rural aqueduct systems and 23% on direct surface-water sources.

These characteristics have direct safeguard implications. Smallholder production systems in steep and climate-sensitive environments may be vulnerable to temporary access restrictions, changes in land use, restoration set-asides, altered grazing practices, and implementation requirements associated with conservation or productive-transition measures. At the same time, the same conditions create a strong rationale for the project's emphasis on climate-resilient farm plans, agroecological practices, silvopastoral systems, agrifood diversification, and improved community water-system efficiency as measures that can reduce vulnerability while supporting livelihoods (Conservation International Colombia, 2023).

Socio-economic disparities across municipalities are pronounced. Many municipalities in the region's area of influence have fewer than 20,000 inhabitants, depend heavily on agriculture or monoculture, and have weak fiscal capacity for financing restoration or environmental infrastructure; one document states that 76% of these municipalities fall in the lowest fiscal capacity category under Colombian law (Conservation International Colombia, 2023; IDOM, 2025). Other characteristics points to a low digital connectivity, sanitation deficiencies, modest investment diversification, and limited resources for environmental management in some intervention landscapes, all of which can constrain adaptive capacity, monitoring, and long-term sustainability of project-supported measures.

Water access and water infrastructure are especially relevant to safeguards because they shape exposure, dependency, and possible project interactions with local services. The broader region faces high levels of water stress, aging infrastructure, and significant losses in treated water within large systems, while rural households and community water associations often rely directly on local sources with limited technical and financial capacity. Community-run water systems in prioritized watersheds may receive support for loss reduction, water-saving practices, and drinking-water treatment, which means the ESMP should address both construction-phase and operational environmental, health, and community engagement considerations for small-scale water infrastructure interventions.

The project recognizes that sanitation deficiencies are one of the factors contributing to water contamination in parts of the broader intervention landscape. However, the project does not include the construction or operation of sanitation infrastructure, wastewater collection systems or centralized wastewater treatment plants. These interventions fall outside the scope, mandate and financing structure of the project and remain under the responsibility of the competent public authorities and service providers.

Notwithstanding this limitation, the project contributes to water quality and ecosystem stability through measures that address other relevant drivers of watershed degradation. These include conservation and restoration of high-Andean ecosystems, recovery of riparian and headwater areas, reduction of land-use pressures, promotion of agroecological and climate-resilient production practices, improved water-use efficiency in community systems, and reduction of physical losses. By improving vegetation cover, soil stability, infiltration and runoff regulation, the project is expected to contribute to better ecosystem conditions and reduce sediment and diffuse pollution pressures associated with degraded land management.

In addition, the project will strengthen community-managed water systems through diagnostics, technical assistance, macro-metering where feasible, loss reduction, efficient water-use practices and context-

appropriate improvements in drinking-water quality. These activities can improve the performance and resilience of selected rural water systems, even though they do not substitute for comprehensive sanitation investments. The ESMP therefore clarifies that the project's contribution to water quality is based on watershed management, source protection, efficient system operation and localized water supply improvements, while structural sanitation gaps will be identified as contextual constraints and, where relevant, referred to or coordinated with competent institutions.

This framing is important to avoid overstating the project's scope. The project will advance water resilience and ecosystem stability through actions within its scope, while recognizing that long-term improvement of sanitation-related contamination requires complementary public investments and sectoral planning beyond the project.

The safeguard analysis must also consider differentiated vulnerability among social groups. Women, female-headed households, dispersed rural populations, small-scale farmers, and, in the wider regional context, migrants, displaced people, and Indigenous peoples are identified as groups that may experience greater vulnerability due to poverty, care burdens, limited participation in decision-making, or weaker access to land, services, finance, and technical assistance. Women are described as playing a central role in water management, household food security, agroecological production, poultry, dairy processing, and community adaptation processes, but they continue to face structural inequalities that can limit their adaptive capacity and participation unless targeted inclusion measures are implemented.

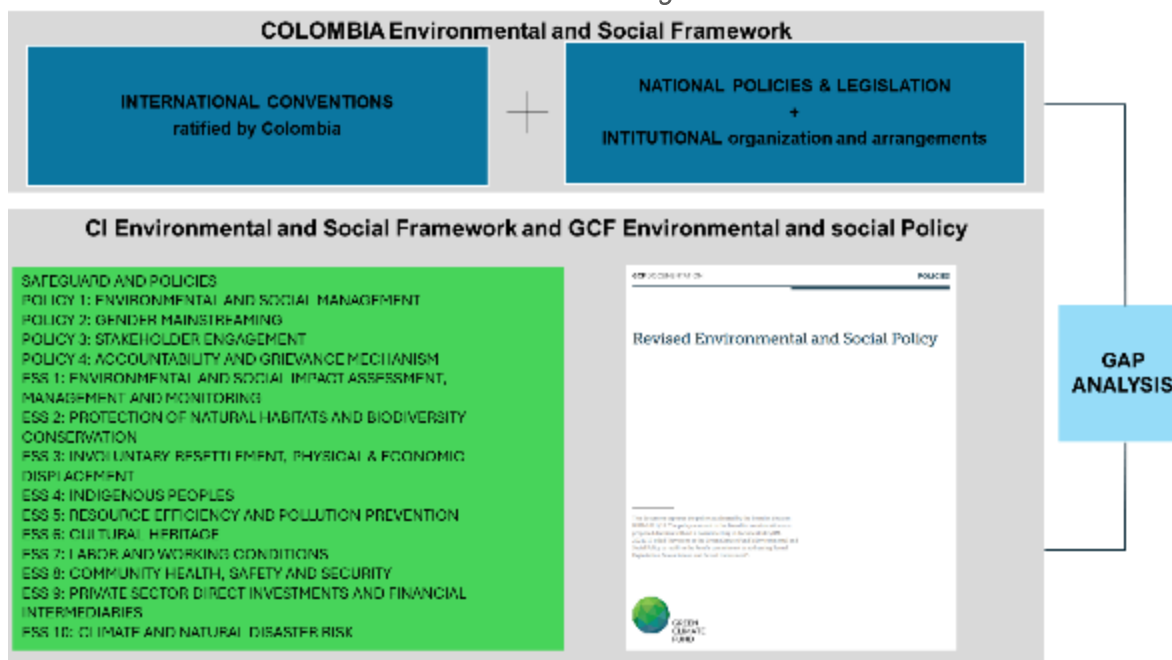
3. Policy, Legal and Administrative Framework

The overarching reference framework that defines the Project's environmental and social management requirements comprises the following specific components:

- National Environmental and Social Risk Management System of Colombia: This includes the international agreements to which Colombia is a signatory, as well as its national environmental and social regulations and institutional structures.
- Environmental and Social Management Framework (ESMF) of Conservation International GCF Agency and Environmental and Social Safeguards (ESS) of the GCF: These establish the requirements and standards that must be met by Bank-financed projects with respect to environmental and social aspects.

These frameworks, along with the gap analysis, are illustrated in the following figure and described in detail in the subsequent sections of this chapter.

Figure 1.. Environmental and Social Framework



Source: IDOM, 2025.

Below is a summary and update of the information contained in document O1.6. Analysis of National and Subnational Policies and Regulatory Framework. For further details, please refer to the mentioned document.

International conventions/ agreements ratified by Colombia

Colombia has ratified **well over 60 multilateral environmental and social safeguard agreements**, including over 50 ILO instruments in force (e.g., Freedom of Association, Non-Discrimination, Child Labour, Forced Labour). These core social and labor conventions complement its environmental commitments. The following are presented Colombia's major international conventions and agreements with environmental and social safeguards, ratified to date in relation to CI's ESS.

Table 3. International agreements ratified by Colombia by CI's Environmental and Social Standard

Environmental and Social Standard	International agreements ratified by Colombia
ESS 1: Environmental and Social Impact Assessment, Management and Monitoring	1. Escazú Agreement (2024) : Regional treaty promoting access to environmental information and justice.
ESS 2: Protection of Natural Habitats and Biodiversity Conservation	1. Ramsar Convention on Wetlands (1971): Entered into force for Colombia in October 1998. Designates wetlands of "international importance," like high-Andean peatlands, and promotes their "wise use" in national planning. 2. Convention on Biological Diversity (CBD, 1992): Ratified by Colombia in 1994. Establishes a legal framework for conserving ecosystems and genetic resources, guiding national biodiversity policies. 3. Cartagena Protocol on Biosafety (2000): CBD supplementary protocol ratified by Colombia. Regulates safe handling, transfer, and release of genetically modified organisms. 4. Convention on Migratory Species (CMS/Bonn, 1979): Obligates Colombia to conserve migratory species and their habitats 5. CITES (1973): Controls international trade in endangered species. 6. UN Convention to Combat Desertification (UNCCD, 1994) : Ratified by Colombia. Aims to prevent land degradation in fragile ecosystems. 7. Nagoya Protocol on Access & Benefit-Sharing: Supplements the CBD. Ensures community consent and fair benefits from genetic resources. 8. UNESCO World Heritage Convention (1972): Enables listing of unique paramo areas (e.g., Los Nevados), providing additional protection under cultural-nature heritage criteria.
ESS 3: Physical & Economic Displacement	1. Escazú Agreement (2018) : offers safeguards for environmental defenders, includes protections related to territorial threats and relocation
ESS 4: Indigenous Peoples	1. ILO Convention 169 (1989) – Indigenous and Tribal Peoples: (1989). Became part of Colombian domestic law via Law 21 of 1991, integrating its standards into the Constitution 2. United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP-2009): Integral to national jurisprudence and Peace Agreement implementation. 3. Escazú Agreement (2018): Mandates Free, Prior, and Informed Consent (FPIC) and environmental safeguards for Indigenous and local communities.

Environmental and Social Standard	International agreements ratified by Colombia
	International Covenant on Civil and Political Rights (ICCPR, 1966 - ratified 1969): Protects property, life, and non-arbitrary relocation—cited in Art. 7. Inter-American Court of Human Rights – Advisory Opinion OC-23/17 (2017): Clarifies states' obligations on land titling, territorial integrity, and Indigenous consent for development
ESS 5: Resource Efficiency and Pollution Prevention	Basel Convention (1989): Controls transboundary movement of hazardous waste. Rotterdam Convention (1998): Regulates trade of hazardous chemicals and pesticides. Stockholm Convention (2001): Eliminates or restricts persistent organic pollutants (POPs). Minamata Convention (2013): Reduces mercury emissions and releases. Vienna Convention (1985): Protects the ozone layer. Montreal Protocol (1987): Phases out ozone-depleting substances. Convention on Long-Range Transboundary Air Pollution (1979): Reduces air pollutants across borders. ILO Convention No. 170 (1990): Safety in the use of chemicals at work.
ESS 6: Cultural Heritage	World Heritage Convention (1972): Protects cultural and natural heritage of outstanding universal value. Convention for the Safeguarding of the Intangible Cultural Heritage (2003): Preserves traditions, oral expressions, rituals, and knowledge. Convention on the Protection and Promotion of the Diversity of Cultural Expressions (2005): Supports cultural diversity and creative industries. Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (1970): Prevents illegal trade of cultural artifacts.
ESS 7: Labor and Working Conditions	ILO Convention No. 29 (1930): Prohibits forced labor. ILO Convention No. 87 (1948): Freedom of association and protection of the right to organize. ILO Convention No. 98 (1949): Right to organize and collective bargaining. ILO Convention No. 100 (1951): Equal remuneration for men and women for work of equal value. ILO Convention No. 105 (1957): Abolition of forced labor. ILO Convention No. 111 (1958): Prohibits discrimination in employment and occupation. ILO Convention No. 138 (1973): Minimum age for admission to employment. ILO Convention No. 182 (1999): Elimination of the worst forms of child labor. ILO Convention No. 155 (1981): Occupational safety and health framework. ILO Convention No. 170 (1990): Safety in the use of chemicals at work. ILO Convention No. 187 (2006): Promotional framework for occupational safety and health. ILO Convention No. 81 (1947): Labor inspection in industry and commerce. ILO Convention No. 129 (1969): Labor inspection in agriculture.

Environmental and Social Standard	International agreements ratified by Colombia
	14. ILO Convention No. 144 (1976) : Tripartite consultation on international labor standards.
ESS 8: Community Health, Safety and Security	1. Sendai Framework for Disaster Risk Reduction (2015): Global strategy for reducing disaster risks and protecting communities. 2. ICCPR (1966): Protects life and security of persons, including during displacement or emergencies.
ESS 10: Climate and Natural Disaster Risk	1. UNFCCC (1992): Framework for global climate action and emissions reduction. 2. Kyoto Protocol (1997): Legally binding targets for greenhouse gas reductions. 3. Paris Agreement (2015): Commitment to limit global warming and enhance climate resilience.

Source: IDOM, 2025.

4. National and local policies, laws, and strategies

Following is the summary of National-level policies, laws, and strategies applied to project's components

Table 4. Colombian's legal instruments by CI's Environmental and Social Standard

Environmental and Social Safeguard	Legal Instrument	Description	Source or Institution
ESS 1: Environmental and Social Impact Assessment	Law 99 of 1993	Creates the National Environmental System (SINA), establishes environmental licensing and mandatory EIA for projects with significant impact.	Ministry of Environment and Sustainable Development (MinAmbiente)
	Decree 2041 / 2014 (replaced by Decree 1076 / 2015)	Regulated EIA procedures (articles 49–62), scope of EIAs, Format of environmental license (Resolution 958/2005), authority roles	MinAmbiente / ANLA
	Decree 1076 / 2015	Consolidates environmental regulations into the “Reglamento Único” (Art. 2.2.2.3.x), including Terms of Reference for EIAs	MinAmbiente / ANLA
	ANLA Resolutions (2015)	Res. 323, 327, 324 define EIA terms, procedures, application formats, scope, and control measures [leap.unep.org].	ANLA
	Law 1712 of 2014	Guarantees access to public information, including environmental and climate data	MinAmbiente
ESS 2: Protection of Natural Habitats and Biodiversity Conservation	Decree 2372 / 2010 (consolidated in Decree 1076 / 2015)	Regulates the SINAP, categories of protected areas; defines protected zones and ecosystem conservation	MinAmbiente
	Constitutional Articles 8, 63, 79, 80	Protect public heritage, define parks as inalienable/inalienable, the precautionary principle, and sustainable resource use	Constitutional Court
	Decree 190 of 2004	Environmental management plans for district protected areas	District Secretariat of Environment
	Law 165 of 1994	Ratifies the Convention on Biological Diversity	MinAmbiente
	SbN Guide 2020	Integration of nature-based solutions in urban planning	Humboldt Institute
	Law 2469 of 2025	Incorporates wetlands into the climate change system	Congress of Colombia
	PGA Bogotá 2038	Long-term environmental planning	District Secretariat of Environment
	Law 2173 of 2021	Promotes ecological restoration through tree planting	Congress of Colombia
	Resolution 1491 of 2025	Regulates implementation of the law 2173 of 2021, promoting ecological restoration through the planting of trees and the creation of forests in the national territory.	MinAmbiente

Environmental and Social Safeguard	Legal Instrument	Description	Source or Institution
	ICA Resolution 780006 of 2020	Requirements for registration of commercial nurseries	ICA
	SDA Protocol 2008	Ecological recovery of urban wetlands	District Secretariat of Environment
	Decree 1468 of 2018	Designates wetlands as Ramsar sites	Bogotá City Hall
	District Development Plan 2020–2024	Urban restoration goals	Bogotá City Hall
	Payment for Environmental Services (PES) Program	Economic incentives for forest and páramo conservation	CAR Cundinamarca
	Resolution 331 of 2024	Adopts public policy on agroecology and protection of rural communities	Ministry of Agriculture
	Resolution 2824 of 2025	Establishes a standard pathway for green job transition	Ministry of Labor
	National Environmental Public Policy	Promotes conservation, restoration, and sustainable use of natural resources	MinAmbiente
	Life and Biodiversity Fund	Financial instrument for environmental projects	Humboldt Institute
	Colombia Sustainable Fund	Multi-donor fund for sustainable rural development	Humboldt Institute
	Decree 1007 of 2018	Regulates the Payment for Environmental Services incentive	Congress of Colombia
	Decree 1076 of 2015	Compiles environmental regulations and structures decision-making systems	MinAmbiente
	CONPES 3870 of 2016	Strategic guidelines for biodiversity and ecosystem services financing	National Planning Department
	Law 1930 of 2018	Regulates páramo management and promotes restoration and education	Congress of Colombia
	Resolution 1427 of 2018	Establishes technical criteria for ecological restoration and training	MinAmbiente
ESS 3: Resettlement and physical and economic displacement	Law 387 of 1997	Defines internally displaced persons (IDPs), their rights, and creates the National System for IDP assistance.	Unit for Victims / Ministry of Interior
	Law 1448 of 2011	Victims and Land Restitution Law, includes reparations and return mechanisms.	Land Restitution Unit / Unit for Victims
	Decrees 4633 & 4635 (2011)	Regulate restitution and rights for Indigenous and Afro-descendant communities.	Ministry of Interior / National Land Agency
	Constitutional Court Ruling T-025 of 2004	Declares an unconstitutional state of affairs due to forced displacement, orders structural measures.	Constitutional Court
	Resolution 063 of 2023	Establishes mechanisms for resettling families in non-mitigable high-risk rural zones.	Caja de Vivienda Popular – Secretaría Jurídica District
	Decree – Resettlement Program (2024 draft)	Defines procedures for resettling strata 1–2 households living in high-risk urban zones.	Secretariat of Habitat, Mayor's Office

Environmental and Social Safeguard	Legal Instrument	Description	Source or Institution
	Decree 330 of 2020	Regulates the resettlement program for families in high-risk zones; includes expropriation/just compensation.	Mayor's Office – Secretaria Jurídica
	CVP–CAR Cooperation (2024)	Joint restoration program for Cerros Orientales and Thomas van der Hammen with urban resettlement integration for risk populations.	CAR & Bogotá Mayor's Office
ESS 4: INDIGENOUS PEOPLES	Political Constitution of Colombia (1991)	Recognizes ethnic and cultural diversity; guarantees autonomy of Indigenous territories and prior consultation rights (Art. 7, 330).	Congress / Constitutional Court
	Law 21 of 1991	Incorporates ILO Convention 169 into domestic law, ensuring rights to land, culture, and prior consultation.	Congress / Ministry of Interior
	Law 70 of 1993	Protects collective rights of Afro-descendant communities, including territorial rights and cultural identity.	Congress / Ministry of Interior
	Decree 1320 of 1998	Regulates prior consultation for projects affecting Indigenous and Afro-descendant communities.	Ministry of Interior
	Decree 4633 of 2011	Establishes measures for attention, assistance, and reparation for Indigenous victims of armed conflict.	Ministry of Interior / Unit for Victims
	Decree 1953 of 2014	Creates a special regime for Indigenous territorial governance and administration.	Ministry of Interior
	Bogotá Development Plan (2024–2027)	Includes an ethnic chapter with measures for Indigenous communities in urban areas: housing, health, education, and cultural preservation.	Mayor's Office – Secretaría Distrital de Gobierno
	District Policy for Ethnic Groups (2018)	Guarantees participation and consultation for Indigenous cabildos in Bogotá; regulates cultural and territorial rights in urban context.	Secretaría Distrital de Gobierno
	Cabildo Recognition Resolutions	Official recognition of Indigenous cabildos (e.g., Muisca, Inga, Kichwa) for representation and FPIC in district projects.	Secretaría Distrital de Gobierno
	CAR Environmental Licensing Protocols	Require identification of ethnic communities and FPIC compliance for projects affecting Indigenous territories or sacred sites.	CAR Cundinamarca
ESS 5: RESOURCE EFFICIENCY AND POLLUTION PREVENTION	Decree 1076 of 2015	Unified environmental regulation; includes provisions on emissions, waste management, and resource efficiency.	MinAmbiente
	Resolution 1407 of 2018	Regulates packaging waste management under Extended Producer Responsibility (EPR).	MinAmbiente
	Decree 1688 of 2020	Regulates water infrastructure in rural areas	District Secretariat of Environment
	Resolution 0844 of 2018	Establishes technical requirements for rural water projects	Congress of Colombia

Environmental and Social Safeguard	Legal Instrument	Description	Source or Institution
	National Policy for Integrated Water Resource Management	Strengthens water governance in Colombia	MinAmbiente
	Decree 334 of 2024	Regulates water-saving and efficient use practices in Bogotá	MinAmbiente
	Sustainable Production Policy for Bogotá D.C.	Promotes sustainable production and consumption aligned with the SDGs	District Secretariat of Environment
ESS 6: CULTURAL HERITAGE	Natural Heritage Fund	Finances conservation of protected areas	ICA
	Law 397 of 1997 (General Law of Culture)	Establishes cultural heritage protection, including tangible and intangible heritage.	Ministry of Culture
	Law 1185 of 2008	Amends Law 397; strengthens protection of cultural property and archaeological heritage.	Ministry of Culture
	Law 1675 of 2013	Regulates management and protection of underwater cultural heritage.	Ministry of Culture
	Decree 1080 of 2015	Unified cultural regulations; includes heritage conservation, restoration, and management.	Ministry of Culture
	Law 163 of 1959	Protects archaeological heritage and regulates excavations.	Ministry of Culture / ICANH
	Bogotá District Decree 070 of 2015	Regulates cultural heritage management in urban planning and construction projects.	Mayor's Office – Secretaría Distrital de Cultura
	Bogotá Cultural Heritage Plan (2020–2030)	Strategic plan for safeguarding tangible and intangible heritage in the city.	Secretaría Distrital de Cultura
ESS 7: LABOR & WORKING CONDITIONS	Political Constitution (1991)	Guarantees labor rights, equality, and freedom of association.	Congress / Constitutional Court
	Labor Code (Código Sustantivo del Trabajo)	Main labor law regulating contracts, working hours, occupational health, and employer obligations.	Ministry of Labor
	Law 1010 of 2006	Prevents workplace harassment and promotes dignity at work.	Ministry of Labor
	Law 1610 of 2013	Strengthens labor inspection and enforcement mechanisms.	Ministry of Labor
	Law 1562 of 2012	Updates occupational health and safety regulations; introduces the Occupational Risk System.	Ministry of Labor
	Decree 1072 of 2015	Unified labor regulations; includes the Occupational Health and Safety Management System (SG-SST).	Ministry of Labor
	Resolution 0312 of 2019	Establishes minimum standards for SG-SST implementation.	Ministry of Labor
ESS 8: COMMUNITY HEALTH, SAFETY AND SECURITY	Law 9 of 1979 (Sanitary Code)	Establishes general health and safety standards for public health, sanitation, and disease prevention.	Ministry of Health
	Law 388 of 1997	Regulates territorial planning and land use management	Congress of Colombia

Environmental and Social Safeguard	Legal Instrument	Description	Source or Institution
	Law 1523 of 2012	Creates the National Disaster Risk Management System (SNGRD) for prevention and emergency response	UNGRD (Unidad Nacional para la Gestión del Riesgo de Desastres)
	Law 1562 of 2012	Updates occupational health and safety regulations, including risk prevention for workers and communities.	Ministry of Labor
	Law 1751 of 2015 (Statutory Health Law)	Guarantees the fundamental right to health and access to services.	Ministry of Health
	Colombia Sustainable Agri-Food Project	Transforms agri-food systems with technology and climate resilience	MADR, CIAT, CIMMYT, AGROSAVIA
	Bogotá District Risk Management Plan	Integrates disaster risk reduction and emergency response for urban communities.	IDIGER (Instituto Distrital de Gestión de Riesgos y Cambio Climático)
ESS 10: CLIMATE RISK AND RELATED DISASTERS	Law 1523 of 2012	Creates the National Disaster Risk Management System (SNGRD) and establishes guidelines for prevention, preparedness, and response to climate-related disasters.	UNGRD (National Unit for Disaster Risk Management)
	Law 1931 of 2018	Establishes the National Climate Change Policy and creates the SISCLIMA system for adaptation and mitigation.	MinAmbiente
	Decree 1076 of 2015	Consolidates environmental regulations, including climate adaptation measures in environmental licensing.	MinAmbiente
	District Risk Management and	Planning instrument to reduce climate vulnerability in Bogotá	District Secretariat of Environment
	Law 2169 of 2021	Establishes carbon neutrality and climate resilience goals	Congress of Colombia
	Decree 555 of 2021	Updates Bogotá's POT with climate and environmental planning instruments	Bogotá City Hall
	District Plan for Disaster Risk and Climate Change Management for Bogotá D.C. 2018-2030	Sets adaptation and mitigation measures for urban climate risks (floods, heat waves).	Secretaría Distrital de Ambiente

Source: IDOM, 2025

Gap Analysis

Below is the analysis of the main gaps between Colombia's regulatory and legislative framework and Conservation International's environmental and social policy framework.

Table 5. Gaps between Colombian Environmental and Social Framework and CI Safeguards

Environmental and Social Standard	National and local requirements	CI-GCF Requirements
ESS 1: Environmental and Social Impact Assessment, Management and Monitoring	Colombian legislation requires Environmental Impact Assessments (EIA) for licensing, but risk categorization criteria often differ from multilateral standards.	CI classifies projects into Category A, B, or C based on impact magnitude. It requires strict application of the mitigation hierarchy (avoid, minimize, mitigate, or offset). An Environmental and Social Management Plan (ESMP) is mandatory for higher-risk projects, and Strategic Assessments (SESA) may be required for programmatic interventions.
ESS 2: Protection of Natural Habitats and Biodiversity Conservation	National law protects sensitive habitats through licenses and protected areas, but it does not always distinguish "critical habitats" or require third-party verification.	CI prioritizes "net gain" or "no net loss" of biodiversity values. Operations in critical habitats are generally prohibited unless no viable alternatives exist and a net gain is demonstrated. It includes strict protocols against invasive alien species and requires verification of primary suppliers.
ESS 3: Involuntary Resettlement, Physical & Economic Displacement	Legislation recognizes the need to prevent displacement and focuses on compensation for formal owners but is less exhaustive regarding tenants or informal occupants.	These standards cover both physical and economic displacement (loss of access to resources), including for those without formal legal titles. It requires a Process Framework or a Livelihood Restoration Plan (LRP) negotiated in good faith. Compensation must be at full replacement cost.
ESS 4: Indigenous Peoples	Constitutional and legal recognition of collective rights, prior consultation, and special protection for indigenous and Afro-descendant communities.	Iterative Process: CI requires Free, Prior, and Informed Consent (FPIC) to be maintained throughout the project life cycle. An Indigenous Peoples Plan (IPP) must be co-designed whenever adverse impacts are anticipated.
ESS 5: Resource Efficiency and Pollution Prevention	Colombia has regulations governing resource use, discharge control, atmospheric emissions, and waste management.	CI strictly prohibits pesticides categorized as IA, IB, or II by the WHO. Projects must estimate and reduce direct and indirect greenhouse gas (GHG) emissions. It promotes Integrated Pest Management (IPM) and requires a specific Resource Efficiency Plan (REPPP).
ESS 6: Cultural Heritage	Strong legislation regarding the protection of archaeological and cultural heritage.	Requires a Cultural Heritage Management Plan (CHMP) for both tangible and intangible resources. It mandates a "Chance Finds Procedure" for all physical works. Intangible heritage is protected against commercialization without FPIC.
ESS 7: Labor and Working Conditions	Detailed labor laws exist, but regulations can be limited in their ability to verify compliance	CI requires written Labor Management Procedures (LMP) and due diligence of primary suppliers regarding child/forced labor. It mandates

Environmental and Social Standard	National and local requirements	CI-GCF Requirements
	across the supply chain for primary suppliers.	Occupational Health and Safety (OHS) measures and access to a grievance mechanism for all workers.
ESS 8: Community Health, Safety and Security	National regulations on public health and industrial risk prevention.	Focuses on preventing Gender-Based Violence (GBV) and Sexual Exploitation, Abuse, and Harassment (SEAH). Requires a participatory Emergency Preparedness and Response Plan (EPRP). Security personnel's use is strictly regulated under human rights principles.
ESS 9: Private Sector Direct Investments and Financial Intermediaries	SARAS principles apply "Proportionality and Relevance," often reserving exhaustive due diligence for high-value credits.	Risk-Based Focus: A mandatory Environmental and Social Management System (ESMS) is required for all activities. Full CI standards (ESS1–ESS10) apply to any subproject triggering specific risks, regardless of size.
ESS 10: Climate and Natural Disaster Risk	Addresses climate risk via the National Disaster Risk Management System and sector-specific adaptation plans.	Mandates "climate-proofing" for all physical infrastructure. Projects must evaluate sensitivity to future climate scenarios to avoid maladaptation. All activities must align with the goals of the Paris Agreement.

Source: IDOM, 2025

5. Applicable GCF and CI safeguards standards: ESS Screening and Categorization

Social and environmental safeguards are implemented to ensure that projects do not negatively impact people or ecosystems but rather deliver tangible benefits to both. For this project, two distinct sets of policies and safeguards apply:

- Those established by the Green Climate Fund (GCF); and
- Those adopted by the CI-GCF Project Agency.

To secure GCF funding, proposals must demonstrate that relevant social and environmental standards have been fully considered during design and will be respected throughout implementation. Conservation International (CI), through its CI-GCF Agency, acts as an Accredited Entity of the GCF and has developed an Environmental and Social Management Framework (ESMF) that meets all GCF safeguard requirements. Applying this ESMF to projects guarantees compliance with GCF standards.

Overview of preliminary ESS screening results

The initial review of the project identified several Environmental and Social Standards (ESS) as applicable based on the nature of the proposed activities. This preliminary screening served as the first step in assessing potential risks and impacts. The ESS standards triggered are the following:

- ESS 2: Protection of Natural Habitats and Biodiversity Conservation
- ESS 4: Indigenous Peoples
- ESS 6: Cultural Heritage
- ESS 8: Community Health, Safety and Security

Following this initial assessment, a second ESS screening was conducted during the PPF stage to evaluate specific risks and impacts that could arise during project implementation. The project's classification remained the same.

Identification of applicable safeguard standards and triggered requirements

The proposed project activities may generate certain adverse environmental and social impacts. However, these impacts are expected to be less severe than those associated with Category A projects, as they are site-specific and can be effectively mitigated through well-designed measures. Restoration efforts will take place in degraded areas or within protected zones consistent with the objectives of the protected area. The likelihood of economic displacement is minimal, and a process framework will ensure that any restrictive measures are agreed upon voluntarily and developed in consultation with community associations. No negative impacts are anticipated for Indigenous Peoples and Local Communities (IPLC). Furthermore, the implementation of the Indigenous Peoples Plan (IPP) will guarantee respect for Free,

Prior, and Informed Consent (FPIC) and ensure that any potential impacts are identified and managed in close coordination with IPLC stakeholders.

Table 6: Applicable safeguard standards and triggered requirements

Environmental and Social Standard	Yes	No	TBD	Justification
ESS 2: Protection of Natural Habitats and Biodiversity Conservation	x			Triggered by interventions in sensitive high-Andean forests and páramos. Manages risks of invasive species and plant mortality through the implementation of nature-based solutions (EbA) and site-specific assessments. Includes measures to prevent habitat fragmentation and alterations in water dynamics, ensuring that the installation of project infrastructure follows a proportional and environmentally sound approach.
ESS 3: Involuntary Resettlement, Physical & Economic Displacement	x			Activated to manage economic displacement risks from water regulations and conservation zoning. Ensures that any resource access restrictions affecting livelihoods are negotiated through transparent, participatory processes and compensated through livelihood restoration measures. This standard also addresses legal uncertainty regarding land tenure and boundaries to prevent operational bottlenecks or social conflicts arising from access to resources.
ESS 4: Indigenous Peoples	x			Triggered by the presence of the Muisca indigenous community in Sesquilé. Guarantees protection of ancestral territories, sacred sites, and traditional knowledge through culturally appropriate collaboration, FPIC, and the co-creation and implementation of an Indigenous Peoples Plan (IPP), which includes participatory processes, culturally appropriate engagement, and measures agreed with the community.
ESS 5: Resource Efficiency and Pollution Prevention	x			Manages pollution from chemical pesticides by transitioning to integrated pest management (IPM) and implementing strict waste management measures for EbA equipment to prevent soil and water contamination. Includes the evaluation of extraction risks to maintain ecological flows for downstream users as part of project mitigation measures.
ESS 6: Cultural Heritage	x			Protects tangible and intangible values in Area 3, including three identified sacred sites and two ancestral paths. Includes a Chance Find Procedure for archaeological discoveries during excavations and safeguards traditional knowledge from commodification. Includes the

				implementation of the Colombian Chance Finds Procedure, which establishes: (i) immediate suspension of activities in the area of discovery; (ii) protection and delimitation of the site; (iii) notification to the competent cultural authorities; and (iv) resumption of activities only after authorization from the relevant authority
ESS 7: Labor and Working Conditions	x			Ensures safe conditions in high-mountain terrain, addressing occupational accidents and biological risks. Critically manages risks of improper PPE use by subcontractors and establishes protocols for personnel integrity, ethics, and security in critical areas, including the implementation of occupational health and safety measures across project activities.
ESS 8: Community Health, Safety and Security	x			Mitigates risks related public order and to gender-based violence (GBV) and sexual exploitation and abuse/harassment (SEAH) by ensuring access to grievance redress mechanisms (GRM) and support pathways, especially for vulnerable groups during project implementation. Includes the implementation of measures for reporting, response, and follow-up of incidents, in coordination with the GRM and relevant institutional arrangements, including defined reporting pathways, response mechanisms, and coordination with the GRM.
ESS 9: Private Sector Direct Investments and Financial Intermediaries	x			Activated as Component 2 acts as a financial mechanism. Manages risks of perverse incentives (impact leakage) through the Grants Manual and ensures that third-party consultants and subcontractors align with CI's rigorous safeguard standards.
ESS 10: Climate Risk and Related Disasters	x			Ensures long-term resilience by preventing the maladaptation of EbA equipment. Analyzes future climate hazards to prevent the ineffectiveness of restoration and livelihood measures due to extreme weather events or shifts in precipitation.

Source: IDOM, 2025

Project categorization (A/B/C) according to the CI-GCF ESMF

According to the ESS Screening report, the project has been classified as a B Category, and following the Safeguard Screening Form, this category requires both a limited ESIA and a limited ESMP.

Category B: a proposed project is classified as Category B if its potential adverse environmental and social impacts on human populations or environmentally or socially important areas are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. A full or limited ESIA is required, depending on the type, degree and extent of the impacts;

6. Baseline Data Collection

6.1 Methodology for primary and secondary data gathering

The baseline study relied primarily on official cartographic information from recognized national and regional institutions, including IGAC, IDEAM, and SINAP. These sources served as the foundation for spatial analysis, ensuring accuracy and compliance with national standards. In cases where official data was incomplete or outdated, open-access platforms such as Global Forest Watch, Copernicus, and Google Earth Engine were consulted as complementary sources to provide updated imagery and trend analysis.

For primary data collection, the methodology included on-site visits to verify ecosystem conditions and the feasibility of restoration. These visits allowed for direct observation, environmental sampling, and validation of secondary data. Structured interviews were conducted with key stakeholders, including community leaders, local authorities, and representatives of relevant organizations, to gather qualitative insights on social, cultural, and gender aspects. Additionally, participatory mapping exercises were carried out with local communities to identify culturally significant sites, resource-use areas, and zones of ecological importance.

The integration of official spatial data, secondary sources, and field-based information ensures a comprehensive and reliable baseline. This approach combines geospatial analysis with socio-economic and cultural dimensions, applying gender-sensitive and health-focused indicators to assess vulnerability and adaptation needs. All data collection adhered to ethical standards, including Free, Prior, and Informed Consent (FPIC) for Indigenous Peoples and Local Communities, and ensured confidentiality and cultural sensitivity throughout the process.

The methodologies used to gather the information supporting this document are detailed below.

Fieldwork Methodology and Activities: Participation was organized into blocks based on the type of stakeholder and objective, highlighting the following direct actions within the territory:

- **Community participatory workshops:** Conducted in priority municipalities with Community Action Boards (JAC), productive and environmental associations, and specific groups (women, youth, indigenous communities, and the elderly).

Workshop attendance disaggregated by gender:

- Intervention landscape 1 (Guandoque): 41 attendees (23 women, 18 men).
- Intervention landscape 2 (Villapinzón): 18 attendees (6 women, 12 men).
- Intervention landscape 3 (Tominé): 66 attendees (17 women, 49 men).
- Intervention landscape 3 (Tunjuelo): 66 attendees (17 women, 49 men).

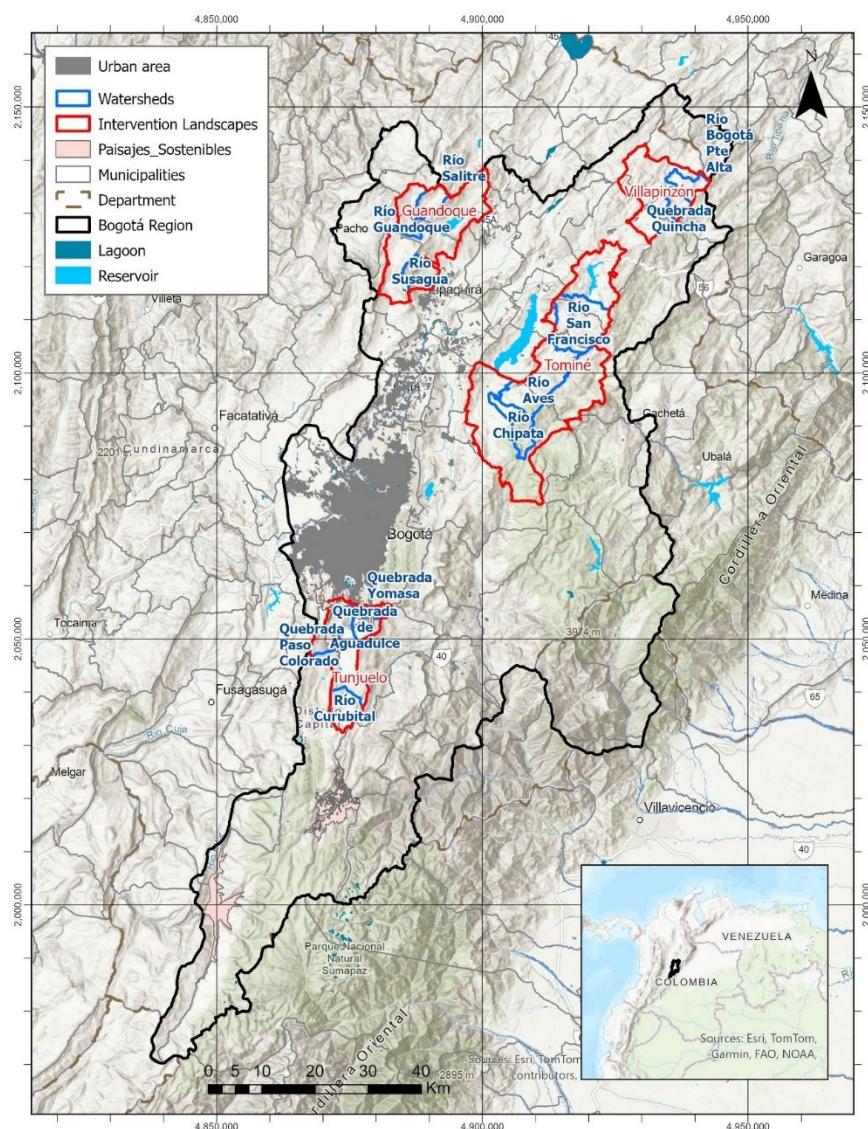
- **Social cartography and qualitative dialogues:** During the workshops, the work was divided into two parts: one for the development of social maps and another for research on perceptions regarding territory, natural resources, livelihoods, gender, and culture.
- **Complementary surveys:** Administered to landowners and key stakeholders in specific clusters (Villapinzón, Tominé, and Tunjuelo) to identify needs, gaps, and current adaptation practices.
 - Intervention landscape 2 (Villapinzón): 29 respondents (13 women, 16 men).
 - Intervention landscape 3 (Tominé): 48 respondents (10 women, 38 men).

6.1.1. Study areas

The Study area corresponds to three intervention landscapes (Figure below) represent the most strategic and sensitive zones within the Bogotá Region. Each combines unique ecological characteristics with pressing environmental challenges (Conservation International, 2024) (Conservation International Colombia, 2023):

1. Guandoque: Located in the upper basins of the Frío and Neusa rivers, this area includes the Guerrero páramo, heavily impacted by potato farming and coal mining (Conservation International, 2024) (Conservation International Colombia, 2023).
2. Villapinzón: Headwaters of the Bogotá River, within the Guacheneque páramo, facing water quality issues due to agriculture and tannery activities (Conservation International, 2024) (Conservation International Colombia, 2023).
3. TominéNorte: Includes the Sisga and Siecha watersheds, with cloud forests and sub-páramo wetlands that contribute to Bogotá's water supply (Conservation International, 2024) (Conservation International Colombia, 2023).
4. Tunjuelo: Located in the upper and mid basin of Tunjuelo river, includes a peri urban area of Bogotá DC, four sustainable landscapes, and páramos in the Curubital watershed.

Figure 2. Selected intervention landscapes in the Bogotá Region



Source: IDOM with data from (IDEAM, 2024)

6.1.2. Habitats and Ecosystems baseline

Below is a summary of the information contained in Annex 2 regarding the **Biodiversity Assessment**. For further details, please refer to the mentioned document.

Páramos and high-Andean forests act as natural “water towers”, while wetlands buffer floods and maintain hydrological cycles. However, deforestation, agricultural expansion, urbanization, and climate change exacerbate ecosystem loss, reducing habitat integrity and compromising water security and biodiversity under the IUCN Red List of Ecosystems framework (Etter, Andrade, Saavedra, Amaya, &

Arévalo, 2017) (Ministerio de Ambiente y Desarrollo Sostenible, 2019) (Ministerio de Ambiente y Desarrollo Sostenible, 2012) (Ministerio de Ambiente y Desarrollo Sostenible, 2023c).

The Bogotá-Region Landscape is a highly diverse and ecologically strategic territory that encompasses a mosaic of natural and anthropogenic ecosystems (Figure 3). Its ecological complexity is shaped by steep altitudinal gradients, varied hydrological regimes, and a dynamic interface between rural and urban land uses. This heterogeneity supports a wide array of ecosystem types, each playing a critical role in biodiversity conservation, water regulation, and climate resilience (Etter, Andrade, Saavedra, Amaya, & Arévalo, 2017) (Ministerio de Ambiente y Desarrollo Sostenible, 2019) (Ministerio de Ambiente y Desarrollo Sostenible, 2012) (Ministerio de Ambiente y Desarrollo Sostenible, 2023c):

- **Páramos**, located at elevations typically above 3,000 meters, are among the most important ecosystems for water regulation and endemic biodiversity in the Northern Andes (Ministerio de Ambiente y Desarrollo Sostenible, 2023c): (Ministerio de Ambiente y Desarrollo Sostenible, 2019) (Etter, Andrade, Saavedra, Amaya, & Arévalo, 2017) In the Bogotá region, the Sumapaz and Chingaza páramo complexes are particularly significant, acting as natural water towers that supply the Chingaza reservoir system and other aqueducts serving Bogotá. These ecosystems are characterized by a mosaic of frailejones (*Espeletia* spp.), cushion plants, peatlands, and glacial landforms, and are highly sensitive to climate change and land-use pressures (IDEAM, 2024) (Morales, et al., 2007) (Armenteras, Gast, & Villareal, 2003).

The four páramo complexes analyzed exhibit distinct patterns in the dynamics of natural and anthropogenic land cover between 2002 and 2018. Land-cover assessments indicate that Cruz Verde–Sumapaz is the largest páramo complex in the region, exceeding 300,000 hectares, with a predominance of natural vegetation and relatively limited anthropogenic transformation. At the national scale, 70% of the transformed area recorded in 2018 is concentrated in eight complexes, including Cruz Verde–Sumapaz. Natural vegetation consistently dominates, maintaining approximately 85–90% of the total area across all years, with slight fluctuations. Within natural covers, herbaceous vegetation is the most prevalent category, while forests and shrublands occupy smaller proportions. Anthropogenic covers show a gradual diversification: until 2009, areas without vegetation accounted for nearly 100% of transformed areas, but by 2018, pastures decreased to 30%, with cultivation (31.7%) and forest plantations (38.3%) emerging as significant components. This trend suggests an intensification and diversification of land-use practices over time, increasing potential fragmentation risks despite the overall stability of natural cover (Google Looker Studio, 2018).

In addition, Chingaza and Guacheneque while maintaining substantial natural cover (more than 90%), exhibits a small proportion of human-modified areas without vegetation in Chingaza and cultivation area in Guacheneque). Between 1984 and 2021, the Rabanal páramo (Guacheneque) lost approximately 33.8% of its native vegetation, primarily converted into montane vegetation (51.5% of the change) and agricultural land (32%), amounting to about 36.7 km² transformed. Agricultural expansion (+12.5%) and the presence of coke ovens are the main drivers of degradation, along with exotic plantations associated with mining activities. Between 2016 and 2021, this trend continued with an additional 11.5% loss, while montane vegetation

grew by 43.9%, evidencing an accelerated replacement of páramo ecosystems. These paramos present a more balanced composition among grasslands, shrublands, and forests (Google Looker Studio, 2018) (Murad, Pearse, & Huguet, 2024).

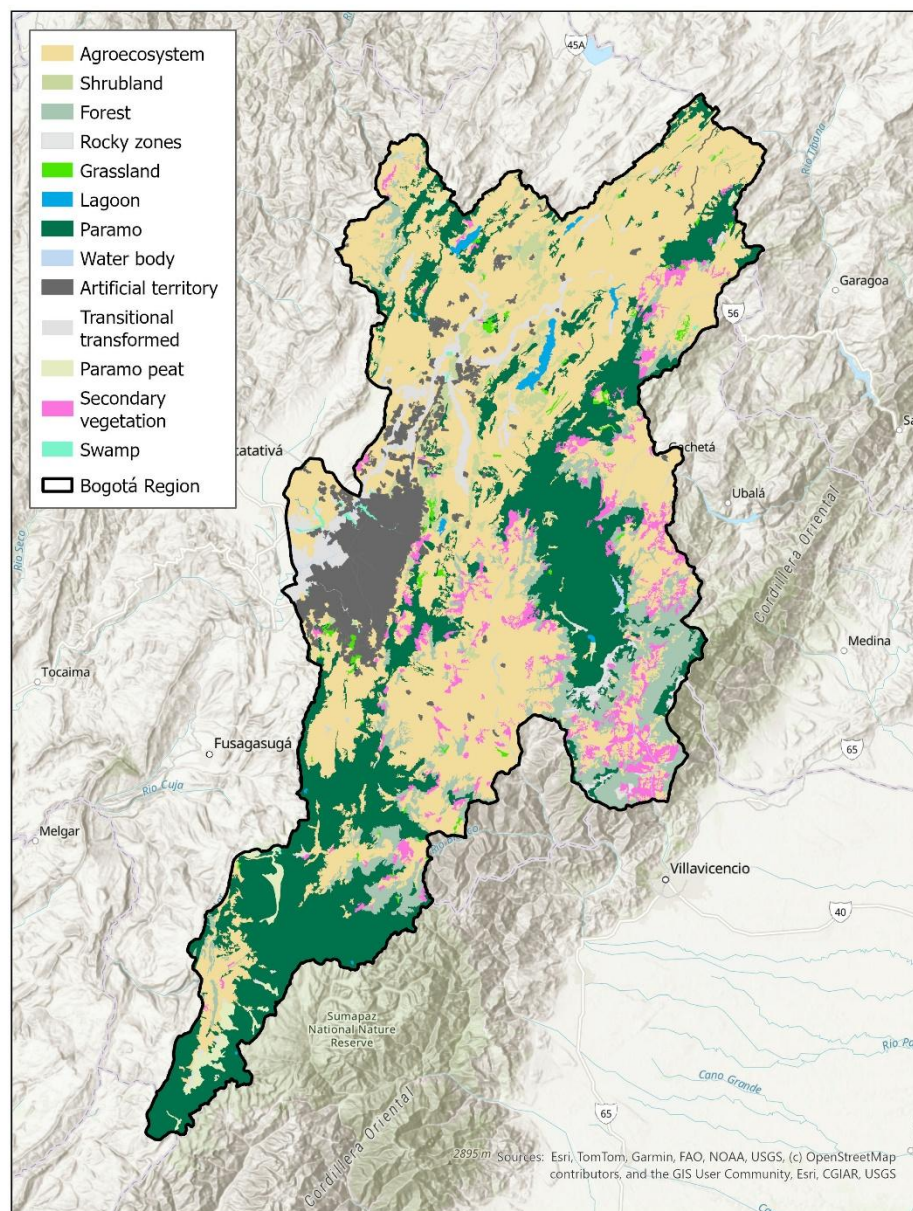
- In contrast, The Guerrero páramo currently retains only 45–55% natural cover, historically dominated by grasslands (48.4%) and shrublands (31.1%). By 2018, grasslands slightly declined to 47.6%, while shrublands rose to 41.5%, indicating internal variability. Forests remain scarce and show a downward trend, and anthropogenic zones consistently lack vegetation. Between 1984 and 2021, the ecosystem underwent extensive transformation: 30.3% of native páramo vegetation was lost ($\approx 110.4 \text{ km}^2$), primarily replaced by montane vegetation (42%) and agriculture (31.7%), with agricultural land expanding by 41.2 km^2 . Although no coke ovens were detected, exotic plantations and forest encroachment have fragmented the landscape. From 2016 to 2021, an additional 4.7% loss occurred, while montane vegetation increased by 40.6%, confirming the substitution trend. These changes reflect altitudinal migration of vegetation and agricultural expansion into higher elevations, driven by climate change and human activities. (Google Looker Studio, 2018) (Murad, Pearse, & Huguet, 2024). **Peatlands** are considered a subtype or sub-ecosystem within the broader páramo biome. In Colombia consist of waterlogged grasslands and shrublands located above 2,800 meters above sea level, in very cold, humid, and super-humid climates on hydromorphic soils. According to the MECCM (2005–2009), they cover 20,283 hectares distributed across 21 peatland ecosystems, of which 99.64% correspond to páramo peatlands and 0.36% to Andean peatlands. These ecosystems occur in 13 departments and are primarily associated with mountainous landscapes (99%), dominated by glacial troughs (61%), small valleys (28%), and Andean summits (8%). Their development is conditioned by edaphogenetic environments characterized by poor drainage and extremely low temperatures (55%), the presence of organic materials (13%), and volcanic ash deposits (9%). These attributes confer a high capacity for water and carbon storage, making them strategic ecosystems for hydrological and climate regulation. (IDEAM, 2024)
- **Wetlands**, both high-altitude and lowland, are scattered throughout the region and provide essential hydrological services, including flood mitigation, groundwater recharge, and water purification. They also serve as critical habitats for migratory birds, amphibians, and aquatic flora. Urban wetlands such as those in the Bogotá Wetland System are particularly vulnerable to encroachment and pollution but remain vital for maintaining ecological connectivity in the urban matrix (SDA, 2025) (Ramsar, 2022).
- **Forests**, including high Andean cloud forests and riparian gallery forests, are essential for carbon sequestration, slope stabilization, and biodiversity conservation. While some forest patches remain relatively intact within protected areas, many are fragmented due to agricultural expansion and infrastructure development. These forests serve as ecological corridors for species migration and are key to maintaining landscape connectivity (Etter, Andrade, Saavedra, Amaya, & Arévalo, 2017) (Ministerio de Ambiente y Desarrollo Sostenible, 2019) (Instituto Humboldt, 2021b) (Ministerio de Ambiente y Desarrollo Sostenible, 2023c).

- **Grasslands and shrublands** dominate transitional zones between forested areas and agricultural lands. These ecosystems provide habitat for native herbivores and pollinators and act as buffers against soil erosion and spreading fire. However, they are increasingly degraded by overgrazing, invasive species, and conversion to monocultures (Ministerio de Ambiente y Desarrollo Sostenible, 2019) (Ministerio de Ambiente y Desarrollo Sostenible, 2023c).
- **Agricultural zones** are widespread, particularly in the central and southern sectors of the region. These include intensive potato cultivation, dairy farming, and commercial flower growing, which often replace native vegetation and contribute to habitat fragmentation, soil compaction, and agrochemical runoff (Ministerio de Ambiente y Desarrollo Sostenible & Instituto Humboldt, 2017) (Ministerio de Ambiente y Desarrollo Sostenible, 2023a) (Observatorio Ambiental de Bogotá, 2025). Despite their environmental pressures, these areas also offer opportunities for implementing climate-resilient agroecological practices.
- **Riparian areas**, following the courses of rivers such as the Bogotá, Tunjuelo, and Guatiquía, function as ecological corridors and buffer zones. They support high biodiversity and are crucial for maintaining water quality and regulating sediment transport. Restoration of riparian vegetation is a key strategy for reducing flood risk and enhancing ecosystem services (Ramsar, 2022) (Conservation International, 2020).
- **Urban and rural mosaics** represent a dynamic interface of land uses, including settlements, peri-urban agriculture, and remnant natural patches. These areas are undergoing rapid transformation due to urban sprawl and infrastructure development. Despite their fragmented nature, they offer potential for green infrastructure interventions and community-based restoration efforts (SDA, 2023) (Ministerio de Ambiente y Desarrollo Sostenible, 2012).

While both páramos and peatlands are high-Andean ecosystems, they differ in structure and function. Both ecosystems are strategic for hydrological and climate regulation, but peatlands are defined by their saturated soils and peat formation, whereas páramos exhibit greater vegetation diversity and less permanent inundation.

Each of these ecosystems contributes uniquely to the ecological integrity and climate resilience of the Bogotá-Region Landscape. Their conservation, restoration, and sustainable management are central to achieving the objectives of the biodiversity assessment and the broader goals of the project.

Figure 3. Ecosystems in the Bogotá Region on intervention areas.



Source: IDOM, 2025 with data from (IDEAM, 2024)

After outlining the broader ecological framework, we proceed to analyze the three intervention landscapes. Each area includes a variety of ecosystem types, with specific conservation and land-use challenges.

1. Guandoque: This intervention landscape is characterized by a mosaic of agroecosystems and paramo, with patches of shrubland and an artificial water body. The predominant ecosystem is the agroecosystem, reflecting intensive agricultural use interspersed with remnant forest fragments. These remnants play a

crucial role in maintaining biodiversity and hydrological regulation. Key challenges include agricultural encroachment and livestock grazing, which contribute to habitat degradation and soil erosion.

2. Villapinzón: Situated at the interface of urban and rural landscapes, this intervention landscape exhibits a dominance of agroecosystems, complemented by areas of paramo and shrubland. Grassland and peatland patches are present but less extensive. The landscape reflects a strong human influence, with natural ecosystems confined to fragmented patches that provide essential ecological connectivity.

3. Tominé: This intervention landscape is dominated by paramo and agroecosystems, which form the core of the Chingaza ecosystem, supporting high biodiversity and water regulation services. Shrublands and fragmented forests occur in transitional zones; and there is also an artificial water body and a rocky zone in the north of the area. This area is critical for conservation and watershed protection.

4. Tunjuelo This intervention landscapes is dominated by agroecosystems. In the southern part there are still some paramos, and in the north a peri-urban area of Bogota D.C. This area includes four Sustainable Landscapes (an environmental and land-use planning strategy that integrates ecological conservation with agricultural production). Driven by entities such as the District Secretariat of the Environment, these areas seek to protect biodiversity and water resources while supporting rural traditions.

6.1.1 Ecological connectivity and fragmentation analysis

The ecosystems surrounding Bogotá D.C., particularly the páramos, high Andean forests, and wetlands, are increasingly affected by fragmentation and loss of ecological connectivity. The landscape has been shaped by rapid urban expansion, agricultural development, and the construction of infrastructure such as roads, which together have created a mosaic of isolated habitat patches. This fragmentation interrupts key ecological processes like species dispersal, gene flow, pollination, and seed dispersal, all of which are essential for maintaining biodiversity and ecosystem functionality (Etter, Andrade, Saavedra, Amaya, & Arévalo, 2017). Within this context, high-Andean Forest, though floristically rich, face severe isolation that limits connectivity and regeneration. Strategic conservation nodes, such as private reserves and protected areas, require integration through landscape-scale restoration and corridor design. While altitudinal gradients offer potential pathways for connectivity, anthropogenic pressures and a matrix dominated by pastures and exotic plantations remain major barriers. Implementing ecological corridors and integrated restoration planning is therefore essential to secure long-term ecosystem stability and functionality (Instituto Humboldt, 2017e).

Notable corridors run through areas like Tausa, Cogua, Sesquilé, Guatavita, Gachancipá, and La Calera, linking patches of high Andean Forest and páramo. Riparian zones along rivers and lakes also serve as natural connectors, and the Eastern hills of Bogotá continue to function as ecological buffers and steppingstones for biodiversity (Etter, Andrade, Saavedra, Amaya, & Arévalo, 2017).

These remaining corridors are crucial for the survival of many species and for the resilience of ecosystems in the face of climate change and human disturbance. However, their effectiveness is limited by the surrounding fragmentation and the low representation of these ecosystems within protected areas. Many of the páramos and high Andean forests in the region are classified as critically endangered or endangered, and their isolation increases the risk of local extinctions and reduces genetic diversity (Etter,

Andrade, Saavedra, Amaya, & Arévalo, 2017) (IDEAM, 2022b) (Ministerio de Ambiente y Desarrollo Sostenible, 2025c).

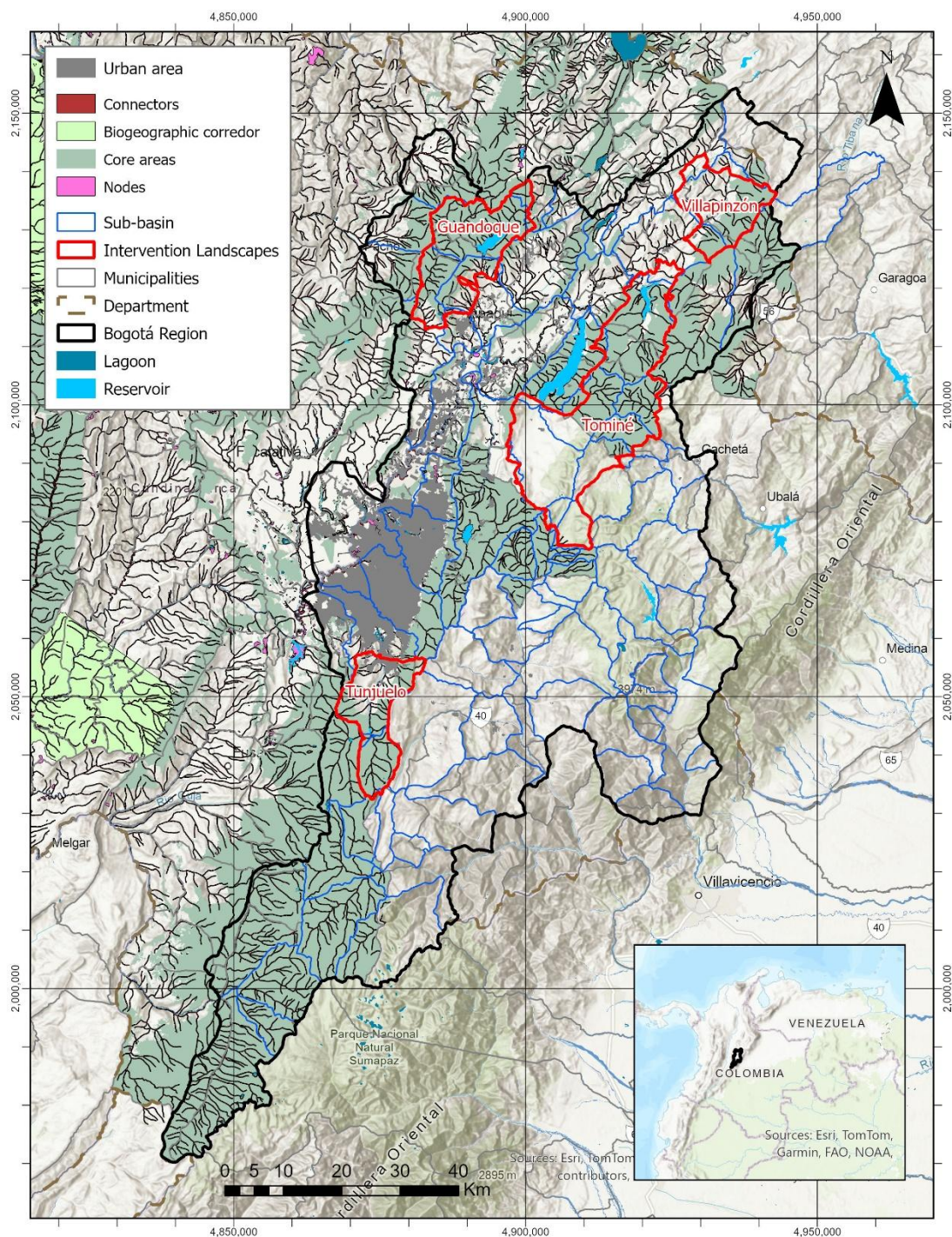
To address these challenges, it is essential to prioritize restoration efforts that enhance connectivity. This includes rehabilitating degraded areas, especially along riparian corridors and the edges of urban zones and implementing green infrastructure that allows for ecological flows within the city. Strengthening the protection of existing corridors and promoting sustainable land use practices in buffer zones can also help reduce pressure on natural ecosystems (Ministerio de Ambiente y Desarrollo Sostenible, 2025c).

In summary, while fragmentation is a serious concern in the Bogotá region, there are still opportunities to restore and maintain ecological connectivity. Doing so will not only support biodiversity but also ensure the continued provision of vital ecosystem services such as water regulation, soil stabilization, and climate resilience particularly important in the high Andean environments that surround the city (Instituto Humboldt, 2023).

Figure below illustrates the potential ecological corridors identified for connectivity within each intervention zone:

1. Guandoque: Guandoque exhibits moderate connectivity, with natural forest patches acting as steppingstones between core areas. However, agricultural expansion has created significant fragmentation, reducing habitat continuity. The presence of connectors is limited, making species movement challenging. Restoration efforts should prioritize riparian corridors to enhance connectivity.
2. Villapinzón: This area shows high fragmentation due to extensive agroecosystems and artificial territories. Core habitats are small and isolated, with minimal structural corridors. Connectivity relies on narrow riparian strips, which are vulnerable to degradation. Strategic reforestation and buffer zones are essential to restore ecological flows.
3. Tominé: Chingaza is one of the most connected areas, dominated by large, continuous natural forests forming a strong biogeographic corridor. Fragmentation is minimal, and ecological integrity remains high. This area serves as a biodiversity reservoir and a critical source of ecosystem services, particularly water regulation.
4. Tunjuelo: since is the most degraded area of the four intervention landscapes, it is very valuable that the four sustainable landscapes can be strengthened and promote ecological connectivity.

Figure 4. Ecological connectivity in the Bogotá Region.



Source: IDOM with data from (CAR, 2025) (SiB Colombia, 2025b) (IDEAM, 2025) (Parques Nacionales Naturales, 2020-2023)

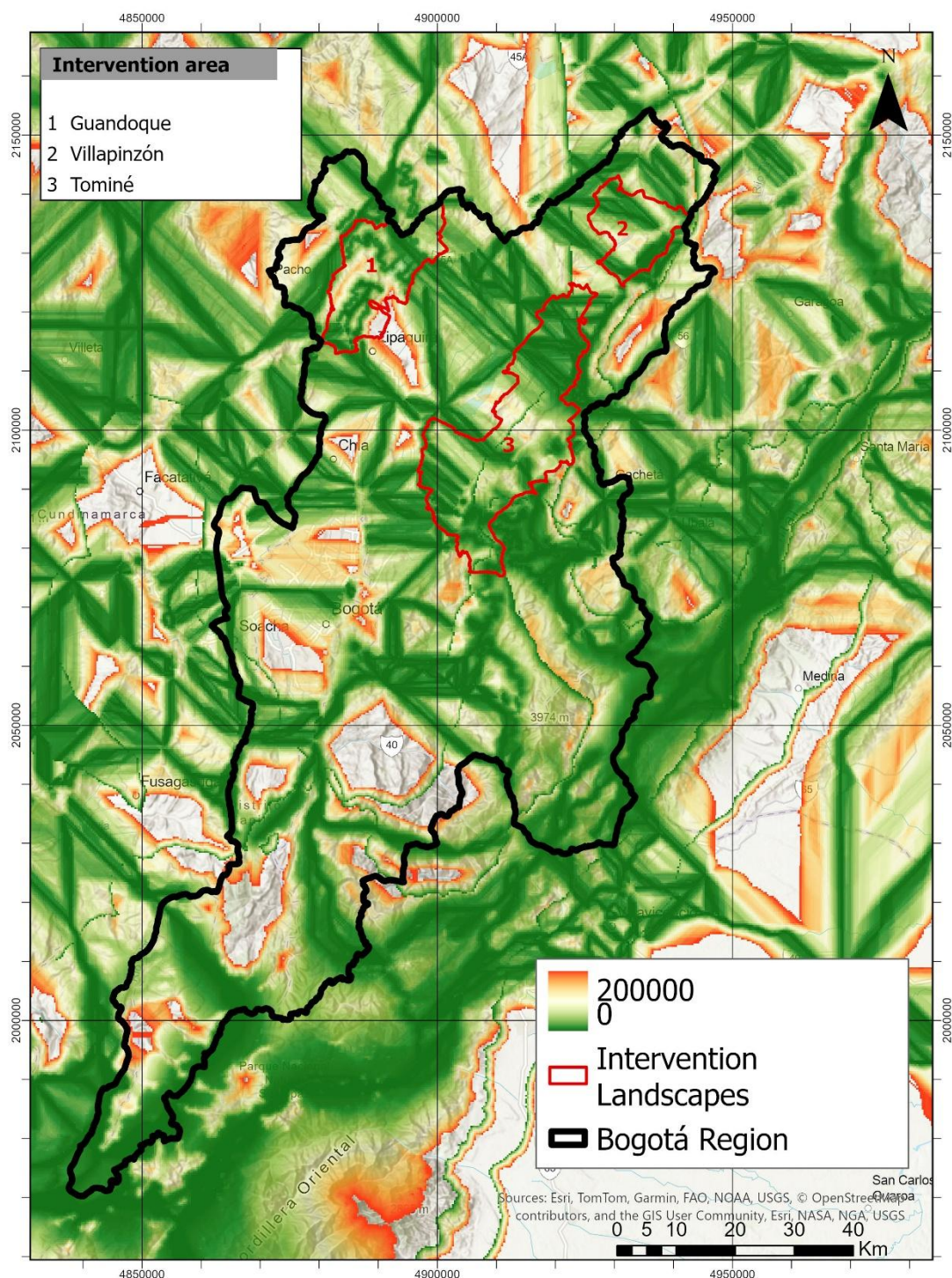
The Humboldt Institute (IAVH) has conducted a comprehensive connectivity analysis across Colombia, using advanced spatial modeling and raster data to identify priority areas for ecological corridors. This analysis prioritizes complementary natural areas with two main objectives: (1) maximize species protection and reduce extinction risk, and (2) enhance connectivity among existing protected areas (Instituto Humboldt, 2025).

From this assessment, the data relevant to the Bogotá Region has been extracted and adapted, focusing on the intervention landscapes (Figure below). The raster layer represents the connectivity potential across the Bogotá Region, with a gradient ranging from green (0 – lowest potential) to red (200,000 – highest potential). Areas in green indicate low suitability for ecological corridors, while orange and red zones highlight regions with the greatest potential for connectivity. Within this framework, four intervention landscapes have been analyzed:

1. Guandoque: This area connects paramo and high Andean Forest ecosystems, essential for water regulation and endemic species conservation.
2. Villapinzón: Positioned northeast, it plays a key role in linking natural fragments and reducing pressure on corridors toward the Guerrero páramo.
3. Tominé: In the north-central zone, surrounding Chingaza National Park, it is vital for maintaining páramo integrity and biodiversity.
4. Tunjuelo: As this area is the entry point to the Sumapaz páramo, it is crucial to reduce the impact of other activities in the surrounding areas in order to maintain the integrity and biodiversity of the páramo.

The intervention landscapes represent strategic zones for improving ecological connectivity. Guandoque and Villapinzón are strategically located within a corridor network that can strongly link páramo ecosystems and high Andean forests. They contain strong corridor segments, although localized gaps could hinder continuous connectivity. Tominé serves as a potential connectivity nucleus. Tunjuelo, in the south of Bogotá DC, serves as an entry point to the Sumapaz Páramo. Together, these areas could potentially form a prioritized network aimed at restoring habitat continuity and strengthening the resilience of the páramo corridor.

Figure 5. Network of potential corridors identified to connect protected areas within the intervention zones.



Source: IDOM with data from (Instituto Humboldt, 2025)

The ecological structure of the Bogotá Region is supported by a complex network of protected and conservation areas that ensure the continuity of ecosystem processes across the landscape. Key areas

include Chingaza and Sumapaz National Natural Parks, as well as regional and municipal protected areas under CAR's jurisdiction. Together with restoration corridors and riparian buffer zones, these ecosystems sustain ecological connectivity, safeguard biodiversity, and contribute to climate regulation at a regional scale (Instituto Humboldt, 2019a).

The Main Ecological Structure (EEP) functions as the city's environmental backbone, integrating core ecosystems that provide essential goods and services such as water supply, climate regulation, and biodiversity conservation. According to the District Environmental Secretariat and the Land Use Plan, the EEP encompasses critical high-mountain ecosystems like the Sumapaz, Cruz Verde, and Guerrero páramos, which serve as strategic water sources for the metropolitan area (Instituto Humboldt, 2019a). The Eastern Hills host high Andean forests and subpáramos that moderate climate and air quality, while urban wetlands, 15 of which are designated under the Ramsar Convention, including Tibabuyes, Jaboque, La Conejera, Torca-Guaymaral, and Santa María del Lago play a crucial role in water regulation and provide habitat for migratory birds (IDEAM, 2019).

6.1.2 Critical Habitats

Critical habitats are areas of high ecological importance that provide essential conditions for the survival of species and ecosystems. These habitats are often recognized under international frameworks due to their unique biodiversity values and their role in maintaining ecological processes. They are prioritized for conservation because of their vulnerability and irreplaceability.

Protected areas

The Bogotá Region contains a significant network of natural protected areas distributed among the seven intervention zones, each playing a crucial role in the region's ecological connectivity and conservation efforts. According to the Single National Registry of Protected Areas (RUNAP), the total protected surface across all intervention landscapes amounts to 64,036 hectares. The coverage includes different protection categories, each with its own conservation focus and management regime (IDEAM, 2025).

Districts for Integrated Management are most prevalent in Guandoque (13,332 ha), and Villapinzon (1,446 ha) include protected areas of various categories, such as Civil Society Reserves and Protective Forests. The formal designation of protected areas combines strict preservation strategies (as reflected in National Parks and Forest Reserves) with collaborative and multifunctional management strategies (such as Civil Society Reserves and Regional Parks). This aligns with national conservation priorities and supports biodiversity, water regulation, and climate adaptation objectives in the Bogotá region (Clerici, 2023).

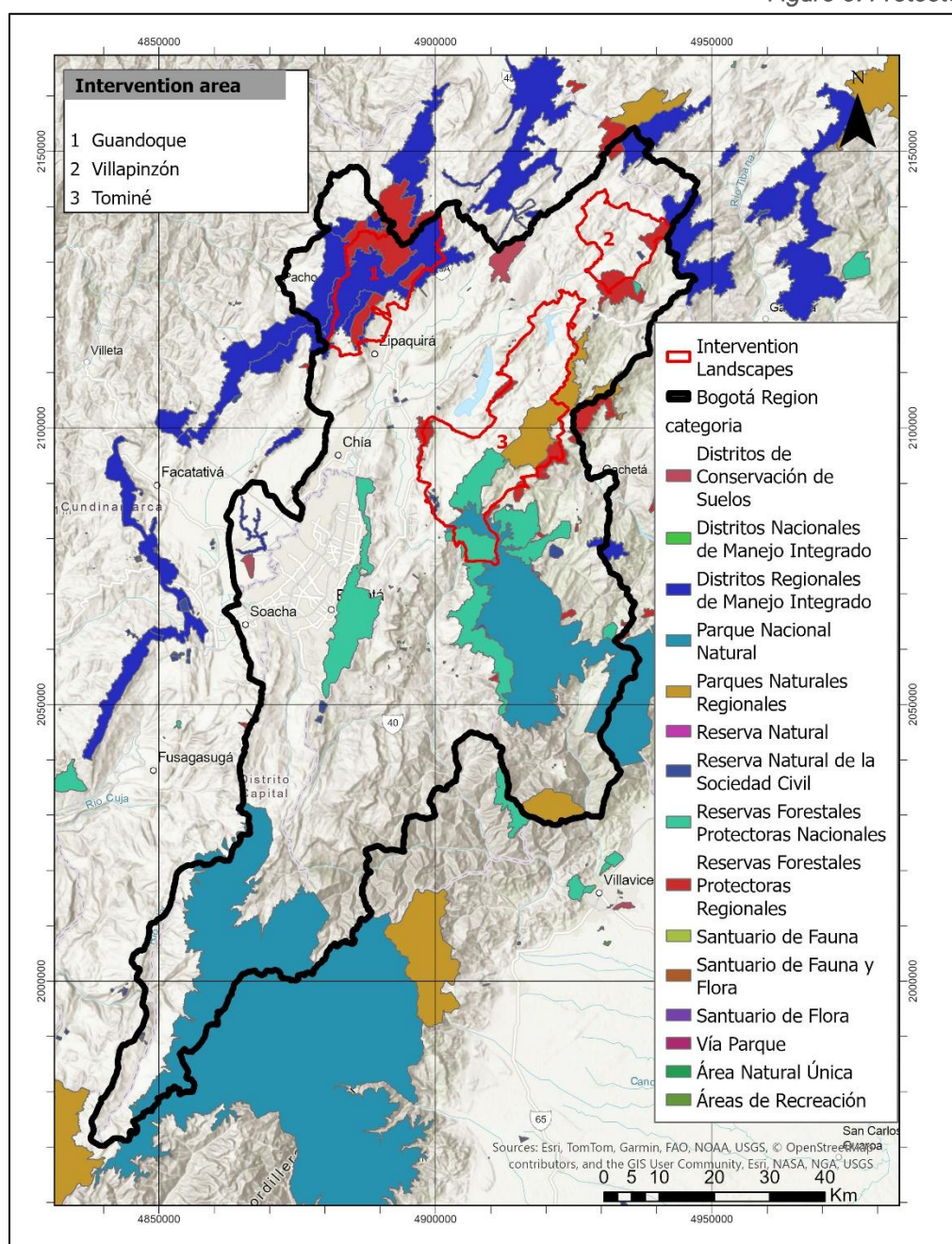
Table 7. RUNAP areas in the intervention landscapes (ha)

Protection Category	1 Guandoque	2 Villapinzon	3 Tominé	4 Tunjuelo
Distritos Regionales de Manejo Integrado	13,332	6		-
Parque Nacional Natural			894	-
Parques Naturales Regionales			8,474	-
Reserva Natural de la Sociedad Civil	71	97	280	-

Reservas Forestales Protectoras Nacionales			5,017	-
Reservas Forestales Protectoras Regionales	5,999	1,343	3,208	-
Total	19,403	1,446	17,873	-

Source: IDOM with data from PNN

Figure 6. Protected areas



Source: IDOM with data from RUNAP

International protected areas

Key Biodiversity Areas (KBAs)

Key Biodiversity Areas are sites of global importance for the persistence of biodiversity, identified based on criteria such as species vulnerability, irreplaceability, and ecological integrity. These areas often support threatened species, unique ecosystems, or critical ecological processes.

Below is a summary of KBAs that overlap with the project's intervention zones:

- **Gravilleras del Valle del Río Siecha** – Overlaps with a portion of Intervention Zone 3.
- **Chingaza National Natural Park and Surroundings** – Overlaps with a small section in the southern part of Intervention Zone 3 and approximately the eastern half of Intervention Zone 5.

Alliance for Zero Extinction (AZE) Sites

Locations where the survival of one or more highly threatened species depend entirely on that site. Two AZE sites intersect with the project's intervention landscapes:

- **Chingaza National Natural Park and Surroundings** – Overlaps with a small section in the southern part of Intervention Zone 3.

Table 8. KBA Description- Gravilleras del Valle del Río Siecha (14403)

Item	Description
General information	Year of last assessment: 2015 National site name: Gravilleras del Valle del Río Siecha Central coordinates: Latitude: 4.8943, Longitude: -73.8767 System: freshwater, terrestrial Elevation (m): 2590 to 2650 Area of KBA (km2): 19.78574
Site Description	The Important Bird Area (IBA) is located in the southern part of the municipality of Guasca and the northern part of Guatavita, approximately 30 km from Bogotá via paved road. It encompasses the alluvial valley of the Siecha River, from the Siecha chapel in the south to the Tominé reservoir in the north. The boundaries include several gravel pits adjacent to the Siecha River, which serves as a connecting element among them, with the reservoir acting as the core axis of the IBA. The Siecha River valley lies over one of the largest gravel deposits in the Bogotá savanna. In the northern section, the land is owned by the Bogotá Energy Company, a public entity that manages the Tominé reservoir. In the central and southern sections, the land is mostly privately owned by mining companies such as Agregados de la Sabana Ltda., which operates active gravel pits in the central area. There are also small farms and scattered rural settlements. Habitats include artificial wetlands, reservoir margins, semi-arid plains, and riparian forests. The gravel pits feature large water bodies with aquatic vegetation along their edges, mainly floating species such as water hyacinth (<i>Eichhornia crassipes</i>) and some rooted species like rushes and <i>Barbasco</i>. Adjacent to the Tominé reservoir gravel pits are semi-arid plains with mosaics of bare soil and sparse native grasses, as well as thorny broom scrub. Along the Siecha River banks, there is an alder gallery forest. The southern edge of the Tominé reservoir is characterized by fluctuating water levels and vegetation typical of waterlogged areas, such as water fern, umbrella plants, water hyacinth, and some rooted species like rushes. The Tominé reservoir and Siecha River are

Item	Description
	managed for hydroelectric power generation for surrounding areas. Additionally, local residents use the land for subsistence activities such as agriculture and livestock. In the Tominé area, aeromodeling, fishing, and motocross are common practices, which cause habitat degradation in the semi-arid plains.
Rationale for Qualifying as a KBA	This site qualifies as a Key Biodiversity Area of international significance, meeting the thresholds for at least one criterion described in the Global Standard for the Identification of KBAs. It was identified as a KBA in the CEPF Ecosystem Profile of the Tropical Andes Hotspot (2015). Taxonomy, nomenclature, and threat status follow the 2013 IUCN Red List.
Additional Biodiversity	In the gravel pits of the Siecha River valley, 64 bird species have been recorded to date. This community is primarily characterized by the presence of aquatic birds associated with wetlands of the Cundiboyacense high plateau, such as <i>Oxyura jamaicensis</i> and <i>Gallinula melanops</i>. Due to the presence of small remnants of native grasses typical of dry areas, nationally threatened species such as <i>Eremophila alpestris</i> and <i>Muscisaxicola maculirostris</i> have been found (Renjifo et al. 2002), although the latter has not been recorded in recent years (ABO data).  Picture Source: Spot-flanked Gallinule Porphyriops melanops - BirdLife Biodiversity, 2025
Non-Bird Biodiversity	No studies have been conducted in the area to assess other endemic or threatened fauna and flora.

Source: IDOM with data from Key Biodiversity Areas, 2025

Table 9. KBA and AZE Description- Chingaza National Natural Park and surroundings

Item	Description
General información	Year of last assessment: 2023 National site name: Parque Nacional Natural Chingaza y alrededores Central coordinates: Latitude: 4.3432, Longitude: -73.4479 System: terrestrial, freshwater Elevation (m): 800 to 4020 Area of KBA (km2): 774.08226 Protected area coverage (%): 99.72
Site Description	Chingaza National Natural Park is located east of the city of Bogotá, in the jurisdiction of ten municipalities in the departments of Cundinamarca and Meta. For the most part, it is a high Andean zone with an enormous wealth of water resources. In addition to supplying water to the cities of Bogotá and Villavicencio, the streams and creeks that originate there feed the Magdalena and Orinoco river basins. Four different biomes can be recognized within the park due to differences in their physiography, elevation above sea level, and climate: hygrophytic forests with a cold thermal floor, hygrophytic forests with a temperate floor, sub-paramo, and páramo (Castaño-Urbe and Cano 1998). Currently, about 91% of its surface is covered by natural ecosystems (Rodríguez-N. et al. 2004). UAESPNN is in charge of the park's administration; however, other entities such as Empresa de Acueducto y Alcantarillado de Bogotá, Fundación ProAves, Universidad de los Andes, Asociación Bogotana de Ornitología, and Fundación Natura, among others, have carried out research and conservation efforts during the last 20 years. Adjacent to the park is the Carpanta

Item	Description
	Biological Reserve, a place that served for more than 10 years as a research center for the fauna and flora of high Andean ecosystems and was managed by Fundación Natura.
Rationale for Qualifying as a KBA	This area is important for the conservation of 19 species that triggered some KBA criteria. 5 amphibians triggered A1b, A1e and B2 criteria; 5 birds species triggered only B2 criteria and 9 plants triggered A1a, A1b, B1 and B2 criteria
Additional Biodiversity	To date, 531 bird species have been recorded: Six species present in the park are endemic to Colombia, 14 near endemic, one (<i>Vultur gryphus</i>) critically endangered, six endangered, four vulnerable, three near threatened, and 37 migratory (34 boreales, 3 austral) Picture Source: Andean Condor- <i>Vultur gryphus</i>. BirdLife Biodiversity, 2025 
Non-Bird Biodiversity	Other groups recorded at the KBA include the record of <i>Tremarctos ornatus</i> (VU), <i>Tapirus pinchaque</i> (EN) and <i>Odocoileus virginianus</i> (Castaño-Urbe and Cano 1998); <i>Atelopus lozanoi</i> (CR) and <i>Atelopus muisca</i> (CR) (Rueda-Almonacid et al. 2004); <i>Espeletia uribei</i> (E. Calderón et al., in litt.).

Source: IDOM with data from Key Biodiversity Areas, 2025

Endemic and threatened species

In Bogotá D.C., a total of 4,712 species has been recorded, representing approximately 5.9% of the species observed in Colombia. Of these, 299 species are endemic, meaning they are unique to this region and not found anywhere else in the world. Additionally, a significant proportion of the recorded species fall under some category of threat, according to national and international criteria, highlighting the importance of their conservation (SiB Colombia, 2025a) (SiB Colombia, 2025b).

Endemic species

Among the endemic species in Bogotá D.C., 239 are plants and 41 are animals, many of which are exclusive to high Andean ecosystems. These ecosystems play a crucial role in water regulation, carbon storage, and climate resilience (SiB Colombia, 2025a). Notable endemic plants include Bogota betony (*Stachys bogotensis*) which is common in open areas and supports pollinators; and autograph tree (*Clusia alata*) and Tequendama fig (*Ficus tequendamae*) that are important for water retention and soil stabilization (SDA, 2022).

In terms of fauna, species like the spot-flanked gallinule (*Porphyriops melanops bogotensis*), which inhabits wetlands and is endemic to the Bogotá savanna, are vital for aquatic ecosystem balance and are currently endangered due to habitat loss (Instituto Humboldt, 2021b).

Bogotá's wetlands, covering over 900 hectares across 17 protected areas, are home to hundreds of species and act as natural sponges, absorbing rainwater and preventing floods. These ecosystems host species such as glowing puffleg (*Eriocnemis vestita*) which aids in seed dispersal and pollination (SDA, 2025), and Bogota robber frog (*Pristimantis bogotensis*) which is an indicator of water quality and ecosystem health (SDA, 2022).

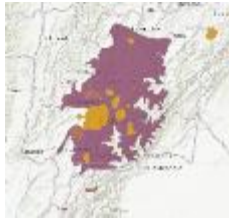
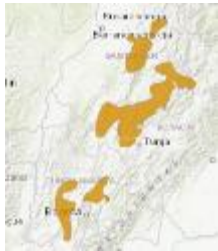
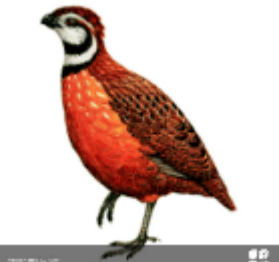
The zones with the highest number of endemics species are found in Guandoque (1). Tominé (3) also shows a significant number of endemics, while Villapinzón (2), have endemism, which could indicate a lower priority for biodiversity conservation, although these areas may be important for ecological connectivity.

Endemic (Restricted-Range) Species in Line with International Standards

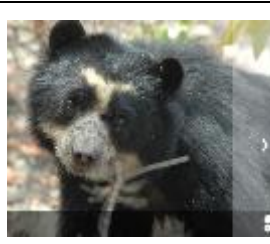
In accordance with International Finance Corporation (IFC) Environmental and Social Performance Standards, species considered endemic or geographically restricted are those with a limited Extent of Occurrence (EOO). For the purposes of this Project, and consistent with international practice for terrestrial vertebrates and plants, species with an EOO of less than 50,000 km² are treated as restricted-range.

Based on a review of the country's Red Lists and the IUCN Red List database, the following species meet the above definition and may occur within the identified areas of intervention. The list is intended to inform subsequent baseline surveys and impact assessment.

Table 10. Endemic Species in Line with International Standards.

Scientific name	Common name	Status / Distribution characteristics	Distribution range / IUCN	Species image
<i>Rallus semiplumbeus</i>	Bogota Rail	VU 6–10 known locations Estimated Area of Occupancy (AOO): 400–504 km ² Extent of Occurrence (EOO): 13,200 km ²		
<i>Coeligena prunellei</i>	Black Inca	VU No known locations Estimated Area of Occupancy (AOO): 11,000 km ² Extent of Occurrence (EOO): 28,700 km ²		
<i>Odontophorus strophium</i>	Gorgeted Wood-quail	VU No known locations Estimated Area of Occupancy (AOO): X km ² Extent of Occurrence (EOO): 17,400 km ²		

Scientific name	Common name	Status / Distribution characteristics	Distribution range / IUCN	Species image
<i>Crax alberti</i>	Blue-billed Curassow	CR 11–50 known locations Estimated Area of Occupancy (AOO): X km ² Extent of Occurrence (EOO): 123,000 km ²		
<i>Mesamphiagrion demarmelsi</i>	Dragonflies	EN 3–5 known locations Estimated Area of Occupancy (AOO): X km ² Extent of Occurrence (EOO): 4,300 km ²		
<i>Anadia bogotensis</i>	Bogota Anadia	NT No known locations Estimated Area of Occupancy (AOO): X km ² Extent of Occurrence (EOO): 23,750 km ²		
<i>Dendropsophus molitor</i>	Green Dotted Treefrog – Rana sabanera	LC No known locations Estimated Area of Occupancy (AOO): X km ² Extent of Occurrence (EOO): 13,519.3 km ²		
<i>Espeletia argentea</i>		LC No known locations Estimated Area of Occupancy (AOO): X km ² Extent of Occurrence (EOO): 7,248 km ²		

Scientific name	Common name	Status / Distribution characteristics	Distribution range / IUCN	Species image
<i>Pristimantis bogotensis</i>	Rana cutín	LC Extent of Occurrence (EOO): 6,406.04 km ²		
<i>Tremarctos ornatus</i>	Oso Andino	VU No information about EOO		

Source: IDOM, 2025 with information from IUCN, 2025.

Threatened species

Bogotá D.C. also hosts 53 plant species, and 36 animal species classified as nationally threatened. These species face pressures such as habitat loss, climate change, and pollution (SiB Colombia, 2025a). For example, some species like Poveda's odontoglossum (*Oncidium povedanum*), large-spiked sage (*Salvia macrostachya*), freshwater oyster (*Acostaea rivolii*), black-headed spider monkey (*Ateles fusciceps*), grey critoniopsis (*Critoniopsis cinere*) and hairy gynoxys (*Gynoxys hirsutissima*) are critically endangered in the region of interest.

Regarding the páramo complexes of the Bogotá region, several threatened vascular plant species have been identified, classified according to IUCN categories: Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) (Table 11). The Cruz Verde–Sumapaz complex hosts the highest number of at-risk species, with 1 in the CR category, 8 in EN, and 7 in VU, highlighting significant pressure on its plant biodiversity. The Chingaza complex records 1 endangered and 4 vulnerable species, while Guerrero contains 1 endangered and 1 vulnerable species. The Rabanal–Río Bogotá complex, which includes the Guacheneque páramo, presents 2 vulnerable species (Baca Gamboa, et al., 2021).

Table 11. Number of threatened vascular plant species in the páramo complexes of the Bogotá Region.

Páramo complex	CR	EN	VU
Cruz Verde-Sumapaz	1	8	7
Chingaza	0	1	4
Guerrero	0	1	1
Rabanal-Río Bogotá	0	0	2

Source: IDOM, 2025 with information from (Baca Gamboa, et al., 2021)

Indicator species

Bogotá's wetlands, high Andean forests, and urban parks host a variety of species that serve as bioindicators, helping assess the ecological health of ecosystems and detect environmental changes.

Birds are among the most studied indicator species in Bogotá due to their sensitivity to habitat changes and pollution and insects such as dragonflies (Odonata) are used to monitor water quality and pollution levels. The presence or absence of macroinvertebrates like Ephemeroptera, Trichoptera, and Plecoptera is a strong indicator of aquatic ecosystem health (León Rincón, Cruz Méndez, López Muñoz, & Peña, 2022). Various species of aquatic plants and algae are also bio-indicator species

Regarding mammals and amphibians, species such as the red-tailed squirrel (*Sciurus granatensis*) and various amphibians are monitored in urban parks to assess habitat fragmentation and pollution. Their behavior and population dynamics reflect the ecological pressures of urbanization (Observatorio Ambiental de Bogotá, 2025).

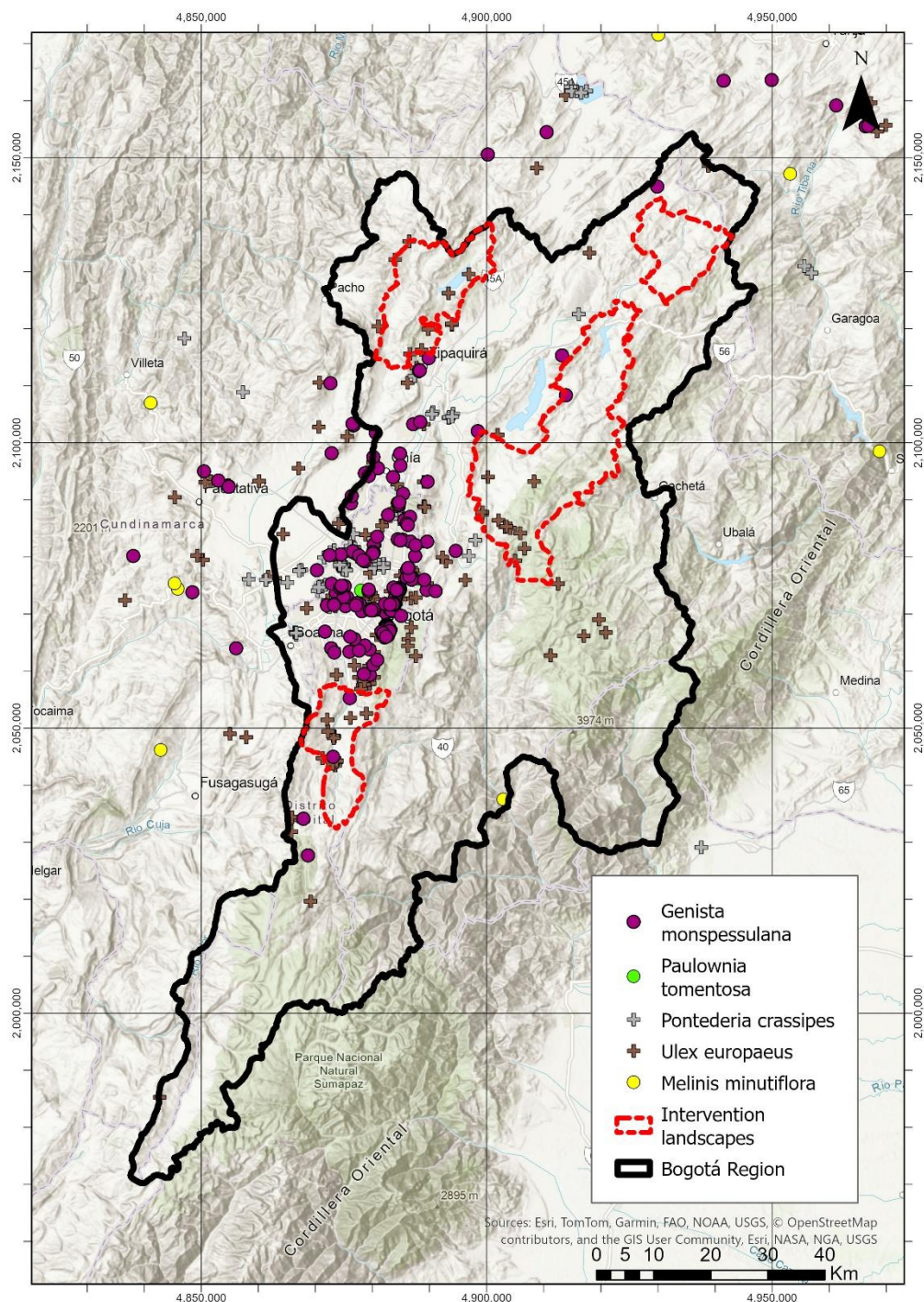
Riparian vegetation (trees, shrubs, mosses) along rivers and wetlands plays a key role in filtering pollutants and stabilizing ecosystems. Changes in its structure and composition are used to evaluate long-term ecosystem health (León Rincón, Cruz Méndez, López Muñoz, & Peña, 2022).

Invasive species

Invasive species pose a threat to native ecosystems by outcompeting local biodiversity and altering ecological processes. Bogotá D.C. has recorded 4 invasive plant species: canary broom (*Genista monspessulana*), empresstree (*Paulownia tomentosa*), water hyacinth (*Pontederia crassipes*) and gorse (*Ulex europaeus*); and 6 invasive animal species garden snail (*Cornu aspersum*), common carp (*Cyprinus carpio*), American bullfrog (*Lithobates catesbeianus*), largemouth bass (*Micropterus salmoides*), rainbow trout (*Oncorhynchus mykiss*) and red swamp crawfish (*Procambarus clarkii*) (SiB Colombia, 2025a).

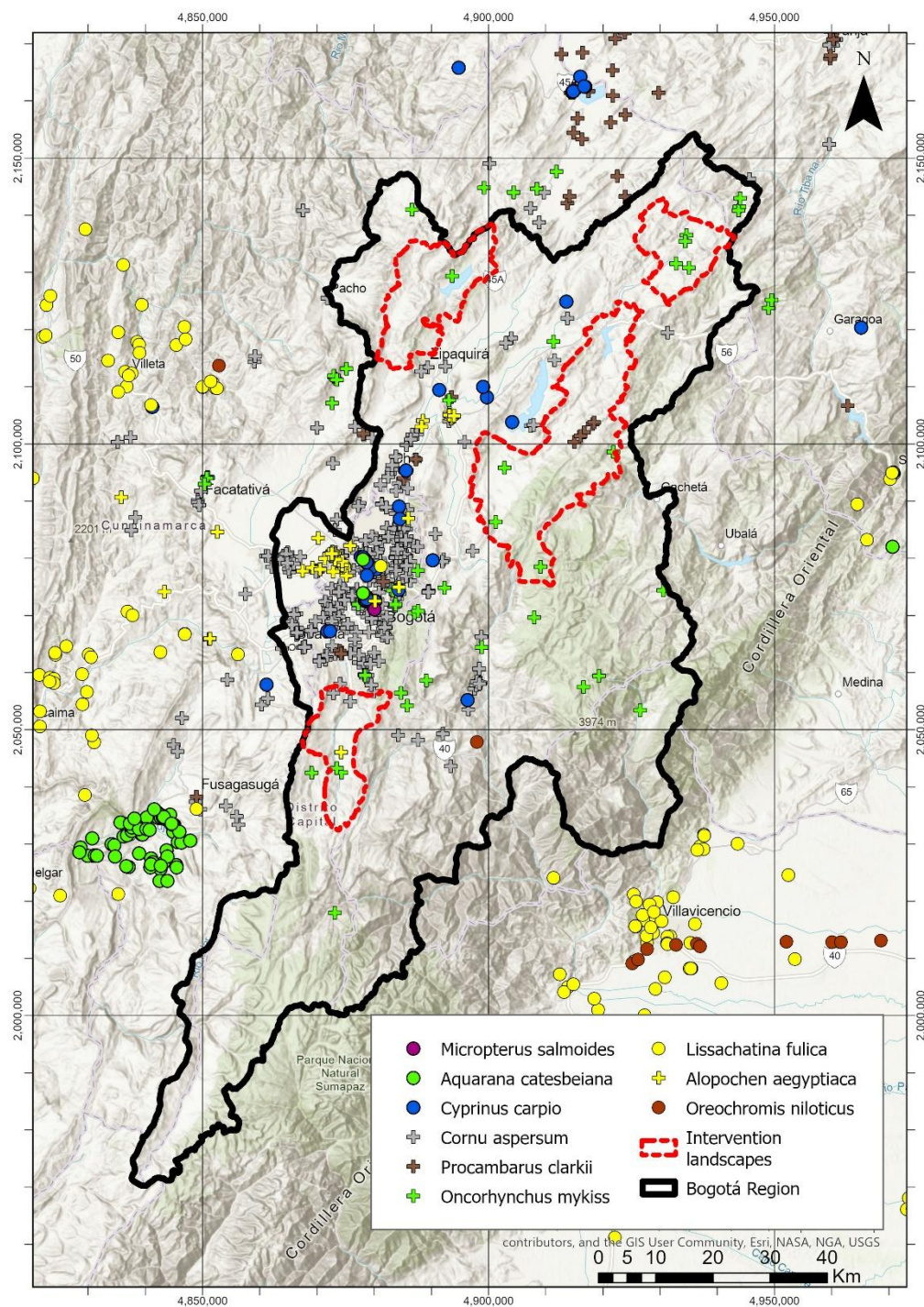
The following maps show the distribution of invasive species within the intervention landscapes. The zones of Guandoque (1), Villapinzón (2), Tominé (3), show a low presence of invasive species. In contrast, other areas of the Bogotá Region have a higher number of invasive species, mainly canary broom (*Genista mospessulana*), gorse (*Ulex europaeus*), garden snail (*Cornu aspersum*), and rainbow trout (*Oncorhynchus mykiss*).

Figure 7. Geographic distribution of the invasive species of plants within the intervention landscapes in the Bogotá Region



Source: IDOM, 2025 with information from (UICN, 2025)

Figure 8. Geographic distribution of the invasive species of animals within the intervention landscapes in the Bogotá Region.



Source:
IDOM, 2025 with information from (UICN, 2025)

The presence of invasive species in aquatic ecosystems, particularly rainbow trout (*Oncorhynchus mykiss*), American bullfrog (*Lithobates catesbeianus*), and red swamp crawfish (*Procambarus clarkii*), has documented ecological impacts in Colombia (WWF Colombia, 2022b) (Urbina Cardona, Nori, & Castro, 2011) (Castañeda & Ocampo, 2023). These impacts compromise the restoration of high mountain aquatic ecosystems, a core component of the project’s ecosystem-based adaptation (EbA) strategy. They also threaten the functionality of rural aqueducts, which depend on healthy watersheds, and reduce the effectiveness of nature-based solutions aimed at improving water regulation, flood control, and biodiversity conservation. Therefore, monitoring and controlling invasive species is essential to safeguard the ecological integrity of the Bogotá Region landscape and to achieve the intended climate adaptation outcomes.

The table below presents additional data on the species mentioned, based on information compiled from GBIF—the Global Biodiversity Information Facility.

Table 12. Invasive species.

Scientific name	Origin	Status (IUCN)	Species image	
<i>Genista monspessulana</i> (retamilla)	Europe	No information		
<i>Paulownia tomentosa</i> (árbol princesa, paulownia real o árbol de la emperatriz)	Asia	Least Concern		
<i>Pontederia crassipes</i> (jacinto de agua dulce)	Amazon Region	No information		
<i>Ulex europaeus</i> (Retamo espinoso)	Europa	Least concern		

Scientific name	Origin	Status (IUCN)	Species image
<i>Cornu aspersum</i> (caracol comun de jardín)	Southwestern Europe	Least concern	
<i>Cyprinus carpio</i> (carpa, carpa común)	Asia-Temperate Asia-Tropical	Least concern	
<i>Lithobates catesbeianus</i> (rana toro)	North America	Least concern	
<i>Micropterus salmoides</i> (perca americana o perca atrucada)	North America	Least concern	
<i>Oncorhynchus mykiss</i> (trucha arcoiris)	North America	Least concern	
<i>Procambarus clarkii</i> (cangrejo rojo americano)	North America	Least concern	

Source: GBIF data, 2025 and IUCN data. Pictures are not IDOM property. There are use under dataset Observation.org (2025)

6.2 Socio-economic baseline (livelihoods, employment, land use)

6.2.1 Socioeconomic profile

Bogotá Region is positioned as the driving force and main hub of the Colombian economy, accounting for approximately a quarter of the national Gross Domestic Product (GDP). Its highly diversified economy is notable for the predominance of the services sector, which contributes 6 % of the local GDP, followed by commerce (15%), manufacturing (9%), and construction (5%). The city is home to the country's most important industrial center and acts as the main commercial hub, concentrating products from various Colombian regions and abroad. Furthermore, Bogotá D.C is a key center for financial and business activities, with most financial and business entities located in the capital (Secretaría de Desarrollo Económico , 2015)

With approximately 4.2 million employed people, Bogotá D.C. boasts a diversified employment structure, with the commerce, social services, financial institutions, and manufacturing sectors generating the most employment. The city contributes significantly to national value added in financial services (50%), market education (47%), communications (35%), public administration (31%), and air transportation (50%), among others (Secretaría de Desarrollo Económico , 2015). Although the manufacturing industry has experienced a recent decline in its value added, it remains the most important industry nationally and maintains a significant role in job creation.

Bogotá's productive structure and economic development reflect a large, dynamic, and strategic economy at both the local and national levels, with a total GDP valued at 175.3 trillion current pesos (2014), a figure comparable to entire economies of neighboring countries (Secretaría de Desarrollo Económico , 2015).

For Cundinamarca in 2024, the employment structure shows an employment rate of 60.9%, an unemployment rate of 10.7%, and an underemployment rate of 6.6%. Averaging the data from previous years (2012-2023), the employment rate stands at approximately 62.2%, the unemployment rate at 8.7%, and the underemployment rate at 11.2%. These figures indicate a recent slight decrease in employment and an increase in unemployment compared to the previous decade, though underemployment shows a pronounced downward trend, suggesting improved job quality and labor absorption in the region.

In 2023, Bogotá and Cundinamarca together accounted for 31.3% of Colombia's total national production, reinforcing their role as the country's primary economic region. The region's GDP growth was 0.5% compared to 2022, slightly below the national average of 0.6%. This difference is explained by the modest performance of Cundinamarca, which grew only 0.1%, while Bogotá D.C. matched the national growth rate at 0.6%. (CCB, 2024).

6.2.2 Population dynamics

The delimitation of the project's intervention landscapes was based on a bottom-up territorial process, from villages to micro-watersheds and intervention landscapes, using hydrological, ecological, and community management criteria. Seven nuclei were identified, covering 239,871 hectares across 22 municipalities in the departments of Cundinamarca and Meta, as well as Bogotá D.C. These areas include rural and peri-urban territories that are strategic for water regulation and ecological connectivity across páramos, high Andean forests, and piedmont ecosystems (DANE, 2018).

Based on this delimitation, the project population comprises the inhabitants of the municipalities and villages included within the intervention nuclei. These correspond to:

- Direct beneficiaries, through their participation in productive, conservation, and institutional-strengthening activities; and
- Indirect beneficiaries, who benefit from the ecosystem services provided by project actions, especially water regulation and biodiversity conservation.

Overall, the Bogotá Region has an estimated population of 9,823,947 inhabitants in 2025 (DANE, 2018; IDOM, 2025). Of this total, 97.3% is urban and 2.7% is rural, reflecting the intense concentration of people in Bogotá D.C., Soacha, Villavicencio, Zipaquirá, and La Calera. At the same time, municipalities such as San Juanito, El Calvario, Junín, Guatavita, and Ubaque maintain small, dispersed rural populations highly dependent on natural resources (DANE, 2018).

In 2025, the Bogotá Region had a population of 9,823,947 inhabitants, of whom 5,053,233 were women (51.4%), and 4,770,714 were men (48.6%). The population is overwhelmingly urban for both sexes: 97.5% of women (4,925,857) and 97.1% of men (4,630,774) reside in municipal capitals, while only 127,376 women (2.5%) and 139,940 men (2.9%) live in dispersed rural settlements. This slight female majority and the marginally higher female urbanization rate are consistent with the region's metropolitan profile (DANE, 2018).

Between 2027 and 2035, population dynamics in the Bogotá Region reveal a clear pattern of urban expansion and rural contraction. Most municipalities show notable urban growth particularly Soacha (+22.9%), La Calera (+19.4%), Cogua and Guasca (both +24%), and Zipaquirá (+15.9%) while several high-Andean areas such as Junín, Fómeque, Guatavita, and Ubaque experience declines in their rural populations. This suggests a reallocation of inhabitants toward peri-urban centers and a gradual densification of the metropolitan fringe. Although Bogotá D.C. itself shows a slight decrease in its urban population (-1.7%) and a modest rise in its rural areas (+5.3%), the overall trend indicates growing demographic pressure that could drive further urban sprawl (DANE, 2018).

Such expansion must be carefully considered in territorial planning and climate adaptation strategies, as it may increase land-use conflicts, threaten ecosystems that regulate water, and challenge the long-term sustainability of the region's landscape.

6.2.3 Population density by intervention landscapes

Across the three intervention landscapes, the rural population represents the majority (77.9% of the total, with exception of Tominé), highlighting the strong rural condition of the Bogotá Region outside Bogotá D.C. Other intervention landscapes with urban concentration include Guasca and Villapinzón in the Tominé and Villapinzón intervention landscapes, respectively, where medium-sized urban centers serve as regional service hubs (CDN - DANE, 2018).

Table 13 Urban population

Urban population in the nucleus				
Intervention landscape	Municipality	Total	Woman	Man
2 Villapinzón	VILLAPINZÓN	6,348	3,256	3,092
3 Tominé	GUASCA	6,097	3,183	2,914
4. Tominé	BOGOTA DC	188,120	94,060	94,060
Total general		200,565	100,499	100,066

Source: IDOM, 2025 with information from (CDN - DANE, 2018)

In contrast, the rural population (52% women and 48% men) is distributed across the headwaters and high-Andean zones that constitute the project's ecological core. Guandoque (15,190) and Tominé (15,850), have the largest rural population, all located in key areas for water regulation and ecological connectivity. Villapinzón (12,850) also host significant rural communities engaged in traditional agriculture and watershed management. (CDN - DANE, 2018).

Table 14 Total population in rural areas

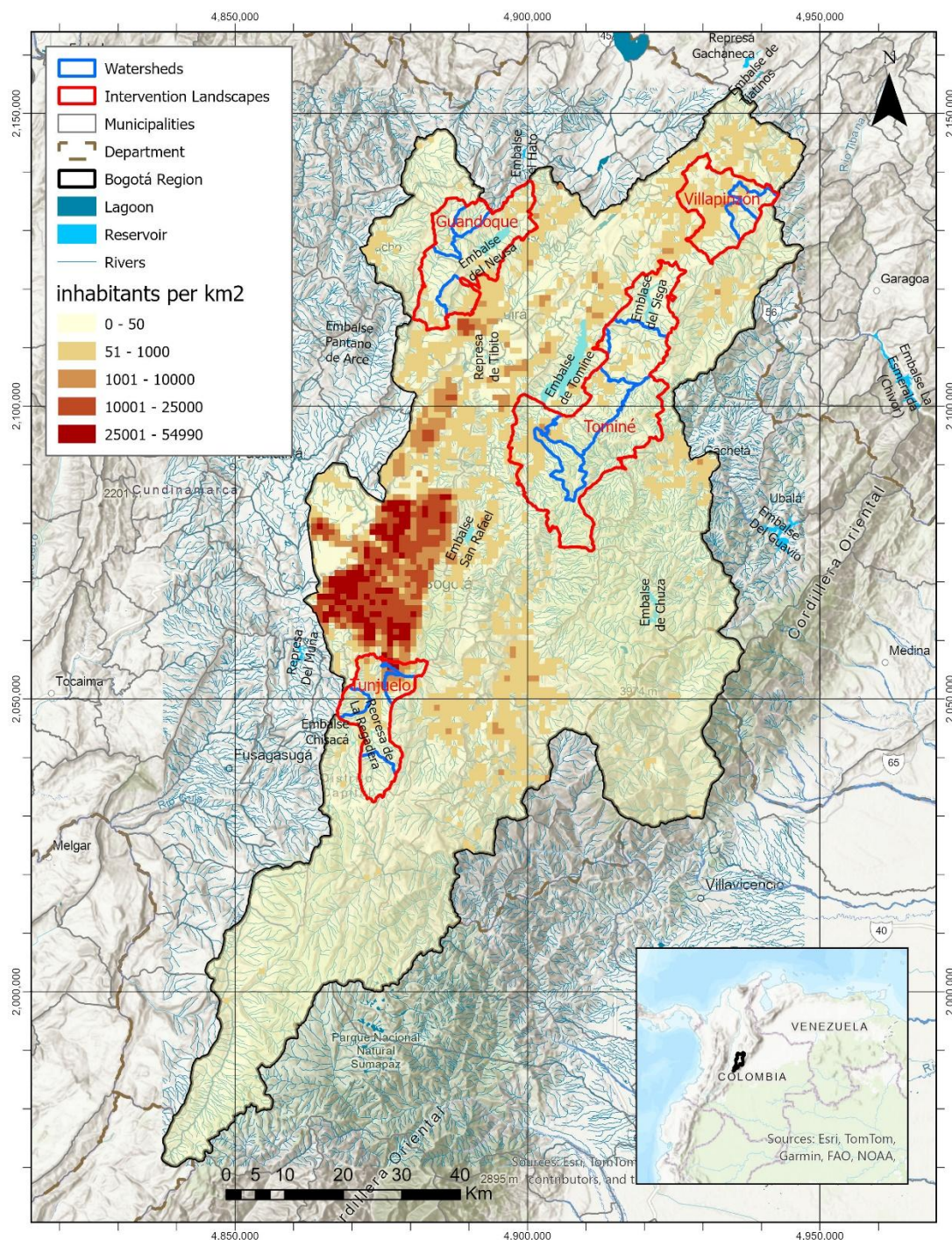
Municipality	Total	% Woman	% Man
Cogua	5,995	51.3	48.7
Tausa	3,914	53.1	46.9
Zipaquirá	5,281	51.3	48.7
Chocontá	3,684	50.3	49.7
Villapinzón	9,166	51.8	48.2
Guasca	7,850	52.1	47.9
Guatavita	3,625	52.4	47.6
Sesquilé	4,375	51.3	48.7

Source: IDOM, 2025 with information from (CDN - DANE, 2018)

Such imbalance represents a pressure for urban expansion that must be carefully managed to prevent ecosystem degradation and to maintain the hydrological and ecological functions on which the region's resilience depends. At the same time, the relatively small but strategic rural population embodies the project's main target group, as their territories coincide with ecosystem service production areas páramos, forests, and water recharge zones critical for regional sustainability (CDN - DANE, 2018).

As illustrated in Figure 9, population density patterns further emphasize these spatial contrasts. The highest densities exceeding 25,000 inhabitants per km² are concentrated in Bogotá D.C. and its immediate metropolitan belt, particularly Soacha and southern Bogotá, which together form the region's primary urban continuum. Intermediate densities (1,000–5,000 inhabitants per km²) extend toward municipalities such as Zipaquirá, Chía, and La Calera, where rapid peri-urban growth increases land-use and water-demand pressures (CDN - DANE, 2018). Conversely, northern and eastern municipalities like Villapinzón, Guasca, Fómeque, El Calvario, and San Juanito remain sparsely populated, with densities below 100 inhabitants per km², corresponding to the region's ecological core.

Figure 9. Population density (inhabitant per km²)



Source: IDOM, 2025 with data from DANE, 2018

In urban zones, with a total population of 1,878,472 inhabitants, the age structure reveals a predominance of young and working-age adults. People between 20 and 39 years old represent 35.6%

of the total (20–24: 10.2%, 25–29: 9.5%, 30–34: 8.3%, 35–39: 7.6%). Those between 40 and 49 years account for 12.1%, while the 50–59 age group adds another 10.7%. Population aged 60 and over makes up 10.9%, distributed among 60–64 (3.8%), 65–69 (2.7%), 70–74 (1.8%), 75–79 (1.3%), and 80 years or older (1.3%). The remaining 21.8% corresponds to children and adolescents aged 0–19 years, completing a demographic profile where the majority of the population is still relatively young but with a significant share of older adults, particularly in large metropolitan centers such as Bogotá D.C. (CDN - DANE, 2018).

In rural territories, the total population amounts to 106,961 inhabitants, with a noticeably higher proportion of older adults. People between 40 and 49 years represent 12.96%, those between 50 and 59 years 12.9%, and those between 60 and 79 years reach 23.9%. The share of people aged 80 and over is 2.28%, showing that almost one out of every four rural inhabitants (26.2%) is 60 years or older. This indicates a more aged demographic profile compared to urban areas, where migration of younger generations toward cities and limited access to services contribute to an aging rural population that is particularly vulnerable due to geographic isolation and reduced socioeconomic opportunities (CDN - DANE, 2018)

The Bogotá region faces significant climate justice challenges linked to water security, with approximately 20% of Colombia's population and nearly 13% of the country's GDP threatened by water availability. Climate change impacts disproportionately affect rural communities living in high Andean ecosystems, whose livelihoods are fragile and who face both climate threats while contributing additional pressure on water supply systems.

Rural communities in the upper Bogotá River watersheds experience multiple forms of environmental injustice, including campesino families facing limited economic alternatives and barriers to implementing sustainable practices. Gender roles significantly limit women's participation in income diversification and decision-making processes. Community-based water organizations struggle for recognition of their water management approaches, claiming justice as both recognition and equitable access to water as a common good and human right (Zwarteveen & Boelens, 2023).

Environmental justice conflicts manifest through Bogotá's appropriation of water resources from rural territories while local communities face water insecurity (Universidad Nacional de Colombia, 2026). Indigenous peoples, Afro-descendants, and peasant communities demand judicial protection of their rights to water due to extractive activities and competition over water uses (Asociación Interamericana para la Defensa del Ambiente (AIDA), 2023). Campesino communities advocate for shared governance in páramo management, proposing territorial planning supporting agroecology transitions while maintaining dignified rural livelihoods (Environmental Justice Colombia, 2020).

6.2.4 Livelihoods

Among the non-climatic drivers identified, unsustainable livestock farming and agriculture stand out as the primary activities that negatively affect most of the study areas in the region. These practices drive change and generate a series of economic, social, and environmental problems. From an economic perspective, soil degradation caused by overgrazing significantly reduces the land's organic capacity, which in turn decreases pasture production. This situation directly impacts milk production, as ranchers are forced to incur higher expenses to acquire concentrates and supplemental forage to adequately feed their livestock. From an environmental perspective, these activities also contribute to the loss of biodiversity, both through the transformation of natural habitats and the fragmentation of ecosystems.

The expansion of the agricultural frontier without sustainable criteria puts native species at risk, alters hydrological cycles, and reduces the ecological resilience of landscapes.

Table 15. Economic profiles

Zone	Zone / Area	Key Economic Activities	Environmental and Ecosystem Impacts	References / Notes
1	Upper Río Frío & Río Neusa (Páramo de Guerrero Core)	Potato farming, dairy cattle ranching (primary livelihoods), coal mining (high GDP contribution, few jobs), emerging tourism (Neusa Reservoir, Zipaquirá salt mine)	Critical for water regulation and carbon storage; expansion of potato farming and coal mining increase soil erosion and wetland degradation; need integrated land management to protect headwaters and support rural economy	(LaVilla, 2018)
2	Upper Río Bogotá (Villapinzón–Chocontá)	(Enel_Colombia, 2022) Dairy cattle farming (Chocontá is major milk producer), potato cultivation, small family-owned leather tanneries (manufacturing jobs, but pollute Bogotá River headwaters)	Food basket for Bogotá and contributor to leather value chain; tannery effluents degrade water quality; necessary balance between agriculture, manufacturing, and water protection	(Angulo, 2023)
3	Tominé (Sisga–Siecha Watersheds)	Subsistence farming of tubers and maize on mountain plots, livestock grazing; growing eco-tourism around Siecha Lagoons and Sisga Reservoir	Provides vital drinking water for Bogotá; páramo wetlands crucial for ecosystem services; economy reliant on natural resources rather than GDP; conservation directly linked to livelihoods	(Cundinamarca Gobernación, 2022)
3	Tominé (Guavio Subzone)	Cattle ranching for income, Guavio Hydroelectric Dam (largest in Colombia, 1,213 MW, ~5,890 GWh annually)	Páramo and cloud forests regulate flows essential for hydropower; deforestation and grazing undermine watershed resilience; conservation national priority	(Enel_Colombia, 2022)
4	Tunjuelo (Curubital watershed)	Mixed urban–rural basin with: informal and formal urban settlements; small-scale commerce and services; brick and construction-materials production and other light industry; smallholder agriculture and livestock grazing on surrounding hillsides; sand and gravel extraction in some stretches; road and infrastructure corridors that concentrate economic activity.	High levels of water pollution from untreated or partially treated domestic and industrial wastewater degrade river water quality and downstream wetlands; conversion of native vegetation and expansion of urban areas on steep slopes increase soil erosion, sediment loads and flood risk; channelization and encroachment on riparian zones reduce habitat connectivity and aquatic biodiversity; loss of páramo and Andean forest cover in the upper micro-catchments weakens natural flow regulation and climate-resilience functions that sustain Bogotá's water security	CAR, SDA

Source: IDOM, 2025

6.2.5 Social and economic challenges

The Bogotá region, which includes Bogotá D.C. and its surrounding municipalities in Cundinamarca, is Colombia's main economic hub, generating a significant share of the national GDP and attracting both

labor and industries. However, this economic dynamism has also deepened territorial disparities, created infrastructure gaps, and increased environmental pressures. Urban expansion from Bogotá into neighboring municipalities such as Chía, Soacha, and Zipaquirá has fragmented green infrastructure and placed stress on ecosystems, while rural areas continue to face challenges in maintaining access to public services and economic opportunities (ADP, 2021) .

Despite urban momentum, institutional coordination across the region remains weak. Municipal governments operate with limited administrative resources and often rely heavily on decentralized associations and private actors, leading to uneven access to social investment and fragmented governance (Carlos M. Jimenez Aguilar and Ulf Thoene, 2020). The region also grapples with persistent social inequality rooted in spatial segregation. Socio-spatial divisions reflect limited access to services, infrastructure, and economic opportunities for those in lower-income strata and in outer municipalities, a scenario aggravated by metropolitan fragmentation and inadequate metropolitan planning (Luis A. Guzman, n.d).

Table 16. Economic and social challenges of the areas of intervention.

Intervention landscape	Social Challenges	Economic challenges
1 Guandoque	Citizen participation in water governance has been more active in the initial stages such as formulation and consultation, but is significantly weakened in the monitoring, evaluation and accountability phases. This generates symbolic processes that do not guarantee effective feedback or transparency in the results	A strong rural-urban gap, with high levels of multidimensional poverty in rural areas.
2 Villapinzon	Villapinzón, as an upper part of the Bogotá River basin, it faces social challenges related to the low participation of local actors in post-policy decision-making. Although there is a robust legal framework, the lack of effective monitoring and evaluation mechanisms limits the real impact of communities.	Although it is an area with livestock and agricultural activity, no structural economic conflicts or significant impacts on the regional economy are identified
3 Tominé	Chingaza, as a strategic area of conservation and water supply, requires more inclusive governance. Inter-institutional coordination between environmental, community and governmental actors is necessary, especially in processes of evaluation and dissemination of results.	No relevant economic pressures are identified in this area due to its conservation nature.

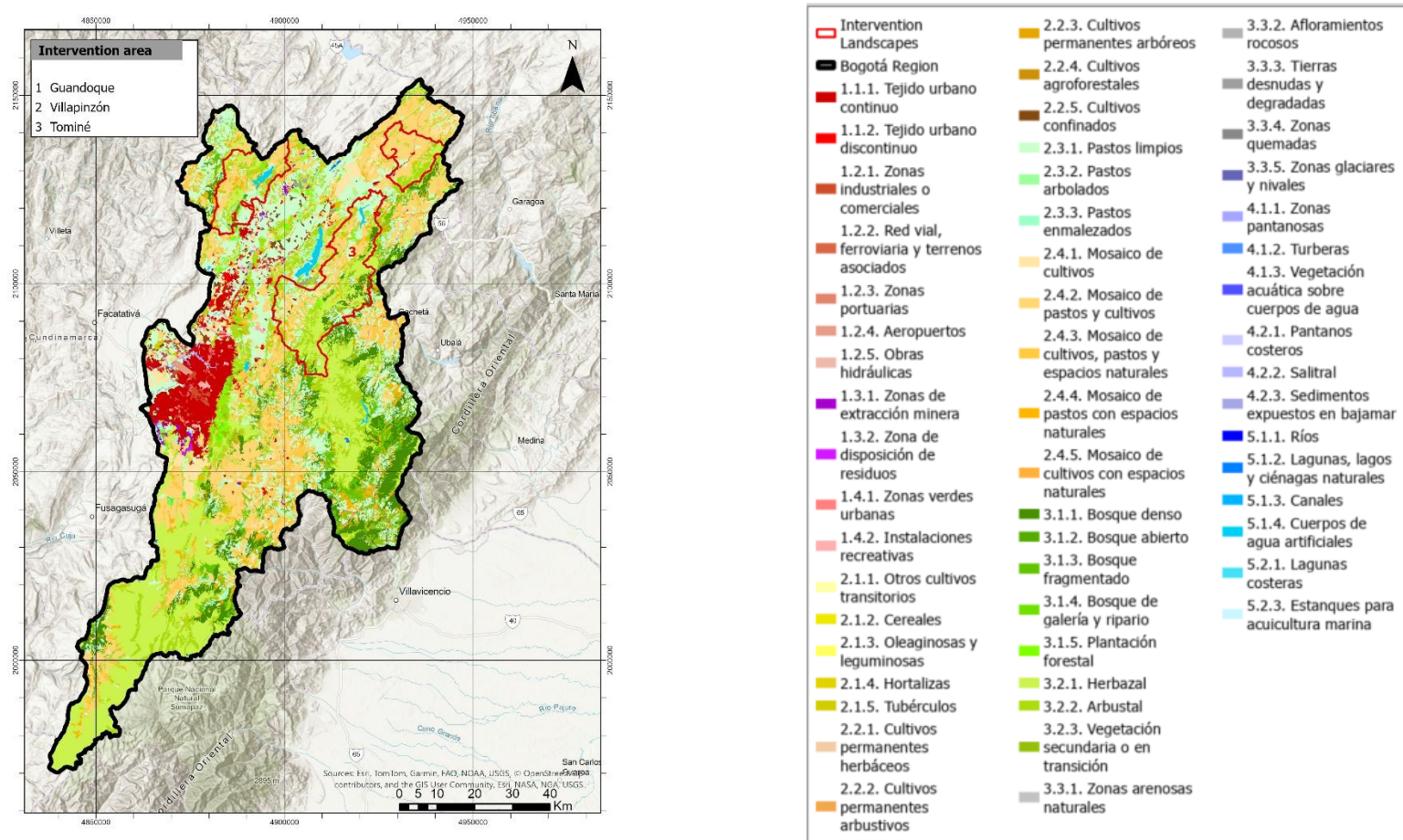
Intervention landscape	Social Challenges	Economic challenges
5. Tunjuelo	In the Tunjuelo basin, social dynamics are marked by strong environmental injustice: marginalized urban and peri-urban communities are disproportionately exposed to flood risk, water pollution and degraded public spaces, while having limited influence over decisions on land use, mining legacies and river restoration. Citizen participation tends to be reactive and fragmented, often focused on conflict (e.g. against quarrying, waste disposal or resettlement) rather than on stable participatory platforms for monitoring, evaluation and co-management of the watershed, which weakens trust in institutions and long-term stewardship	The local economy combines informal commerce, small industries, construction-related activities and precarious jobs linked to past and present extraction of construction materials, creating high dependence on environmentally degrading sectors with limited income stability. At the same time, the environmental degradation of the river and surrounding ecosystems constrains opportunities for more sustainable economic alternatives (such as green public spaces, eco-tourism or nature-based enterprises), reinforcing a development model that generates short-term gains but undermines long-term resilience and quality of life.

Source: (Rojas, Meulder, & Shannon, 2015) (Salamanca & Durán, 2023) (Scarpa & Rizzi, 2024)

6.2.6 Land use patterns

The Bogotá Region presents a complex mosaic of land cover types that reflect centuries of human intervention superimposed on diverse natural ecosystems. This analysis examines the current land cover distribution (2020) across the seven intervention landscapes within the region, highlighting the spatial patterns of urbanization, agricultural transformation, and ecosystem conservation. The region's land cover patterns demonstrate the tension between rapid urban expansion and the preservation of critical environmental services, particularly in the context of the Sabana de Bogotá ecosystem.

Figure 10. Land cover, 2020 (Corine Land Cover level 3)



Source: IDOM, 2025 with data from IDEAM 2020

Urban fabric dominates the central Bogotá Region this concentration reflects the historical pattern of urban expansion in Bogotá, which has grown from 260 hectares in 1900 to over 30,110 hectares by 1999 (Gallini, 2024). The urban expansion has been particularly pronounced in the last five decades, driven by both formal and informal settlement processes that have transformed the relationship between the city and its surrounding agricultural landscape (Weller, Hoch, & Huang, 2021).

Industrial and commercial land uses follow similar spatial patterns the Bogotá Region represent critical nodes in the country's economy, supporting both manufacturing activities and transportation infrastructure that connects Bogotá D.C. with national and international markets. The co-location of urban and industrial activities reflects planning strategies that have prioritized functional integration, though this has also contributed to environmental pressures on surrounding ecosystems.

Mining, dump, and construction sites occupy significant areas in the south of Bogotá D.C., indicating ongoing construction activities and resource extraction processes. These land uses represent transitional categories that often precede full urban development, suggesting continued pressure for landscape transformation in these intervention landscapes.

Disordered urban growth has led to a significant reduction in the original vegetation cover, which contributes to the generation of muddy torrents during intense rainfall events. These flows increase the sediment load in water bodies, deteriorating water quality and negatively impacting wetlands. Furthermore, the loss of vegetation increases the area's vulnerability to phenomena such as landslides and recurrent flooding in critical areas, exacerbating the environmental and social risks associated with unplanned urban development.

On the other hand, agricultural territories constitute the predominant land use across most intervention landscapes, reflecting the historical importance of the Sabana de Bogotá as a productive agricultural region (Mora, 2015). Heterogeneous agricultural areas are present in Tominé (11,127.6 ha), and Guandoque (11,270.2 ha). These mixed agricultural landscapes represent an adaptation to local microclimatic conditions and reflect centuries of agricultural innovation by local farming communities.

Pastureland covers 18,497.82 ha across the region, with notable concentrations in Guandoque (4,209.75 ha). The distribution of pasturelands reflects both historical land use preferences and current economic incentives that have favored livestock production over crop cultivation in many areas of the sabana. Research has shown that livestock activities have been consistently more resilient to climatic fluctuations than cereal production in this region, leading to their predominance in areas susceptible to flooding or drought (Mora, 2015).

Arable land totals 7,524.02 ha, with significant concentrations in Guandoque (1,508.3 ha), and Tominé (1,221.3 ha). The relatively limited extent of dedicated cropland reflects both environmental constraints and market dynamics that have influenced agricultural land use decisions in the region.

Forest ecosystems represent one of the most significant natural land cover types in the region. Shrub and herbaceous vegetation associations represent the most extensive single land cover category. These

vegetation types are particularly prominent in Tominé(21,230 ha). This vegetation category encompasses both natural páramo ecosystems and secondary vegetation that has developed following agricultural abandonment or reduced management intensity.

Wetland ecosystems, while spatially limited, represent critical components of the region’s hydrological infrastructure and biodiversity conservation network. The region’s wetlands have experienced dramatic reductions over the past century, declining from approximately 50,000 hectares in 1938 to only 500 hectares by 2005 (Gallini, 2024). Current wetland areas are primarily concentrated in Guandoque (901.0 ha) and Tominé (443.99 ha), representing remnants of what was once a much more extensive wetland system. Related to the above, the development of agricultural and livestock activities can generate soil erosion and degradation in ecologically fragile areas such as high Andean páramos, forests, and wetlands. These areas, when converted to productive uses without adequate planning, have their essential ecosystem functions compromised. The loss of vegetation cover, shown in Table 1 according to the data by project core, in turn produces alterations in the soil structure, significantly reducing its capacity for water infiltration, retention and regulation. As a consequence, a decrease in regional water availability is observed, affecting both the ecosystems and the communities that depend on these services.

Table 17. Description of vegetation loss in the intervention landscapes according to each municipality

Intervention landscape	Municipality 1	Municipality 2	Municipality 3	Municipality 4
1. Guandoque	<u>Cogua:</u> In 2020, Cogua had 4040 hectares of natural forest, covering 30% of its land area. By 2024, it had lost 5 hectares of natural forest, equivalent to 2.33 kt of CO₂ emissions.	<u>Tausa:</u> In 2020, Tausa had 6060 hectares of natural forest, covering 32% of its land area. By 2024, it had lost 4 hectares of natural forest, equivalent to 1.37 kt of CO₂ emissions.	<u>Zipaquirá:</u> In 2020, Zipaquirá had 7340 hectares of natural forest, covering 38% of its land area. By 2024, it had lost 42 hectares of natural forest, equivalent to 17.9 kt of CO₂ emissions.	
2. Villapinzon	<u>Villapinzón:</u> In 2020, Villapinzón had 5710 hectares of natural forest, covering 25% of its land area. In 2024, it lost less than 1 hectare of natural forest, equivalent to 236 t of CO₂ emissions.			

Intervention landscape	Municipality 1	Municipality 2	Municipality 3	Municipality 4
3. Chingaza	<u>Chocontá:</u> In 2020, Chocontá had 8690 hectares of natural forest, covering 29% of its land area. By 2024, it had lost 4 hectares of natural forest, equivalent to 1.77 kt of CO₂ emissions.	<u>Guasca:</u> In 2020, the municipality of Guasca had 16.500 hectares of natural forest, covering 45% of its land area. By 2024, it had lost 1 hectare of natural forest, equivalent to 635 tonnes of CO₂ emissions.	<u>Guatavita:</u> In 2020, Guatavita had 9710 hectares of natural forest, covering 40% of its land area. By 2024, it had lost 7 hectares of natural forest, equivalent to 3.22 kt of CO₂ emissions.	<u>Sesquilé:</u> In 2020, Sesquilé had 4.650 hectares of natural forest, covering 33% of its land area. By 2024, it had lost 3 hectares of natural forest, equivalent to 1.37 kt of CO₂ emissions.
4. Tunjuelo	In 2020, the Tunjuelo basin within Bogotá D.C. still conserved important remnants of Andean forest and páramo vegetation in its upper and middle slopes, covering around 30–35% of the basin area. Between 2020 and 2024, ongoing urban expansion, infrastructure development and small-scale agriculture on steep slopes led to the loss of approximately 40 hectares of natural forest and shrubland, equivalent to about 15 kt of CO₂ emissions	=	=	=

Source: (Global Forest Watch, 2025)

Inland water bodies and associated riparian systems provide essential hydrological services across the intervention landscapes, though their spatial extent has been significantly modified by channelization and water management infrastructure. The Río Bogotá system, which historically supported extensive wetland complexes, now functions primarily as a heavily engineered waterway that divides the city from the surrounding sabana (Weller, Hoch, & Huang, 2021).

The spatial distribution of land cover types across intervention landscapes reveals distinct gradients from urban core to rural periphery. Urban and industrial land uses are concentrated in central areas of the Bogotá Region, while agricultural and natural vegetation types dominate peripheral intervention landscapes (Guandoque, Villapinzon, Tominé). This spatial organization reflects both historical settlement patterns and contemporary planning policies that have attempted to contain urban expansion within defined boundaries.

Landscape connectivity varies significantly across intervention landscapes, with some regions maintaining relatively intact ecological corridors while others are highly fragmented by urban and transportation infrastructure. Tominé retain more continuous natural vegetation cover, supporting connectivity with páramo ecosystems in the surrounding mountains. In contrast, western and central areas show higher degrees of landscape fragmentation, with natural areas existing as isolated patches within agricultural and urban matrices.

The heterogeneous agricultural areas that dominate several intervention landscapes represent a complex land cover category that includes multiple land uses and vegetation types within individual management units. This heterogeneity reflects both traditional farming practices that maintain diverse crop rotations and agroforestry systems, as well as contemporary land use transitions where agricultural areas are being converted to urban uses or abandoned to natural succession.

The land cover patterns reveal both opportunities and challenges for sustainable regional development in the Bogotá region. The persistence of extensive agricultural areas demonstrates the continued importance of local food production systems and suggests opportunities for promoting sustainable agricultural practices that can support both economic development and environmental conservation objectives.

The concentration of urban development within specific intervention landscapes provides opportunities for promoting compact urban form and protecting agricultural and natural areas from sprawling development patterns. However, the significant extent of transitional land uses (construction sites, mining areas) suggests continued pressure for landscape transformation that will require careful management to avoid negative environmental impacts.

Forest and natural vegetation recovery in some areas presents opportunities for expanding protected area networks and improving landscape connectivity between existing conservation areas and urban green spaces. The integration of these natural areas into regional planning frameworks could support both biodiversity conservation and urban sustainability objectives.

The critical state of wetland ecosystems requires immediate attention to prevent further losses and to restore degraded areas where possible. The remaining wetland fragments serve disproportionately

important roles in regional hydrology and biodiversity conservation, making their protection a high priority for sustainable development planning.

Table 18. Land cover for the intervention landscapes, 2020

Land cover	1 Guandoque	2 Villapinzon	3 Chingaza	4. Tunjuelo
Urban fabric	40.6	135.1	48.9	779.43
Industrial, commercial and transport units		52.4	9.3	11.73
Mine, dump and construction sites				456.23
Artificial, non-agricultural vegetated areas	16.4			-
Arable land	1,508.3	186.0	1,221.3	-
Permanent crops			69.2	-
Pastures	4,209.7	693.5	11,734.6	491.99
Heterogeneous agricultural areas	11,270.2	9,455.6	17,471.6	9,517.30
Forest	511.4		6,350.5	168.89
Shrub or herbaceous vegetation association	8,428.7	3,906.0	21,230.0	6,777.79
Open spaces with little to no vegetation			87.2	-
Inland wetlands			56.7	-
Inland waters	901.0		443.9	35.76
Total	26,886.3	14,428.6	58,723.1	18,239.12

Source: IDOM, 2025 with data from IDEAM, 2020

6.2.7 Pre-existing conflicts or disputes over the use, access or control of natural resources: Land Ternue

According to Zapata, J.; C. Sarmiento & A. Rivera (2022), land tenure informality represents a historical debt of the government to rural communities in Colombia. This situation makes these communities more vulnerable to land dispossession, theft, economic insecurity, and reduced investment in development.

A property without clear ownership is also harder to monitor for inappropriate land use (e.g., deforestation) and nearly impossible to incentivize toward sustainability, given the inability of public entities to invest in these areas (e.g., Payment for Environmental Services schemes).

The Rural Agricultural Planning Unit (UPRA) developed the Land Tenure Informality Index, which measures the degree of informality at the municipal level. A property is considered informal if it meets any of the following criteria:

- i) Not registered in ICARE;
- ii) Lacks a property registration number in the cadastral database;

- iii) Identified as having improvements on land owned by others in the cadastral database;
- iv) Shows false ownership history in the property registration folio;
- v) Listed as part of the inventory of public lands.

Colombia has a 52.7% land tenure informality rate, while the average for municipalities with páramos is 57%, slightly higher than the national average. In 22 páramo complexes, land tenure informality exceeds 50%. Pisba, Chiles-Cumbal, and Sotará show the highest rates, above 75%.

Law 1930 of 2018 granted a five-year period for IGAC, ANT, SNR, National Natural Parks, and other authorities to carry out the land regularization process in páramo complexes. This deadline expired in 2023, when a change in the trend was expected. However, UPRA has not established a regular schedule for measuring this index.

The indices of informality of land tenure by municipality in the areas of intervention are presented below:

Table 19. Informality of land tenure 2020 by municipality

Intervention landscape	Municipality	Informality of land tenure 2020 (Properties)
1 Guandoque	COGUA	42,68 %
	TAUSA	47,52 %
	ZIPAQUIRÁ	38,42 %
2 Villapinzon	CHOCONTÁ	65,40 %
	VILLAPINZÓN	60,46 %
3 Tominé	CHOCONTÁ	65,40 %
	GUASCA	51,88 %
	GUATAVITA	69,63 %
	SESQUILÉ	40,36 %
4. Tunjuelo	BOGOTÁ D.C.	58% (Usme)

Source: IDOM, 2025 with data from ((UPRA), 2020).

6.2.8 Pre-existing conflicts or disputes over the use, access or control of natural resources: Mining activities

According to (Zapata-Jiménez, 2022), since 2010, through various legal instruments (Law 1382/2010, Law 1450/2011, Law 1753/2015, Constitutional Court Ruling C-035/2016, Law 1930/2018), páramo ecosystems have been excluded from mining activities due to their critical role in providing essential services for humanity, such as water supply and regulation.

During the initial years, this prohibition helped reduce the number of new mining concessions granted within these ecosystems, but it did not revoke existing ones even those without ongoing

exploration or exploitation activities, or without the required mining and environmental permits. In 2012, there were 522 active mining titles, and by 2015, there were still 511.

It was not until 2016, following the Constitutional Court's ruling and the official delimitation of páramo complexes, that the Mining Authority began the process of terminating concession contracts, although some were voluntarily returned by titleholders.

Of the 511 titles active in 2015 (covering 140,205 hectares), 300 titles remained active by the end of 2021 (covering 50,644 hectares). More than 70% of these remaining titles are concentrated in the páramos of Pisba, Jurisdicciones-Santurbán-Berlín, Tota-Bijagual-Mamapacha, and Guerrero.

Recently, in December 2021, the Ministry of Environment established environmental guidelines for the program aimed at replacing mining activities and promoting labor reconversion or relocation for traditional small-scale miners in páramo ecosystems. Monitoring mine closure processes and implementation of substitution plans will be critical in the coming years.

6.3 Vulnerability mapping

6.3.1 Poverty

A general overview of poverty was developed for each intervention landscape, based on information from the National Planning Department (SISBÉN IV / Terridata, data of June 2024)². To this end, the incidence of extreme and moderate poverty was calculated, with each municipality's contribution weighted by its relative size within the intervention landscape. This statistical analysis was complemented by findings from various research studies, allowing for a comprehensive characterization of territorial socioeconomic dynamics.

Intervention Landscape 1 Guandoque

The socio-economic vulnerability of the area is defined by the situation in Tausa (11.3% in extreme poverty), which, despite Zipaquirá's stability, raises the area's risk profile to medium-high. The local economic structure is primarily based on potato farming and dairy cattle ranching. Meanwhile, coal mining, while significant for regional GDP, demonstrates limited capacity to absorb local labor, creating a 'growth without well-being' scenario (LaVilla, 2018). A 'strong rural-urban divide' persists, with high levels of multidimensional poverty in rural areas. This dependence on extractive activities and monoculture has driven the expansion of the agricultural frontier, exacerbating erosion and wetland degradation; a cycle that reduces long-term land productivity and deepens the precariousness of farmers (LaVilla, 2018).

² <https://terridata.dnp.gov.co/index-app.html#/perfiles>

Intervention Landscape 2 Villapinzón

The situation is critical throughout the region, as almost half of its population lives in some degree of poverty (extreme or moderate). Here, the economy presents a conflicting duality. On the one hand, it serves as a food supplier for Bogotá (potatoes and milk); on the other, it is home to family-run tanneries that generate manufacturing jobs but severely pollute the headwaters of the Bogotá River (Enel_Colombia, 2022) (Angulo, 2023). This situation illustrates the dilemma of poverty: communities accept jobs in polluting, hazardous industries because they lack sustainable economic alternatives.

Intervention Landscape 3 Tominé

It is the most stable rural area, thanks to Guasca's strong performance (only 3% extreme poverty). This stability offsets the small pockets of poverty present in smaller municipalities, such as Gachetá. This area has an economic structure based on the direct use of natural resources. In the Sisga and Siecha river basin subzones, a subsistence economy predominates, based on the cultivation of tubers and corn in mountain plots, combined with cattle grazing and a growing ecotourism sector around the Siecha lagoons and the Sisga reservoir (Cundinamarca Gobernación, 2022). Meanwhile, the Guavio subzone is characterized by cattle ranching as a source of income and by the presence of the Guavio Hydroelectric Plant, the largest in Colombia, whose operation depends on water regulation provided by the páramos and cloud forests, which are currently threatened by deforestation and grazing (Enel_Colombia, 2022) (Agencia_Noticias_UNAL, 2018)(Agencia_Noticias_UNAL, 2018)

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Intervention Landscape 4 Tunjuelo

The Tunjuelo landscape shows one of the starkest expressions of urban and peri-urban poverty in the Bogotá River basin, combining high population density with legacies of mining, precarious housing and environmental degradation. Based on SISBÉN IV/Terridata (June 2024) and district diagnostics, the sub-basin presents a medium-high incidence of moderate poverty and significant pockets of extreme poverty in hillside neighborhoods and rural areas of Usme and Ciudad Bolívar, where informal settlements often lack full access to quality basic services, secure land tenure and safe public space. In contrast, some consolidated urban areas exhibit relatively better income levels and service coverage, deepening socio-spatial segregation between formal and informal sectors of the city.

Economically, the area is characterized by a strongly informal labor market, dominated by low-wage commerce, small workshops, transport services and jobs linked to construction and the historical extraction of construction materials. These activities provide short-term income but rarely offer social protection or upward mobility, trapping many households in a cycle of vulnerability and environmental risk. Environmental degradation of the river and surrounding

ecosystems further limits the emergence of greener and more diversified livelihoods, reinforcing dependence on unstable and often polluting economic activities. In this context, interventions in the Tunjuelo landscape must simultaneously address poverty, environmental recovery and formalization of land tenure and employment if they are to generate a structural improvement in well-being.

6.3.2 Gender-disaggregated demographic profile and gender situation in project areas

Intervention landscape 1. Guandoque (Cundinamarca)

Table 17. Demographic context in intervention landscape 1

A. Demographic and territorial context			
Municipalities where the intervention landscape is located	This data focuses on Tausa and Zipaquirá, which together account for 78.5% of the project's surface area.		
Geographic distribution	Tausa Urban: 26.4% Rural: 73.6% Cogua Urban: 43% Rural: 57% Zipaquirá Urban: 85.2% Rural: 14.8%		DANE- Population projections based on the 2018 Census-DNP, published in Terridata municipal fact sheets
Population disaggregated by sex (2024)	Tausa 9,711 people Women: 48% Men: 52% Cogua 26,870 people Women: 50.6% Men: 49.4% Zipaquirá 160,629 people Women: 51.5% Men: 48.5%		DANE- Population projections based on the 2018 Census, available on Terridata
Population over 59 years old	Tausa 11.3% of the total population. Cogua 13.6% of the total population. Zipaquirá 11.7% of the total population.		DANE CNPV 2018
Literacy	Tausa	Men: 95.1%.	

(% of people over 15 years old who can read and write)	Cogua Zipaquirá	Women: 94.8%. Men: 95.7%. Women: 96.4%. Men: 98.3%. Women: 97.9%.	DANE CNPV 2018
Place of birth	Tausa	Men Other country: 0.31% Other municipality: 27.93% Women Other country: 0.28% Other municipality: 27.88%	DANE CNPV 2018
	Cogua	Men Other country: 0.34% Other municipality: 40.2% Women Other country: 0.24% Other municipality: 41.84%	
	Zipaquirá	Men Other country: 0.94% Other municipality: 23.22% Women Other country: 0.93% Other municipality: 25.69%	

The demographic analysis of Area 1 reveals a sharp contrast between the rural, peasant profile of Tausa (73.6% rural) and the urbanized expansion of Zipaquirá (85.2% urban). This divide influences gender distribution: while Tausa shows a slight male majority, likely due to female migration to urban centers, Zipaquirá maintains a female majority, reflecting its role as a regional service hub. A critical challenge is the aging of the rural population, with over 11% of residents aged 59 or older. This trend threatens generational renewal in water and land management, leaving climate adaptation tasks often physically demanding for an older demographic. Regarding human capital, high literacy rates (over 94%) mask a persistent technical gap in rural areas. Gender inequality further exacerbates this through "time poverty": while rural men spend 3 hours daily on domestic work, women invest over 8 hours. This burden is expected to intensify as water scarcity increases the effort required for household and livestock management.

Table 18. Inequality gaps in intervention landscape 1

B. Inequality Gaps			
Services (% of homes that have the service)	Tausa	Aqueduct: 87.6%. Sewerage: 18.6%.	DNP, with data from the Superintendency of Public Utilities 2022
	Cogua	Aqueduct: 88.82%. Sewerage: 36.43%.	

	Zipaquirá		Aqueduct: 94.8%. Sewerage: 91.2%.	- published in municipal records Terridata
Average daily time spent on unpaid domestic and care work (hours)	Data for the Region Men: 1.7 hours Women: 3.6 hours	Data for rural areas : Men: 3.0 hours Women: 8.6 hours		DANE-ENUT reported in the Colombian Observatory of Women
	Data scope: Time use information is presented at a regional scale and by zones (urban and rural), since the ENUT (National Time Use Survey) lacks statistical representativeness at the municipal or departmental level. The only exception is Bogotá DC, whose data is specific; for the other municipalities, regional averages reported by DANE (National Administrative Department of Statistics) are used.			
Poverty (% of people living in that situation)	Tausa	Extreme poverty: 11.3% Moderate poverty: 29.7%		Records in SISBEN IV, 2024 published in municipal records Terridata
	Cogua	Extreme poverty: 6.1% Moderate poverty: 22.2%		
	Zipaquirá	Extreme poverty: 7.0% Moderate poverty: 22.5%		
Rate of domestic violence per 100,000 inhabitants	Tausa	Rate 2023: 74.3 Downward trend vs. the previous year		DNP, with data from MinDefensa, Medicina Legal and DANE - published in Terridata municipal records
	Cogua	Rate 2023: 92.1 Downward trend vs. the previous year		
	Zipaquirá	Rate 2023: 291.1 Upward trend vs. the previous year		

These disparities are exacerbated by socioeconomic factors, including extreme poverty in Tausa and limited women's legal landownership, which can restrict their participation in decision-making and their access to conservation incentives, such as Payments for Environmental Services (PES). For this reason, it will be necessary to develop a mechanism to involve all household members, including women. Furthermore, the deficient sewerage infrastructure in rural Tausa (18.6%) relative to urban Zipaquirá (91.2%) directly affects women, who, as the primary managers of domestic water, are exposed to contamination from inadequate wastewater discharge. Adding to this outlook are the concerning rates of domestic violence and harassment in the area, factors that could jeopardize personal safety and limit women's autonomy in community leadership roles.

To complement the statistical baseline, fieldwork was conducted in the intervention landscape to capture the lived experiences and perceptions of local communities. This qualitative approach enables a deeper

understanding of the social fabric and the specific challenges that women face in practice. The following table synthesizes these field findings, categorized by leadership dynamics, participation barriers, and climate-specific vulnerabilities identified in Tausa, Cogua, and Zipaquirá.

Table 19. Qualitative fieldwork findings: leadership, barriers, and technical needs (Area 1)

Category	Tausa	Cogua	Zipaquirá
Leadership and Organizations	Key actors include female heads of household, artisans, and vegetable producers.	Features women's home garden associations and the "Casa de la Mujer" (Women's House).	Strong female leadership in local associations and entrepreneurship groups.
Barriers to Participation	Caregiving burdens, limited time and transportation.	Reports of harassment, social pressure within guilds, and a lack of recognition of women's roles in the field.	Caregiving burdens, limited time and transportation, and youth disinterest due to limited options.
Climate Vulnerability	Specific impacts on beekeeping (colony mortality) and loss of nutrients in livestock pastures.	Farmers experience pronounced seasonal variability in rainfall.	Women responsible for care and production are most affected by water scarcity.
Logistics and Technical Needs	Training in marketing and technical assistance for cold storage and packaging.	Coordination with environmental and social NGOs for recycling and environmental education.	Specific budgets to cover transportation and childcare services during project workshops.

Fieldwork, IDOM, 2025

The fieldwork conducted in the municipalities of Tausa, Cogua, and Zipaquirá demonstrates that female leadership underpins community organization, with a prominent presence in artisan and producer associations and in environmental care groups. In Zipaquirá, strong female participation in local associations was observed, whereas in Tausa, women, particularly female heads of households, are recognized as primary actors in the management of natural resources. However, this community leadership contrasts with institutional disconnection, as these leaders do not currently participate in external technical projects across several sectors, thereby limiting their influence on structural water-related decisions.

A central finding of the diagnosis is the persistence of structural barriers that condition women's participation. Caregiving burdens and domestic chores are cross-cutting factors that limit available time, compounded by transportation difficulties in hard-to-reach rural areas. Nevertheless, in municipalities like Cogua, additional challenges related to a lack of autonomy and social pressure are detected, where situations of harassment and a culture that still limits women's agencies in the field are reported. Likewise, mistrust of external entities, stemming from prior experiences of imposition of sanctions, discourages the female community's active involvement in new processes. With respect to climate vulnerability, women

are identified as the most exposed group due to their direct role in water management for domestic consumption and family food security. Phenomena such as droughts and the drying up of springs significantly increase their workload and affect their livelihoods, including home gardens and small livestock farming. Despite this exposure, it highlights that women possess extensive traditional knowledge and historical memory of water source behavior, often exceeding official technical information.

It's useful to highlight that in the region, a significant proportion of women rely exclusively on agricultural work or on renting out their labor to survive, creating economic precariousness that limits their capacity to invest in adaptation measures. Furthermore, the educational attainment levels of some rural women may hinder their understanding of complex technical languages, underscoring the need to value and preserve local knowledge as a fundamental resource for the territory's resilience.

Intervention landscape 2. Villapinzón (Cundinamarca)

In this case, the analysis focuses on the municipality of Villapinzón. The demographic context and gender gaps are then presented using official municipal statistics, information which is subsequently compared with the qualitative and quantitative findings obtained in the field.

Table 20. Demographic context in intervention landscape 2

A. Demographic and Territorial Context			
Municipalities where the intervention landscape is located	The entire area is located within the municipality of Villapinzón.		
Geographic distribution	Villapinzón	Urban: 45.0% Rural 55.0%	DANE-Population projections based on the CNPV 2018, published in Terridata municipal fact sheets
Population disaggregated by sex (2024)	Villapinzón 20,735 people	Women: 49.9% Men: 50.1%	DANE-Population projections based on the 2018 Census, available on Terridata
Population over 59 years old	Villapinzón	12.8% of the total population.	DANE CNPV 2018
Literacy (% of people over 15 years old who can read and write)	Villapinzón	Men: 97.1%. Women: 96.1%.	DANE CNPV 2018

Place of birth	Villapinzón	Men Other country: 0.25% Another municipality: 21.32% Women Other country: 0.18% Another municipality: 21.81%	DANE CNPV 2018
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Villapinzón is characterized by a landscape of hydric and social vulnerability, where rurality (55%) and poverty (47.1%) significantly shape women's daily lives. A distinctive challenge in this area is the physical burden of water management: as local springs dry up, women are forced to spend up to an hour per trip collecting water. This labor is compounded by a deficient sewage system that covers only 40% of the territory, increasing their exposure to environmental contamination. These physical demands coexist with an aging population (12.8%) and deeply rooted gender barriers. Fieldwork identified a critical lack of autonomy, exemplified by the persistence of "male permission" for land management decisions and a low formal participation rate in community organizations (15%). Given the rising domestic violence rates and the environmental pressure from the leather processing industry, interventions in Villapinzón must go beyond technical assistance. They must prioritize reducing "time poverty" and empowering women to gain full sovereignty over their natural resources and decision-making processes.

Table 21. Inequality gaps in intervention landscape 2

B. Inequality Gaps			
Services (% of homes that have the service)	Villapinzón	Aqueduct: 88.3%. Sewage: 40.0%.	DANE CNPV 2018
Average daily time spent on unpaid domestic and care work (hours)	Data for the Region Men: 1.7 hours Women: 3.6 hours	Data for rural areas: Men: 3.0 hours Women: 8.6 hours	DANE-ENUT reported in the Colombian Observatory of Women
	Data scope: Time use information is presented at a regional scale and by zones (urban and rural), since the ENUT (National Time Use Survey) lacks statistical representativeness at the municipal or departmental level. The only exception is Bogotá DC, whose data is specific; for the other municipalities, regional averages reported by DANE (National Administrative Department of Statistics) are used.		
Poverty (% of people living in that situation)	Villapinzón	Extreme poverty: 12.2% Moderate poverty: 34.9%	Records in SISBEN IV, 2024 published in municipal records Terridata
Rate of domestic violence	Villapinzón	Rate 2023: 264.20 Upward trend vs. the previous year	DNP, with data from MinDefensa, Medicina Legal

<i>per 100,000 inhabitants</i>		and DANE - in Terridata municipal records
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The table above reveals that although water supply coverage reaches 88.3%, the sewage system is significantly underdeveloped (40.0%), directly impacting the pollution of local water sources. Furthermore, 47.1% of the population lives in poverty to some degree.

As a part of the fieldwork, the community reports an alarming transformation of the hydric landscape over the last three decades. Climate risk perception in Villapinzón is critical and is characterized by three primary phenomena: hailstorms, frosts, and droughts. Local testimonies highlight the disappearance of springs and a drastic reduction in water flow on farms where, thirty years ago, streams ran year-round. This scarcity forces women into precarious water management: while some have access to aqueducts, many remain dependent on natural springs and reservoirs. This leads to extreme physical burdens, with some women traveling more than 1,000 meters and spending up to 1 hour per trip to collect water. Furthermore, a latent health risk persists as a significant portion of the population consumes non-potable (raw) water.

Regarding environmental degradation, the area faces multidimensional pressure on its natural resources. The expansion of the agricultural frontier, specifically potato cultivation on steep slopes, and livestock farming without proper waste management, has accelerated deforestation and soil contamination. A distinctive stressor in this area is industrial pollution from tanneries (curtiembres), with waste improperly disposed of in sensitive locations such as the Paramo. This situation creates constant tension between production needs and the imperative for paramo conservation, a tension exacerbated by the absence of a Municipal Wastewater Treatment Plant (PTAR).

Despite women's high involvement in daily farm labor, their formal decision-making capacity and leadership remain limited. There is an evident technical disconnect: most rely exclusively on traditional knowledge for climate-related decisions and lack access to official meteorological data. Only a small minority (approximately 15%) currently participate in formal projects or community organizations.

Gender barriers in Villapinzón are explicit:

- In several households, women must still "ask for permission" from men to decide what to plant or how to manage the land.
- Domestic responsibilities and the geographical isolation of certain villages act as a "glass ceiling" for attending technical training.
- There is a widespread distrust of environmental authorities (such as the CAR), rooted in the perception that conservation projects may lead to sanctions or restrictions on their agricultural production.

The following table synthesizes the critical field findings for this area:

Table 22. Qualitative fieldwork findings: leadership, barriers, and technical needs (Area 2)

Category	Critical Findings in Villapinzón
Leadership and Organizations	The community structure relies on rural aqueduct associations and Community Action Boards (JACs). However, formal engagement is low, with only 15% of surveyed women linked to current initiatives. Female leadership is most visible in apiculture, local tourism, and dairy processing.
Barriers to Participation	Time poverty due to unpaid care and domestic workloads is the primary barrier. Restrictive gender dynamics persist, including the reported need for "male permission" for land management decisions. Logistical hurdles include distance, lack of transport, and institutional distrust.
Climate Vulnerability	Documented disappearance of water sources on family farms. High sensitivity to frosts, hailstorms, and droughts that threaten agricultural assets. Severe water insecurity, with collection times exceeding one hour for some households.
Logistics and Technical Needs	Stakeholders demand integrated technical assistance directly on the farm, tailored to each property. Key needs include training in restoration, community water-flow monitoring, and administrative support for direct marketing. Initial capital is required for transitioning to sustainable systems.

Fieldwork, IDOM, 2025

Intervention landscape 3. Tominé (Cundinamarca)

The intervention landscape is primarily concentrated in the municipalities of Guasca and Guatavita, both of which have a strong rural identity.

Table 23. Demographic context in intervention landscape 3

A. Demographic and Territorial Context			
Municipalities where the intervention landscape is located	73.2% of the intervention landscape is concentrated in the municipalities of Guasca and Guatavita (44.8% and 28.4%, respectively). The remaining percentage is distributed among Chocontá and Sesquilé. Consequently, this section presents information exclusively for the two municipalities with the largest surface area.		
Geographic distribution	Guasca  Urban: 48.2% Rural 51.8% Sesquilé  Urban: 38.5% Rural 61.5% Chocontá Urban: 59.9% Rural 40.1%		DANE- Population projections based on the 2018 Census- DNP, published

	Guatavita	Urban: 43.0% Rural 57.0%	in Terridata municipal fact sheets
Population disaggregated by sex (2024)	Guasca 18,569 people	Women: 50.1% Men: 49.9%	DANE- Population projections based on the 2018 Census, available on Terridata
	Sesquilé	Women: 49.9% Men: 50.1%	
	Chocontá 12,939	Women: 50.1% Men: 49.9%	
	Guatavita 7,605 people	Women: 50% Men: 50%	
Population over 59 years old	Guasca	12.9% of the total population.	DANE CNPV 2018
	Sesquilé	12.1% of the total population.	
	Chocontá	12.2% of the total population.	
	Guatavita	15.0% of the total population.	
Literacy (% of people over 15 years old who can read and write)	Guasca	Men: 96.0%. Women: 96.8%.	DANE CNPV 2018
	Sesquilé	Men: 96.7%. Women: 97.0%.	
	Chocontá	Men: 96.0%. Women: 95.3%.	
	Guatavita	Men: 95.8%. Women: 96.6%.	
Place of birth	Guasca	Men Other country: 0.63% Another municipality: 29.28%	DANE CNPV 2018
		Women Other country: 0.67% Another municipality: 29.33%	
		Men Other country: 1.08% Another municipality: 31.63%	
		Women Other country: 0.93% Another municipality: 31.85%	
	Sesquilé	Men Other country: 0.49% Another municipality: 18.24%	
		Women Other country: 0.33% Another municipality: 17.63%	
		Men Other countries: 0.24% Another municipality: 20.10%	
	Chocontá		
	Guatavita		

	Women Other countries: 0.16% Another municipality: 20.23%	
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Guatavita shows a slightly higher aging index, with 15.0% of the population aged 59 or older, compared to 12.9% in Guasca. Nevertheless, both municipalities maintain outstanding literacy levels exceeding 95% for both sexes, reflecting a solid educational foundation. In terms of mobility and local roots, 2018 Census data reveal that Guasca presents a more active internal migration dynamic: approximately 29% of its population was born in other municipalities, compared to 20% in Guatavita. In contrast, the presence of a foreign population is marginal in both locations, not exceeding 0.67%. This territorial configuration suggests stable communities with a strong sense of belonging, key factors for the success of intervention efforts in the area.

Table 24. Inequality gaps in intervention landscape 3

A. Inequality Gaps				
Services <i>(% of homes that have the service)</i>	Guasca	Ü	Aqueduct: 80.4%. Sewerage: 40.5%.	DNP, with data from the Superintendency of Public Utilities 2022 - published in municipal records Terridata
	Chocontá	Ü	Aqueduct: 87.75%. Sewerage: 48.06%.	
	Sesquilé	Ü	Aqueduct: 91.97%. Sewerage: 58.32%.	
	Guatavita	Ü	Aqueduct: 42.6%. Sewerage: 17.5%.	
Average daily time spent on unpaid domestic and care work (hours)	Data for the “Oriental Region” Men: 1.7 hours Women: 3.6 hours		Data for rural areas: Men: 3.0 hours Women: 8.6 hours	DANE-ENUT reported in the Colombian Observatory of Women
	Data scope: Time use information is presented at a regional scale and by zones (urban and rural), since the ENUT (National Time Use Survey) lacks statistical representativeness at the municipal or departmental level. The only exception is Bogotá, D.C., whose data are specific; for the other municipalities, regional averages reported by DANE (the National Administrative Department of Statistics) are used.			
Poverty <i>(% of people living in that situation)</i>	Guasca	Ü	Extreme poverty: 3.0% Moderate poverty: 16.5%	Records in SISBEN IV, 2024, published in municipal records Terridata
	Chocontá	Ü	Extreme poverty: 11.2% Moderate poverty: 34.9%	
	Sesquilé	Ü	Extreme poverty: 11.1% Moderate poverty: 26.2%	
	Guatavita	Ü	Extreme poverty: 5.5% Moderate poverty: 24.0%	

Rate of domestic violence per 100,000 inhabitants	Guasca	Ü	Rate 2023: 166.8 Upward trend vs. the previous year	DNP, with data from MinDefensa, Medicina Legal and DANE - published in Terridata municipal records
	Chocontá	Ü	Rate 2023: 91.1 Upward trend vs. the previous year	
	Sesquilé	Ü	Rate 2023: 81.4 Downward trend vs. the previous year	
	Guatavita	Ü	Rate 2023: 135.5 Downward trend vs. the previous year	

The gender dimension underscores serious challenges in how time is distributed. In the eastern region, women bear the disproportionate burden of unpaid domestic work. Additionally, public safety remains a concern: although Guatavita reports a lower rate of domestic violence (135.5 per 100,000 inhabitants) with a declining trend, Guasca shows a higher figure (166.8) with a worrying increase.

Fieldwork conducted in Guasca, Guatavita, and Sesquilé revealed that while community groups have high capacity for organization, access to resources remains limited. The findings highlight three key areas:

- There are serious concerns about soil degradation due to mining, monocultures of potato and blueberry, and the spread of invasive species. Limited basic services in peripheral areas force families to depend on natural reservoirs, with collection times exceeding one hour.
- Women participate actively in organizations, yet their leadership is undervalued socially, and a caregiving overload hampers their personal and economic growth.
- Communities seek direct 'farm-to-farm' technical assistance and communication strategies to break the isolation of scattered rural districts.

Table 25. Qualitative fieldwork findings: leadership, barriers, and technical needs (Area 3)

Category	Guasca	Guatavita	Sesquile
Leadership and Organizations	High associative capacity in various sectors: blueberries, weaving, beekeeping, and farmers' markets. Women lead organizations such as AGREGUA, Manos Tejedoras, and dairy associations.	Solid network of dairy cooperatives (Levacar, AMEG, Coprolag) and female entrepreneurs. Notable local tourism agency managed exclusively by women with a matrifocal structure	Established dairy cooperatives (Coldorados, Copranses) and women's associations such as AMUSES and "Nuevas y Emprendedoras." Growing interest in youth movements and associations.

		(female heads of household).	
Barriers to Participation	Lack of interest and generational renewal among rural youth. Women face double workloads and meeting schedules incompatible with household care. Distrust toward previous extractive or infrastructure projects.	Lack of credibility in the municipal administration and institutional distrust. Women perceive a lower social valuation of their voices and leadership than men do. Conflicts with invaders on vacant border lands.	Technical information "does not flow" to the periphery and relies on word-of-mouth. Low social valuation of female management capacity. Resources tend to be centralized, leaving remote areas neglected.
Climate Vulnerability	Water rationing in sectors like Pastor Ospina and recurrent flooding of the Siecha River. Technical supply issues in dispersed areas like San Jorge, where they rely on direct collection from creeks.	Extreme water insecurity: 90% of surveyed women consume non-potable water (raw or filtered). Some travel more than 1,000 meters to obtain water, with collection times of up to two hours.	Severe scarcity in summer and risk of forest fires. Degradation of wetlands in rural districts like Agua Blanca. Landslides in Ranchería are affecting property stability.
Logistics and Technical Needs	Demand for "farm-to-farm" technical assistance in soil management and silvopasture. Need for climate monitoring kits and accounting/administrative training for associations to manage their own resources.	Prioritize irrigation projects in critical sectors and the creation of a municipal nursery for native species. Request incentives for water reuse plants in tourist accommodations.	Require reservoirs to store water in summer and genetic improvement of livestock. Need clear, free, and timely calls for participation to ensure the involvement of peripheral areas.

Fieldwork, IDOM, 2025

The vulnerability in the Tominé intervention zone presents a paradox: it is a region rich in strategic water resources, yet its residents, particularly in Guatavita, face extreme water insecurity. The municipality's low coverage of aqueducts (42.6%) and sewerage (17.5%) means water security is a daily challenge, especially for women who spend over an hour manually collecting water. This situation diminishes the community's adaptive capacity, as the physical effort and time spent on basic survival leave little room for pursuing long-term climate strategies.

In terms of ecosystem restoration, the area's high aging index (15% in Guatavita) and the 8.6-hour daily caregiving burden on women pose significant obstacles. When women's leadership is undervalued and their time consumed by domestic responsibilities, the social fabric necessary for hydric resilience remains underexploited. The project must recognize that women in Guasca and Guatavita are not only participants but also the traditional custodians of sacred sites like the Siecha Peaks. Their ancestral knowledge is a vital asset for Ecosystem-based Adaptation (EbA).

Therefore, these findings underscore the importance of linking water resilience to efforts to close basic service gaps. To ensure sustainable restoration, the project should implement "farm-to-farm" technical assistance to reduce the labor burden on older populations and women. Success hinges on transforming the strong associative capacity of dairy and craft cooperatives into a governance platform, empowering women with the technical autonomy and time to lead the protection of the páramo, so that the territory's water resources primarily support the resilience of the communities that protect them.

Intervention Landscape 4 Tunjuelo

The Tunjuelo intervention landscape focuses on the rural upper basin in the locality of Usme, where the La Regadera reservoir and surrounding high-Andean ecosystems are located. Although administratively part of Bogotá, D.C., this territory maintains a predominantly rural character, with dispersed settlements, smallholder agriculture and strong community organization around land and water management.

Table 23. Demographic context in intervention landscape 4

Item	Tunjuelo – rural Usme (Bogotá, D.C.)
Municipalities where the intervention landscape is located	The intervention landscape is located in the rural upper basin of the Tunjuelo River, within Bogotá, D.C. (locality of Usme), extending toward the La Regadera reservoir and adjacent páramo and high-Andean areas. For analytical purposes, the project focuses on rural and dispersed settlements, which concentrate the headwater ecosystems and smallholder livelihoods relevant for water regulation and Ecosystem-based Adaptation.
Geographic distribution	Usme (focus on rural Tunjuelo upper basin): the majority of the population lives in rural veredas and dispersed farmsteads, while a smaller share resides in consolidated urban or roadside centers with better access to services and markets.
Population disaggregated by sex (2024)	The rural population of the Tunjuelo–Usme landscape is relatively young, with a slight predominance of women. Women play a central role in agricultural labor, care work and community organization, while men tend to concentrate in construction, transport, quarrying and seasonal agricultural activities, often involving temporary migration.
Population over 59 years old	The area shows a growing share of older adults who have aged in place, many of them smallholders whose children have migrated to urban centers. This aging trend increases vulnerability, as older farmers face physical barriers to maintaining agricultural practices, participating in collective work and accessing health and administrative services.
Literacy (% of people over 15 years old who can read and write)	Literacy in basic reading and writing is high, reflecting the overall educational coverage of Bogotá, but there are gaps in secondary and technical education completion, especially among older adults and women. Limited access to higher education and digital skills constrains young people's access to better-paid jobs and reduces the ability of community organizations to engage with technical information on equal footing with institutions.
Place of birth	The rural upper Tunjuelo basin combines long-standing local families with a significant proportion of residents born in other municipalities of Cundinamarca

	and neighboring departments. The presence of foreign-born population is marginal. This mix produces communities with strong local identity but diverse land-tenure trajectories (formal titles, informal subdivisions, occupations), which are central to understanding conflicts over land use, conservation restrictions and access to restoration benefits.
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Overall, the rural Tunjuelo–Usme landscape is characterized by a predominantly rural population embedded within the administrative framework of Bogotá, D.C. The combination of aging smallholders, youth out-migration and relatively high basic literacy—but limited access to higher education and technical training—creates both constraints and opportunities for ecosystem-based adaptation. Stable community roots and strong local identity can be leveraged to support long-term watershed governance, provided that interventions explicitly address mobility barriers, generational gaps and the diversity of land-tenure situations.

Despite belonging to one of the country’s most prosperous districts, rural communities in the upper Tunjuelo basin face marked inequalities in access to basic services, income stability and protection from gender-based violence. These structural gaps amplify climate vulnerability and must be considered when designing water and ecosystem restoration interventions.

Table 24. Inequality gaps in intervention landscape 4

Category	Tunjuelo – rural Usme (Bogotá, D.C.)
Services (% of homes that have the service)	In the rural upper Tunjuelo–Usme area, many households depend on community aqueducts, springs and rainwater harvesting, often with intermittent supply and insufficient water-quality control. Sewerage coverage is low, with a prevalence of septic tanks, latrines or direct discharges to streams, in contrast with the much higher coverage enjoyed by urban households in Bogotá. These gaps deepen health risks and undermine households’ capacity to adapt to climate variability.
Average daily time spent on unpaid domestic and care work (hours)	In line with national and regional patterns, women devote substantially more hours than men to unpaid domestic and care work, including water collection, fuelwood gathering, food preparation, and care of children and older adults. This unequal distribution of time limits women’s participation in training, leadership roles, income-generating activities and watershed governance processes.
Poverty (% of people living in that situation)	The rural upper Tunjuelo basin exhibits medium to high levels of monetary and multidimensional poverty, despite being part of Bogotá. Households depend heavily on small-scale agriculture, livestock and informal employment that are highly sensitive to price fluctuations and climate shocks. Informal land tenure and distance to markets and services further constrain access to public investment, credit and social protection.
Rate of domestic violence (per 100,000 inhabitants)	Official data for Bogotá point to persistent concerns regarding domestic and gender-based violence, and local diagnostics indicate that women and girls in rural and peri-urban sectors like Usme face particular risks. Economic stress, precarious housing, isolation of rural veredas and limited presence of

	institutional support services exacerbate under-reporting and hinder access to protection and justice.
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Inequality in the Tunjuelo–Usme landscape is expressed less through formal municipal averages and more through territorial gaps: rural households lag behind the rest of Bogotá in access to safe water, sanitation, secure income and protection from violence. Women, older adults and youth in dispersed settlements experience overlapping vulnerabilities that erode their capacity to participate in and benefit from climate and ecosystem restoration investments. Addressing these inequality gaps—especially in water and sanitation services, time use, and protection systems—will be essential to unlock the full potential of local leadership and ensure that water resilience interventions translate into tangible improvements in wellbeing.

6.1.2. Indigenous people

The following table presents a comparative analysis of ethnic self-identification across the project's intervention landscapes, based on data from the 2018 National Population and Housing Census (DANE). The data highlights a predominantly homogeneous demographic profile across all target municipalities

Table: Ethnic population by Intervention landscape

Area	Municipality	Predominant Group (No ethnic group)	Minority Ethnic Groups
1. Guandoque	Tausa	100%	None reported
	Cogua	99.9%	- Afro-Colombians: 0.1% - Indigenous people: 0.1%
	Zipaquirá	99.7%	- Afro-Colombians: 0.2% - Indigenous people: 0.1%
2. Villapinzón	Villapinzón	99.9%	Afro-Colombians: 0.1%
	Choconta	99.8%	- Afro-Colombians: 0.2% - Indigenous people: 0.1%
	Guasca	99.8%	- Afro-Colombians: 0.1% - Indigenous people: 0.1%
3. Tominé	Guatavita	99.7%	- Afro-Colombians: 0.1% - Indigenous people: 0.1%
	Choconta	99.8%	- Afro-Colombians: 0.2% - Indigenous people: 0.1%
	Sesquile	97.7%	- Afro-Colombians: 0.1% - Indigenous people: 2.1%
4. Tunjuelo	Usme	98.5	- Afro-Colombians: 1% - Indigenous people: 0.5%

Source: DANE CNPV 2018

Although census data indicate very low percentages of Indigenous population across the intervention areas, it is important to note, consistent with the IPP analysis, that census-based self-identification does

not necessarily reflect the presence of indigenous communities with customary relationship to the territories. These reflect processes of displacement associated with different factors—including armed conflict—as well as migration, urbanization and other territorial transformations. As a result of these processes, Indigenous people may be present outside their ancestral territories, including in both urban centers and rural areas, in many cases without maintaining a collective territorial presence or holding formal recognition as a group.

Within the project's influence zone, specifically in the municipality of Sesquilé, Cundinamarca, the Mhuysqa Chuta Fa Aba – Los Hijos del Maíz Indigenous Reserve is located. This community, part of the historical Mhuysqa people, has been undergoing a process of cultural resurgence since the late 1990s, focusing on the recovery of its language, rituals, and traditional forms of government. Although the formally titled territory comprises 207 hectares in the village of La Espiga and does not directly overlap with the project's operational area, the community maintains traditional, spiritual, and productive uses in a "broad territory" that geographically coincides with the project intervention zones, particularly in the hamlets of Tilatá, Tierranegra, Ranchería, and El Hato.

The reserve population consists of 256 individuals across 88 families. The demographic structure shows that elders represent 83.5% of the population, granting them a decisive role as territorial guides and keepers of ancestral memory. Furthermore, there is a statistical and functional majority of women (54.7%), who serve as guardians of water, seeds, and traditional medicine. Community governance is exercised through the Governor Cabildo for political representation and the Council of Poporeros for spiritual guidance, with the Qusmhuy (Ceremonial House of Water) serving as the center for consensus-based decision-making for any action affecting their environment.

The community's cosmovision considers the territory and water as living beings that feel and guide; therefore, their relationship with the land is marked by the "Four Fires" calendar and a reflection period known as ZHA, during which invasive external activities must be suspended. Three fundamental sacred sites have been identified within the project area: the Piedra del Sapo (Toad Stone), intended for the ordering of thought; La Chorrera, a site for purification and ritual baths; and the Camino del Cajón – Observatorio, a space for spiritual learning. These points are interconnected by active ritual paths, such as the ceremonial path to the Piedra del Sapo and the ritual route to La Chorrera – Observatorio, both of which coincide with areas where the project plans restoration and water management activities.

As their livelihoods depend on native seed agriculture and the collection of medicinal plants in these areas, the community has identified critical risks, such as accidental intervention in sacred sites, the interruption of ritual routes, and the alteration of spiritual calendars. Consequently, the reserve's plan requires that all project activities respect their "Güeta" Life Plan, incorporate prior permission ceremonies, and ensure that technical interventions do not displace ancestral knowledge or the essential role of women as water caretakers.

6.4 Cultural Heritage

6.4.1 Tangible cultural heritage

In the Bogotá Region and the municipalities intersected by the intervention landscapes, there is a diverse material (tangible) and immaterial (intangible) cultural heritage associated with historic centers, religious architecture, rural cultural landscapes, small-scale farming traditions, and religious festivals. This heritage may face potential risks from project activities, but it also offers opportunities for strengthening cultural values if the cultural dimension is integrated into planning processes (e.g., participatory assessments, social mapping, safeguards, and archaeological and cultural management measures).

It is important to note that cultural heritage policy in Colombia is organized around the category of Bien de Interés Cultural (BIC)—Cultural Heritage Asset—which includes individual buildings, urban ensembles, movable heritage, and archaeological assets. Projects that may affect BIC-designated assets are subject to specific protection obligations and regulatory procedures.

Regional planning instruments also highlight the need to protect “minor” material cultural heritage and rural cultural landscapes, which, although not always formally declared as BIC, are essential to local

In the broader Bogotá–Cundinamarca region, several “nodes” or territorial integration zones have been identified. These are places where strategic ecosystems (páramos, water-supply basins), agricultural uses, and distinct cultural dynamics (religious festivities, traditional farming, historical routes) converge.

Across the region’s rural municipalities, there are typically historic rural settlements, chapels, cemeteries, bridges, old mule tracks, and haciendas. These features compose agrarian and high-mountain cultural landscapes with cultural values linked to cold-climate farming, cattle ranching, and water-based livelihoods.

6.4.2 Intangible cultural heritage and local farming practices

In Bogotá and its surrounding region, intangible cultural heritage includes religious expressions (pilgrimages, patron saint festivals, Holy Week celebrations, local devotions), farmers’ markets, culinary knowledge, traditional rural crafts, regional festivities, customary practices, myths, and legends. Some of these hold national relevance, such as the legend of El Dorado, originating in the village of Guatavita near the lake of the same name, which shapes community relationships with the territory and water.

At the national level, the Representative List of Intangible Cultural Heritage (LRPCI) and associated safeguard policies provide guidance for identifying, documenting, and protecting local cultural expressions. These instruments may apply to rural practices in the municipalities mentioned, even when they have not yet been formally registered.

Traditional potato farming and extensive cattle ranching are closely linked to longstanding agro-pastoral knowledge, agricultural calendars, seed management, community work organization, barter practices, and local marketing, which form part of the region’s intangible heritage.

Also, in the project region includes the presence of the Mhuysqa Chuta Fa Aba – Los Hijos del Maíz Indigenous Reserve. Located in the municipality of Sesquilé, Cundinamarca, this community maintains spiritual and productive uses in a “broad territory” that overlaps project intervention landscapes in the veredas of Tilatá, Tierranegra, Ranchería, and El Hato. The reserve’s intangible cultural heritage is deeply rooted in a cosmovision that treats water as a sentient, living being that must be consulted through “pagos” and rituals. Their social fabric is governed by the Governor Cabildo and the Council of Poporeros,

with decision-making centered in the Qusmhuy (Ceremonial House of Water) according to a spiritual calendar marked by the "Four Fires" and the ZHA period of reflection.

Within the project's specific boundaries, the community has identified three critical sacred sites: Piedra de Sapo (a place for ordering thought), La Chorrera (a site for purification and ritual baths), and the Camino del Cajón – Observatorio (a path for spiritual learning). These sites are connected by active ritual paths, such as the ceremonial way to Piedra del Sapo and the route to La Chorrera, which coincide with planned restoration zones. Furthermore, their local farming practices revolve around the cultivation of native seeds, including diverse varieties of maize, quinoa, and arracacha—preserved in ceremonial gardens and community seed banks. These agricultural traditions are primarily led by women, who represent 54.7% of the population and act as the guardians of water, seeds, and medicinal plants.

7 Environmental and Social Risk/ Impacts

7.1 ESIA methodology

The approach for conducting ESIA's will be aligned with the guidance provided in Appendix II of the CI-GCF Agency's Environmental and Social Management Framework (ESMF).

When a proposed community grant or site-based restoration activity, as *Building a Water Resilient Landscape Project in the Bogotá Region*, is classified as Category B during the safeguards screening process, a limited Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP) are required to ensure environmental and social integrity and sustainability.

For a Category B (medium risk) project, a limited ESIA is required to identify and prioritize specific environmental and social impacts, using secondary and primary information (where possible), to ensure the project proposal's sustainability. This assessment is complemented by an ESMP, which defines the necessary measures to avoid, minimize, or mitigate the identified risks and establishes monitoring protocols, team responsibilities, and the budget required for solid implementation.

The ESMP clarifies that restrictions under Payment for Conservation and Conservation Agreements³ are not expected to be widespread. The project is based on voluntary participation and localized, plot-level agreements, which limit impacts to specific areas and willing participants.

Risk mitigation measures include voluntary agreements, benefit-sharing mechanisms, livelihood restoration, application of the Process Framework and GRM access. These measures ensure that the project does not generate large-scale economic displacement and remains within its current ESS risk categorization.

Limited-ESIA Process Overview

The ESIA process includes the following key elements:

- a) Initiates safeguard screening at the earliest stage of the project cycle and continues iteratively throughout planning and implementation.
- b) Considers all relevant biodiversity, habitat, and community data.
- c) Addresses direct, indirect, and cumulative impacts by analyzing ecological, social, and economic changes.
- d) Examines the interaction between environmental and social factors.

³ Conservation Agreement – This applies to landowners who will receive incentives under the PES (Payment for Environmental Services) scheme.

ESIA Stages

Impact Analysis

Risk rating is based on two elements: likelihood and expected impact (consequences). Likelihood represents the probability that a given risk event will occur. The likelihood should be established using the following five ratings: Very unlikely to occur (1), Not expected to occur (2), Likely – could occur (3), Known to occur - almost certain (4) and Common occurrence (5) Impact (or consequence) refers to the extent to which a risk event might negatively affect environmental or social receptors – see criteria distinguishing five levels of impacts in table below.

Table 20. Rating impact of a risk event

Severe (5)	Adverse impacts on people and/or environment of very high magnitude, including very large scale and/or spatial extent (large geographic area, large number of people, transboundary impacts), cumulative, long-term (permanent and irreversible); receptors are considered highly sensitive; examples are severe adverse impacts on areas with high biodiversity value; severe adverse impacts to lands, resources and territories of indigenous peoples; significant levels of displacement or resettlement with long-term consequences on peoples' livelihood; impacts give rise to severe and cumulative social conflicts with long-term consequences
Major (4)	Adverse impacts on people and/or environment of high magnitude, including large scale and/or spatial extent (large geographic area, large number of people, transboundary impacts), of certain duration but still reversible if sufficient effort is provided for mitigation; receptors are considered sensitive; examples are adverse impacts on areas with high biodiversity value; adverse impacts to lands, resources and territories of indigenous peoples; significant levels of displacement or resettlement with temporary consequences on peoples' livelihood; impacts give rise to social conflicts which are expected to be of limited duration.
Medium (3)	Adverse impacts of medium magnitude, limited in scale (small area and low number of people affected), limited in duration (temporary), impacts are relatively predictable and can be avoided, managed and/or mitigated with known solutions and straight forward measures.
Minor (2)	Adverse impacts of minor magnitude, very small scale (e.g. very small, affected area, very low number of people affected) and only short duration, may be easily avoided, managed, mitigated.
Negligible (1)	Negligible or no adverse impacts on communities, individuals, and/or on the environment

The significance of a risk is determined by combining its likelihood and the expected impact (consequence) of the risk event. The significance rating signals how much attention the risk event will require during project development and implementation, and the extent of control actions to be put in place.

Table 21. Rating significance of a risk event

		Likelihood of occurrence				
		Very unlikely to occur (1)	Not expected to occur (2)	Likely – could occur (3)	Known to occur - almost certain (4)	Common occurrence (5)
Impact	Severe (5)	Moderate	Substantial	High	High	High
	Major (4)	Low	Moderate	Substantial	Substantial	High
	Medium (3)	Low	Moderate	Moderate	Moderate	Substantial
	Minor (2)	Low	Low	Moderate	Moderate	Moderate
	Negligible (1)	Low	Low	Low	Low	Low

7.2 Predictive Assessment of risk/ Impacts

Identification of Potential risks and impacts on critical habitats and ecosystems

The habitat and ecosystem baseline indicates that the intervention landscapes intersect multiple ecosystem types, predominantly high-Andean (altoandino) systems and páramo environments. These ecosystems are classified as Critically Endangered (CR) or Endangered (EN) due to their restricted extent, high ecological sensitivity, and ongoing pressures. The analysis also reveals a high degree of landscape

fragmentation within and between these ecosystems. The primary drivers are urban expansion and the advancement of the agricultural frontier, which reduce habitat extent and connectivity, impair species dispersal, and increase edge effects.

Although fragmented, the remaining ecological corridors still provide essential structural connectivity that enables the persistence of certain species of populations. However, these corridors are narrow and discontinuous in places, which makes functional connectivity vulnerable to further land-use change, barrier effects (e.g., roads, fencing), and invasive species. Maintaining and, where possible, restoring corridor quality will be critical to sustain metapopulation dynamics, gene flow, and ecosystem services.

The identification of critical habitat indicates overlap between the intervention landscapes and several protected areas at national and district levels, including:

- Five Key Biodiversity Areas (KBAs), and
- Two Alliance for Zero Extinction (AZE) sites.

Given this overlap, updates to the Environmental Management Plans (EMPs) for both public and private protected areas within the project footprint should explicitly incorporate international criteria and safeguards in addition to applicable national and district regulations.

Within the intervention landscape, more than 20 endemic species have been identified based on Instituto Humboldt data. Applying international standards (IFC PS6 criteria; IUCN Red List and range data), nine species were confirmed as restricted-range and/or endemic. These taxa may trigger critical habitat status where they meet concentration thresholds, dependence, or irreplaceability criteria. Project planning should therefore:

- verify species presence, distribution, and seasonality through targeted field validation and expert consultation,
- assess population viability and habitat dependency, and
- incorporate avoidance and no-net-loss/ net-gain measures where critical habitat is triggered.

There is a persistent regional and national threat from invasive alien species, notably *Ulex europaeus* (gorse, retamo espinoso), *Genista monspessulana* (retamilla), and *Cornu aspersum* (brown garden snail). Active eradication/containment campaigns are ongoing. Project activities can inadvertently introduce or facilitate the spread of IAS through:

- movement of soil and aggregates contaminated with seeds or propagules,
- removal of natural barriers (e.g., hedgerows, riparian vegetation), and
- construction logistics (vehicles, equipment, packaging).

As part of the Environmental and Social Management Plan (ESMP), specific measures to prevent and control Invasive Alien Species (IAS) will be integrated.

Identification of disadvantaged / vulnerable groups and their differentiated risks

The project's intervention landscape is home to a diverse population with deep socioeconomic gaps that exacerbate their vulnerability to climate change. The following section identifies the groups facing disadvantaged conditions, as well as the differentiated risks associated with project activities and climate threats.

Rural communities and smallholder farmers. In the region's rural hubs (such as Guandoque, Villapinzón, and Tominé), vulnerability is intrinsically linked to a high dependence on natural resources and a small-scale land-ownership structure, with plots ranging from 1 to 5 hectares. This group, primarily engaged in potato farming and dairy production, faces the risk of economic displacement if the transition to sustainable production systems or conservation measures restricts access to subsistence lands without immediate compensation or income alternatives. Furthermore, multidimensional poverty in areas like San Juanito, where it reaches 60% of the population, limits their capacity to recover from extreme climate events, such as frosts or droughts, which directly affect their food security.

Rural Women (Gender Approach).

Women in high-mountain areas play a critical role in food security and water management; however, they face structural gender barriers that may limit their participation in project benefits. High levels of unpaid care work and multidimensional poverty—affecting approximately 4 out of 10 rural women—create significant constraints associated with time poverty. If participation mechanisms are not tailored to these conditions, there is a risk of exclusion.

Additionally, without deliberate measures, existing inequalities in access to productive resources and economic incentives may be reproduced, particularly where women's ownership and leadership in commercial activities are limited. In municipalities with high rates of domestic violence, such as San Juanito (216.6 cases per 100,000 inhabitants), changes in economic dynamics may also increase the risk of household tensions and backlash.

In response, the project adopts a household-level approach to promote inclusive participation and mitigate potential risks associated with shifts in traditional gender roles. This approach considers intra-household dynamics and actively seeks to engage both women and men, ensuring that women's involvement in project activities is safe, socially acceptable, and sustainable over time.

Within the project's area of influence, specific population groups require differentiated attention. In the municipality of Sesquile, Cundinamarca, the Mhuysqa Chuta Fa Aba – Los Hijos del Maíz Indigenous Reserve represents a community with significant cultural and territorial importance. Although its formally titled territory (207 hectares) does not directly overlap with the operational polygon, the community maintains traditional uses within a broader territory that intersects with project intervention areas, particularly in the hamlets of Tilatá, Tierranegra, Ranchería, and El Hato.

The reserve comprises 256 individuals across 88 families, with a demographic structure characterized by a high proportion of elders (83.5%), who play a central role as custodians of ancestral knowledge and territorial governance. Women represent 54.7% of the population and serve as key actors in water management, seed conservation, and traditional medicine, reinforcing their critical role in ecosystem stewardship and community resilience.

Other vulnerable groups within the project context include rural youth, the elderly, and migrant populations. Youth face risks of cultural disconnection and migration due to limited economic opportunities, potentially affecting long-term project sustainability. The elderly may experience increased vulnerability due to mobility limitations and barriers to accessing project information, particularly in emergency contexts. Additionally, the Venezuelan migrant population presents specific vulnerabilities related to legal insecurity and social exclusion, requiring targeted communication and inclusion measures to ensure equitable access to project benefits.

The project recognizes time poverty as a key constraint affecting women's participation. To address this, mitigation measures include decentralized technical assistance, reduced travel requirements, and adaptive scheduling of activities. These measures are designed to facilitate participation without increasing the unpaid workload of women.

Barriers related to land tenure and access to resources are addressed through gender-responsive design measures. The project does not aim to modify or guarantee land tenure rights; however, it ensures that access to project benefits is not restricted by formal land ownership. Mechanisms such as gender-

responsive Payments for Conservation eligibility criteria and Climate Adaptation Agreements (CAA) enable women to access resources and participate in project activities regardless of tenure status.

The project also acknowledges the risk of backlash associated with increased participation of women in economic and decision-making processes. To mitigate this, interventions incorporate gender-sensitive facilitation, household-level engagement strategies, and alignment with the Gender Action Plan, ensuring a “Do No Harm” approach.

While deficiencies in sanitation infrastructure and wastewater management disproportionately affect women as primary managers of domestic water, large-scale sanitation interventions fall outside the project’s scope. Instead, the project integrates complementary measures to reduce these impacts, including rainwater harvesting systems for productive and domestic use (e.g. home gardens), agroecological practices that improve water use efficiency, and decentralized water management approaches that reduce exposure to unsafe water sources and decrease time burdens.

Together, these measures ensure that the project addresses gender-related barriers in a context-appropriate and operationally feasible manner, promoting equitable access to resources, reducing participation constraints, and strengthening the role of women in climate resilience and water management.

Identification of Potential risks and impacts on cultural heritage

Forest restoration and habitat improvement activities may involve land-use restrictions, pasture relocation, changes to rural infrastructure, or modifications to productive landscapes. These actions could affect historic roads, chapels, cemeteries, or other material heritage elements located within intervention landscapes.

Interventions in watersheds, páramos, or high-Andean forests may overlap with symbolic and ritual spaces used by rural or indigenous communities (such as pilgrimage routes, crosses, and water springs of spiritual significance). If not recognized and integrated into project design, impacts on intangible cultural heritage could occur.

Efforts to modernize or improve potato and cattle production systems could affect traditional knowledge, territorial practices, and forms of social organization, particularly if new technologies or business models fully replace local practices without proper adaptation, dialogue, or community participation.

There is also a risk of rural gentrification or tourism-driven transformations, especially in areas of high scenic and cultural value (e.g., Guatavita, Guasca, and rural Bogotá). Environmental projects may increase the attractiveness of these areas for external investment, potentially displacing or altering local cultural dynamics.

Distribution of project risks/benefits among stakeholders

Benefits

The project seeks to generate comprehensive positive impacts focused on climate resilience and water security in the Bogotá Region and its municipalities.

- Water resilience and adaptation: improving the adaptive capacity of urban and rural communities to climate risks such as floods, flash floods, and landslides. This will be implemented through the integration of integrated water resources management.
- Protection of rural livelihoods: conservation of ecosystem services essential to maintaining the productivity of agriculture and livestock farming, on which rural populations depend for their livelihood.
- Restoration of strategic ecosystems: prioritizing the conservation and effective management of 38,883 hectares of high Andean ecosystems, strengthening the environmental governance of the territory.
- Social inclusion and gender equity: ensuring that historically excluded groups (women, youth, indigenous communities, older people, migrants, and victims of conflict) have access to opportunities through a design with differential and territorial approaches.
- Education and awareness: implementation of training processes in resilient farming techniques and understanding of the importance of the water cycle.
- Value and employment generation: boosting the local economy through the creation of direct employment in the project activities and transparency in access to information on citizen services.

Risks and challenges for stakeholders

Social and environmental risks are identified that must be managed to prevent adverse impacts.

- Adverse impacts from inadequate design: the risk that the local needs and interests of disadvantaged groups will not be fully integrated, resulting in unequal benefits or accidental harm.
- Opposition due to perceived incompatibility: possibility of rejection by actors with opposing interests or who perceive the project as a threat to their values, cultural practices, or current living conditions.
- Risks to ethnic autonomy: potential violation of the rights, lands, or cultural heritage of indigenous peoples if the free, prior, and informed consent (FPIC) procedure is not rigorously applied.
- Barriers to accessibility and participation: logistical obstacles (schedules that coincide with caregiving duties), physical obstacles (inadequate infrastructure for people with disabilities), or communicative obstacles (lack of interpreters or incomprehensible technical language).
- Governance conflicts: difficulties in coordination between national, regional, and local entities that may delay implementation or dilute responsibilities in citizen services.

Summary matrix of benefits and risks by actor

Table 22. Summary matrix of benefits and risks by actor

Actors Group	Expected Benefits	Identified Risks
Rural and Urban Communities	Water security and reduction of natural disaster risks (floods and landslides).	Adverse impacts due to the lack of local validation of technical interventions.

Rural Population (Farmers)	Strengthening climate-adapted production practices and watershed protection.	Restriction on the traditional use of land or their means of livelihood.
Women and Vulnerable Groups	Gender parity in decision-making and in care spaces.	Exclusion is due to inaccessible communication, incentives, and information, or schedules conflicting with women's caregiving duties.
Indigenous Peoples	Respect for ancestral practices and validation of traditional knowledge in design and implementation.	Coercion or lack of transparent information in FPIC processes.
Institutions and Government	Alignment with regulatory frameworks (Constitution, Law 134) and improvement of public management.	Lack of technical capacity, budgetary constraints, or overlapping functions for the long-term monitoring of safeguard compliance and project oversight.
Private Sector	Long-term financial sustainability through nature-based solutions (NbS).	Conflicts over water use or reputational risks if there is no productive synergy.

Risk / impact explanation

This section presents a predictive assessment of impacts in a descriptive narrative of the individual and collective activities of the proposed project. It draws from the project description, baseline environmental and social information and trends, as well as policy and the experience of similar models to predict the likely outcomes of the intervention measures proposed. For negative impacts, it is organized by CI's ESS. The positive impacts are also mentioned and highlighted for the whole project. Table below shows a summary of the impacts identified (further details are provided in the ESMP for each ESS standard triggered, its corresponding risks and proposed mitigation measures):

Table 23. Potential risks and impacts.

No.	Potential Impacts	Related activities	Explanation
ESS 2. Protection of Natural Habitats and Biodiversity Conservation			
1	Impacts of the EbA equipment in ecologically important areas	1.1.2 1.2.3	The installation of Ecosystem-based Adaptation (EbA) equipment ⁴ , such as rainwater harvesting systems and poultry production modules, can cause habitat fragmentation, displacement of native vegetation in ecologically important areas, or alteration of local water dynamics.
2	Introduction of invasive or non-native species that alter ecosystem balance.	1.1.2 1.2.1.1	Restoration and productive transformation activities in high-Andean forests and páramo areas risk introducing invasive alien species if strict biosecurity protocols are not implemented.
3	High plant mortality due to poor-quality inputs or unsuitable species.	1.1.2	Restoration success depends on the use of appropriate species; using plant material unsuitable for the site can lead to the failure of ecological function recovery actions.
4	Harm to wildlife due to the use of unsuitable materials.	1.1.2 1.2.1.2	The use of support infrastructure, such as barbed-wire fences, poses a physical risk to local fauna; therefore, connectivity criteria must be followed.
ESS 3. Resettlement and Physical and Economic Displacement			
5	Tensions due to water use regulations that ignore traditional rights.	2.1.1 1.1.1	Strengthening conservation zoning could restrict traditional access to natural resources, affecting the livelihoods of small-scale farmers under both formal and informal land tenure systems.
6	Land insecurity and economic displacement.	1.2.1 1.1.1	Although there is no physical resettlement planned, limitations on land or water use resulting from management decisions can lead to economic displacement requiring compensation or livelihood restoration measures.

⁴ The implementation of Adaptation-based Ecosystem (AbE) equipment and the promotion of sustainable production are proposed. This initiative involves deploying rainwater-harvesting systems to ensure access to resources during dry periods. Furthermore, poultry production modules and protected agriculture units (covered backyard gardens) will be established, integrating technologies for the comprehensive management of organic waste.

7	Legal insecurity regarding land tenure and boundaries.	1.2.1.1 1.2.3 2.1.2.	The lack of clear land titles or overlapping geographical boundaries in the intervention landscapes creates operational bottlenecks and risks of social conflict for restoration, conservation, livelihood support and incentives. Without prior tenure validation and boundary consensus, activities may be interrupted by legal disputes or claims over traditional land-use rights, significantly impacting the project implementation
ESS 4. Indigenous Peoples			
The project will apply a precautionary approach to identify any additional Indigenous Peoples during implementation and ensure that appropriate safeguards, including FPIC, are applied where relevant. Details on risks and mitigations are included in the IPP.			
8	Impact on ancestral territories and social structures of the Muisca community.	1.2.3.1 1.1.2	Project activities may affect ancestral territories and Indigenous governance systems, including impacts on traditional decision-making processes and culturally defined territorial use. There is also a risk of misalignment between project timelines and Indigenous cultural calendars, which may affect participation processes (further details provided in the IPP).
9	Interference with sacred sites and loss of traditional knowledge.	1.2.3.1 1.1.2	Project interventions may interfere with sacred sites, ritual routes and ceremonial practices, and may pose risks related to the inappropriate use of traditional knowledge without the consent of Indigenous authorities. Activities may also affect culturally significant natural elements that support spiritual and cultural practices (further details provided in the IPP).
ESS 5. Resource Efficiency and Pollution Prevention			
10	Pollution from the use of chemical pesticides.	1.1.2 1.2.1.2	Productive transformation activities may involve using chemical pesticides, necessitating a transition to Integrated Pest Management (IPM).
11	Pollution from inadequate management of EbA equipment waste.	1.2.1.1 1.2.1.3 1.2.3.1 1.2.3.3	The installation and operation of nature-based solutions (NbS) generate solid waste and surplus materials. If these are not managed through strict segregation, transport, and final-disposal protocols, there is a risk of contaminating soils and freshwater habitats, thereby compromising the integrity of the

			ecosystems the project aims to protect or restore.
12	Soil and water contamination from inadequate waste management.	1.2.3.3 1.2.1.2	The operation of AbE equipment generates waste and discharges that, if not managed through segregation, can contaminate freshwater habitats and soils.
13	Compromise of ecological flows due to excessive water extraction.	1.1.2 1.2.3.3 1.2.1.2	Irrigation or consumption needs for climate resilience could compromise ecological flows or affect downstream users if extraction risks are not mitigated.
ESS 6. Cultural Heritage			
14	Disturbance of intangible and tangible cultural heritage and incidental archaeological findings.	1.2.3.1 1.1.2	Due to the high density of cultural values in the intervention landscape, physical works, such as installing EbA equipment or performing restoration activities, may affect ancestral paths or lead to incidental archaeological discoveries that require a Chance Find Procedure. Through consultation processes with Indigenous authorities, three sacred sites and two ancestral paths have been identified within the area of direct influence. The project will establish exclusion zones and physical protection measures to prevent disturbances
ESS 7. Labor and Working Conditions			
15	Occupational accidents and biological risks in the field.	1.1.2	High-mountain restoration personnel face significant physical risks, including extreme weather, biological hazards, and tool-related accidents, making the use of personal protective equipment (PPE) indispensable.
16	Health and safety risks due to improper use of PPE	1.1.2 1.2.3	Subcontracted personnel performing restoration and water equipment activities in high-mountain areas (páramos and Andean forests) may face injuries, occupational accidents, or biological and climate-related hazards if Personal Protective Equipment (PPE) is not used correctly. Non-compliance with occupational health and safety protocols by third parties not only compromises workers' physical integrity but also creates legal contingencies and non-compliance risks related to the project's safeguard standards.

17	Inappropriate behavior by field personnel.	1.2.3 2.1.1	A lack of integrity and ethics in contracted personnel can negatively affect community relations and the dignified labor environment.
ESS 8. Community Health, Safety and Security			
18	Gender-Based Violence and Harassment (GBV AND SEAH (SEXUAL EXPLOITATION AND HARASSMENT)) by contractor personnel.	1.2.3.1	The mobilization and entry of non-local workers (legitimate employees of contractors and subcontractors) for installation works or restoration in rural areas increases the risk of harassment, exploitation, and sexual abuse incidents toward the local community, exacerbated by power asymmetries and the isolation of work areas.
19	Fraud and security risks due to the impersonation of project personnel.	Output 1.1 Output 1.2	Given the regional public order context, external actors or criminal groups may impersonate project employees, subcontractors, or promoters to gain access to private properties, obtain sensitive information from the community, or commit acts of theft, extortion, or harassment, affecting the physical safety of beneficiaries and the reputation of the implementing institutions.
20	Occupational health and safety risks due to new tools and lack of PPE	Output 1.1 Output 1.2	The introduction of new tools and technical equipment for active restoration, silvopastoral systems, and the modernization of community water systems increases the likelihood of physical accidents or health impacts for producers and local beneficiaries. This risk is heightened by a potential lack of specialized technical training in tool handling and the absence or incorrect use of Personal Protective Equipment (PPE) during the execution of field activities.
21	Public order risks and threats from criminal groups.	All field activities	The regional context may expose personnel and the community to criminal dynamics, necessitating strengthened travel protocols (for personnel and communities) and coordination with local authorities in accordance with the "do no harm" principle.
ESS 9. Private Sector Direct Investment and Financial Intermediaries			
22	Risk of perverse incentives and	1.1.1.2 1.2.1	The disbursement of financial incentives to producers carries the risk that resources may be used inappropriately or generate

	environmental impact leakage.		counterproductive effects. For instance, a beneficiary might conserve the area restored under the project while expanding the agricultural frontier in other parts of the farm or adjacent areas (leakage).
23	Misalignment in Safeguard Implementation Commitment by Third Parties.	2.1.2	There is a risk that sub-grantees may not share the same level of institutional commitment or technical capacity as CI regarding the implementation of environmental and social safeguards. This operational inconsistency could lead to a lax application of field protocols, creating gaps in the protection of human rights or biodiversity and compromising the project's compliance with required environmental and social standards.
ESS 10. Climate Risk and Related Disasters			
24	Maladaptation of EbA equipment.	1.2.1 1.2.3	If the design of equipment for Nature-based Solutions (NbS) does not account for future environmental factors and climate variability, there is a risk of functional failure when faced with climate hazards. This would result in maladaptation, increasing long-term vulnerability rather than reducing it, and potentially compromising the project's intended Volumetric Water Benefits (VWBs)
25	Ineffectiveness of restoration and livelihood measures due to climate change.	Output 1.1 Output 1.2	Ecological restoration interventions and livelihood transformation activities risk becoming ineffective if they are not designed with a climate adaptation and resilience approach. The occurrence of extreme weather events or shifts in precipitation and temperature regimes may exceed the tolerance thresholds of the selected species or implemented production systems, leading to a loss of investment and a failure to generate the projected Volumetric Water Benefits (VWBs).

7.3 Assessment of impact and significance

The following section presents the assessment of the significance of the risks and impacts identified in the previous chapter. Each impact has been evaluated using a structured significance methodology that considers impacts and the likelihood of occurrence.

The results indicate that one impact has been classified as Substantial, and the remaining impacts as Moderate (17) or Low significance (7), depending on their characteristics and the vulnerability of the affected environmental and social components.

The assessment table also identifies the corresponding management plans and instruments that will be applied to prevent, mitigate, reduce, or compensate the identified risks and impacts, ensuring alignment with Conservation International's Environmental and Social Safeguards (ESS) and international best practice. Further details on each ESS standard associated risks and mitigation measures are provided in the ESMP under each standard specific section, and for the ones related to ESS 4 on Indigenous Peoples, further information is provided on the IPP.

Table 24. Assessment of risks and impacts significance.

No.	Potential Impacts	Impact	Likelihood of occurrence	Risk	Plan / Instrument
1	Impacts of the EbA equipment in ecologically important areas	Medium (3)	Not expected to occur (2)	Moderate	ESMP- Biodiversity Component
2	Introduction of invasive or non-native species	Medium (3)	Very unlikely to occur (1)	Low	ESMP- Biodiversity Component
3	High plant mortality due to poor-quality inputs or unsuitable species	Medium (3)	Not expected to occur (2)	Moderate	ESMP- Biodiversity Component
4	Harm to wildlife due to the use of unsuitable materials	Minor (2)	Not expected to occur (2)	Low	ESMP- Biodiversity Component
5	Tensions due to water use regulations that ignore traditional rights	Major (4)	Not expected to occur (2)	Moderate	Process framework
6	Land insecurity and economic displacement	Major (4)	Not expected to occur (2)	Moderate	Process framework

7	Legal insecurity regarding land tenure and boundaries	Medium (3)	Not expected to occur (2)	Moderate	Process framework
8	Impact on ancestral territories and social structures of the Muisca community	Major (4)	Not expected to occur (2)	Moderate	Indigenous Peoples Plan (IPP)
9	Interference with sacred sites and loss of traditional knowledge	Major (4)	Not expected to occur (2)	Moderate	Cultural Heritage Management Plan (CHMP)
10	Pollution from the use of chemical pesticides	Medium (3)	Very unlikely to occur (1)	Low	ESMP (Pollution Prevention)
11	Pollution from the inadequate management of EbA equipment waste	Medium (3)	Not expected to occur (2)	Moderate	ESMP (Pollution Prevention)
12	Soil and water contamination from inadequate waste management	Medium (3)	Not expected to occur (2)	Moderate	ESMP (Pollution Prevention)
13	Compromise of ecological flows due to excessive water extraction	Medium (3)	Very unlikely to occur (1)	Low	ESMP (Pollution Prevention)
14	Disturbance of tangible cultural heritage and incidental archaeological findings	Medium (3)	Very unlikely to occur (1)	Low	Indigenous Peoples Plan (IPP)
15	Occupational accidents and biological risks in the field	Medium (3)	Likely – could occur (3)	Moderate	ESMP(Labor and working conditions Component)
16	Health and safety risks due to improper use of PPE	Medium (3)	Not expected to occur (2)	Moderate	ESMP(Labor and working conditions Component)
17	Inappropriate behavior by field personnel	Major (4)	Very unlikely to occur (1)	Low	ESMP(Labor and working conditions Component)

					conditions Component)
18	Gender-Based Violence and Harassment (GBV AND SEAH (SEXUAL EXPLOITATION AND HARASSMENT)) by contractor personnel	Severe (5)	Very unlikely to occur (1)	Moderate	GMP
19	Fraud and security risks due to impersonation of project personnel	Major (4)	Not expected to occur (2)	Moderate	ESMP (Safety Component)
20	Public order risks and threats from criminal groups	Major (4)	Likely – could occur (3)	Substantial	ESMP (Security and Safety Component)
21	Occupational health and safety risks due to new tools and lack of PPE	Medium (3)	Not expected to occur (2)	Moderate	ESMP (Security and Safety Component)
22	Risk of perverse incentives and environmental impact leakage	Medium (3)	Not expected to occur (2)	Moderate	ESMS - Environmental and Social Management System
23	Misalignment in Safeguard Implementation Commitment by Third Parties	Medium (3)	Not expected to occur (2)	Moderate	ESMS - Environmental and Social Management System
24	Maladaptation of EbA equipment	Major (4)	Not expected to occur (2)	Moderate	ESMP (Climate Risk)
25	Ineffectiveness of restoration and livelihood measures due to climate change	Major (4)	Very unlikely to occur (1)	Low	ESMP (Climate Risk)

8 Environmental and Social Management Plan (ESMP)

This section presents the set of plans, programs, and management instruments designed to address, in an integrated manner, the environmental and social risks and impacts identified in the assessment.

All measures have been developed following the mitigation hierarchy—avoidance, minimization, restoration, and, where necessary, compensation—and in accordance with international best practices and Conservation International's Environmental and Social Safeguards (ESS) requirements.

8.1 Environmental and Social Management Plan (ESMP) – Biodiversity Component (ESS2: Protection of Natural Habitats and Biodiversity Conservation)

This plan adopts the precautionary approach and the mitigation hierarchy (avoid, minimize, restore and compensate) to ensure that there is no net loss of biodiversity, ideally seeking a net gain in critical moorland habitats.

Purpose and Scope

- Objective: To protect and conserve biodiversity and ecosystem services, maintaining functional connectivity in high Andean and páramo ecosystems.
- Scope: Applies to all areas of direct intervention, areas of influence and associated facilities (roads, camps, depots).
- Critical Habitats: The moorland is recognized as a critical habitat; any intervention requires demonstrating that there are no viable alternatives and that a net gain in biodiversity values will be generated.

Biodiversity No Net Loss and Net Gain

The project adopts a precautionary approach and the mitigation hierarchy to avoid, minimize and restore potential impacts on biodiversity, particularly in high Andean forests, páramos, wetlands, riparian systems and ecological corridors. To ensure that this commitment is verifiable, the project will implement an audit-ready biodiversity demonstration approach based on documented baseline conditions, georeferenced intervention landscapes, clearly defined biodiversity indicators, monitoring records and adaptive management measures.

The demonstration of biodiversity performance will begin with the establishment of ecological baseline conditions for intervention landscapes. Baseline diagnostics will characterize the ecological condition of each area prior to implementation, including vegetation structure, natural regeneration, species composition, presence of invasive or undesirable species, and the degree of ecological degradation or recovery. The methodology will use vegetation indicators such as the natural regeneration index and the importance value or physiognomic dominance index, which allow the project to understand the successional condition of each site and determine whether the most appropriate intervention is active restoration, assisted natural regeneration, enrichment or exclusion from intervention. This approach is consistent with the methodology discussed for comparable high-mountain restoration areas, where

ecological diagnostics are used to evaluate the real condition of the site and the degree of presence of invasive or colonizing species before defining the restoration strategy.

The project will also use ecosystem and cover-type representativeness to support technical decisions. The baseline approach discussed by the restoration team considers different ecosystem ranges and land-cover combinations, including páramo, sub-páramo, high Andean Forest and Andean Forest, together with cover types such as forest, high secondary vegetation, low secondary vegetation and pasture. This allows the project to compare intervention sites with ecologically relevant reference conditions and to define restoration strategies that are appropriate to the site's ecological trajectory.

To make the biodiversity demonstration audit-ready, each intervention landscape will be documented through a traceable record that links the original baseline condition, the restoration or EbA measure selected, the rationale for the intervention, the expected biodiversity outcome, and the monitoring evidence collected during implementation. This record will include georeferenced boundaries, baseline characterization, photographs where relevant, restoration approach, species selected, invasive species management actions, maintenance activities and monitoring results.

The project will define biodiversity performance indicators that are proportionate to the type of intervention and ecological objective of each site. For restoration areas, indicators may include native vegetation survival, natural regeneration, invasive species recurrence, vegetation structure recovery, and evidence of functional recovery. For areas under assisted natural regeneration, indicators may focus on native recruitment, reduction of invasive or undesirable cover, and recovery of ecological succession. Where feasible, additional ecological indicators such as soil variables, infiltration and pollinator presence may be incorporated to support a more robust assessment of ecological functionality, as these variables were identified in the technical discussions as useful components of the baseline and monitoring approach.

The project will use the SMART platform, where feasible, as a monitoring and documentation tool to consolidate planning records, field forms, cartography, intervention history, species information, implementation activities, maintenance information and monitoring results. The restoration team identified SMART as a platform already used in Colombia for monitoring, verification and reporting, capable of storing the history of each farm or site, including socialization visits, forms, mapping, planning, validation, area adjustments, species information, implementation, maintenance and monitoring records. This traceability is central to demonstrating that biodiversity outcomes are not only estimated at design stage but monitored and documented throughout implementation.

The project will apply mitigation hierarchy throughout this process. Activities that may affect critical biodiversity values, ecological corridors, natural habitats or sensitive ecosystems will first be avoided through site-specific exclusion criteria. Where minor impacts cannot be fully avoided, designs will be adjusted to minimize disturbance, reduce vegetation clearance, maintain connectivity and avoid hydrological alteration. Where disturbance occurs, restoration or regeneration measures will be implemented to recover ecological function. Compensation will only be considered where residual impacts remain after avoidance, minimization and restoration measures have been applied, and only if compatible with applicable safeguards requirements.

For critical or highly sensitive habitats, the project will not claim net gain solely on the basis of area treated or number of hectares restored. Instead, net gain will be demonstrated through a combination of baseline-to-monitoring comparison, evidence of improved native vegetation structure, control or reduction of invasive species pressure, recovery of ecological processes, and maintenance or improvement of connectivity. This means that biodiversity gain will be treated as a documented ecological outcome rather than as a simple implementation output.

Plant material selection will also form part of the audit trail. Restoration activities will prioritize native species selected according to ecological suitability, altitudinal range, soil conditions, functional traits and restoration objectives. Technical discussions highlighted that species selection should be supported by available information on native species, nursery availability and functional criteria, and that in restoration areas the use of native species is the basis for reducing the risk of introducing inappropriate or invasive material. Where plant material is procured, the project will prioritize qualified forest nurseries, including ICA-certified nurseries where applicable, to support quality control and reduce biosecurity risks.

The demonstration process will be supported by monitoring and adaptive management. Monitoring results will be reviewed periodically to verify whether restoration trajectories are consistent with expected outcomes. If monitoring identifies high mortality, invasive species re-establishment, insufficient natural regeneration, hydrological stress, or other signs that biodiversity outcomes are not being achieved, corrective actions will be triggered. These may include additional maintenance, enrichment planting, invasive species control, adjustment of species mixes, redesign of restoration nuclei, reinforcement of protection measures, or exclusion of unsuitable areas from further intervention.

Responsibilities will be assigned across the project implementation team. The Ecological Restoration Lead will define the ecological methodology, restoration strategy and biodiversity indicators. Restoration Leads and field teams will verify site conditions, implement restoration measures and collect field information. The Safeguards Specialist will verify compliance with exclusion criteria, mitigation hierarchy and ESS6 requirements. Extensionists will support field-level monitoring and evidence collection. The M&E Coordinator will consolidate monitoring information, including SMART records where feasible, and include biodiversity performance results in periodic reports. The Safeguards Manager will review compliance and trigger corrective actions where monitoring shows that biodiversity risks are not being adequately managed.

This approach provides an audit-ready demonstration framework because it links baseline data, intervention design, implementation records, monitoring evidence, corrective actions and reporting into a single traceable process. It allows the project to demonstrate not only that it has adopted a precautionary approach, but also that biodiversity loss is being systematically avoided and that any claimed net gain in critical or sensitive habitats is supported by documented ecological evidence.

The project does not aim to alter or guarantee land tenure rights. Instead, it addresses structural barriers by ensuring that access to project benefits is not restricted by formal land ownership. Mechanisms such as Climate Adaptation Agreements and gender-responsive eligibility criteria are designed to facilitate inclusive participation and equitable access to resources, without intervening in legal land tenure arrangements.

Environmental Considerations for EbA Infrastructure

The installation of Ecosystem-based Adaptation (EbA) equipment, including rainwater harvesting systems, poultry production modules and other livelihood-support infrastructure, may generate localized environmental impacts if not properly sited, designed, installed and managed. Potential impacts include limited vegetation clearing, localized habitat disturbance, minor fragmentation effects in sensitive areas, waste generation, soil or water contamination, and changes to local drainage or water-flow patterns. Although these impacts are expected to be site-specific and limited in scale, they are relevant given the ecological sensitivity of the project landscapes, particularly in areas associated with páramos, high Andean forests, wetlands, riparian systems, water recharge areas and ecological corridors.

To address these risks, the project will apply activity-specific mitigation measures for EbA infrastructure as part of the ESMS screening and ESMP implementation process. These measures will complement the broader biodiversity safeguards framework by translating the mitigation hierarchy into operational controls for the main types of EbA interventions supported under the project. All EbA-related infrastructure will therefore be subject to prior environmental screening, site-selection criteria, technical supervision and monitoring before and during installation.

Sitting criteria will be applied to ensure that EbA equipment is located only in areas that are already transformed, previously intervened, under compatible productive use or otherwise suitable for community-level infrastructure. Installations will not be placed in natural ecosystems, ecological corridors, wetlands, riparian buffers, water source protection areas, legally restricted conservation zones or other high-priority habitats identified through biodiversity screening and the site-specific exclusion criteria defined in the ESMP. Where a proposed site presents potential sensitivity, the intervention will be relocated, redesigned or rejected before implementation.

For rainwater harvesting systems, the project will apply specific design and installation controls to avoid alteration of local hydrological regimes. These systems will preferably be associated with existing roofs, productive areas, household or community infrastructure, or previously intervened surfaces, thereby reducing the need for additional land disturbance. Storage structures, conveyance elements and discharge points will be designed and located to avoid erosion, waterlogging, uncontrolled runoff, slope instability or changes to drainage pathways that could affect downslope habitats, wetlands, riparian systems or water-dependent ecosystems. The systems will be designed to improve water availability for productive and livelihood purposes without modifying ecological flows or natural hydrological functions.

For poultry production modules, the project will apply specific sitting and environmental management requirements to prevent habitat fragmentation, vegetation loss and pollution risks. Poultry modules will only be in areas compatible with productive use and outside sensitive habitats or connectivity zones. Their design and operation will incorporate good environmental management practices for organic waste, manure handling, drainage control, hygiene, odour prevention and pollution control. Modules will not be installed in locations where adequate waste management, runoff control, maintenance capacity or basic sanitary conditions cannot be ensured. These requirements are intended to prevent contamination of soil, water bodies and nearby habitats, while ensuring that livelihood-support activities remain compatible with biodiversity conservation objectives.

Site preparation for all EbA infrastructure will be implemented progressively and with the minimum disturbance necessary. Large-scale clearing, full parcel exposure or unnecessary removal of native vegetation will be avoided. Where minor vegetation clearance is unavoidable, it will be limited to the smallest feasible area and, where appropriate, combined with restoration, revegetation or natural regeneration measures consistent with the project's ecological restoration approach. The use of invasive species, inappropriate biological materials, hazardous materials or infrastructure designs that could exacerbate environmental degradation will be prohibited.

The project will also ensure that EbA infrastructure maintains functional connectivity and does not create unnecessary barriers to wildlife movement. Where fencing, protection structures or enclosures are required, these will be designed to avoid harm to fauna and to maintain permeability at plot level. Materials

and installation methods will be selected to reduce collision, entrapment or obstruction risks for local wildlife, particularly in areas close to restoration zones, riparian systems or ecological corridors.

Implementation responsibilities will be clearly assigned. The ecological restoration and technical teams will be responsible for validating site suitability and ensuring that EbA infrastructure is consistent with biodiversity and restoration objectives. The safeguards team will verify compliance with exclusion criteria, activity-specific mitigation measures and ESMP requirements. Extensionists and field teams will support daily or periodic field verification, including visual inspection of installations, confirmation of drainage and waste-control measures, and reporting of non-compliance or unforeseen impacts. The M&E team will consolidate monitoring results and ensure that findings are reflected in project reporting.

Monitoring will verify that EbA installations comply with siting criteria, avoid sensitive habitats, minimize vegetation removal, maintain natural drainage conditions and apply appropriate waste and pollution prevention measures. Any non-compliance or unforeseen environmental impact identified during implementation will trigger corrective actions, which may include relocation, redesign, repair, restoration of disturbed areas, reinforcement of waste-management measures or suspension of the activity where necessary.

This activity-specific approach ensures that mitigation measures for EbA infrastructure are not only embedded in the general ESMP framework but are explicitly operationalized for each type of intervention. It strengthens the alignment of Activity 1.2 with CI-GEF/GCF ESMF requirements by ensuring that rainwater harvesting systems, poultry modules and related infrastructure contribute to livelihood resilience without compromising biodiversity values, ecological connectivity, natural hydrological processes or ecosystem functionality.

Invasive Species Risk Management

The project recognizes that invasive and other undesirable species represent a material risk for ecological restoration, natural regeneration and EbA-related interventions in high Andean and páramo landscapes. Invasive species may outcompete native vegetation, modify successional pathways, increase edge effects, alter habitat structure and reduce the effectiveness of restoration measures. Therefore, the project will move beyond species identification and will apply a structured mitigation approach based on prevention, site screening, exclusion or redesign, active control, maintenance and monitoring.

The management of invasive species will be informed by ecological baseline diagnostics and field-level verification. Prior to restoration or EbA interventions, the project will assess the condition of each intervention landscape using ecological information such as vegetation structure, natural regeneration, species composition, degree of colonization and presence or absence of invasive or undesirable species. This information will be used to determine whether the site is suitable for active restoration, assisted natural regeneration, enrichment planting, or whether the site should be excluded or redesigned due to the level of invasion risk.

Areas with extensive or high-density presence of highly problematic invasive species, particularly species such as *Ulex europaeus* and *Genista monspessulana*, will not be prioritized for restoration unless a technically feasible and adequately resourced control protocol is available. This is particularly relevant where the expected cost, time and maintenance requirements for invasive species management could

compromise restoration success. In such cases, the project will either exclude the area from direct intervention, redesign the intervention, or apply a dedicated invasive species management protocol before restoration activities proceed.

For eligible restoration areas, invasive and undesirable species will be identified during site preparation and removed or controlled before planting or regeneration support activities are implemented. In active restoration areas, control measures will be incorporated as part of land preparation, ensuring that invasive species are not simply cleared once, but are subject to follow-up maintenance to address re-sprouting, vegetative reproduction or seedbank persistence. In natural regeneration areas, control will focus on removing or reducing invasive or undesirable cover where it prevents native species recruitment or limits ecological succession.

Site preparation will be carried out progressively and in controlled sections rather than through full and immediate parcel opening. This approach will reduce exposure of bare soil, minimize erosion risks and reduce the likelihood of rapid reinvasion by species with high dispersal capacity, vegetative reproduction or persistent propagules. Where invasive species are removed, the project will seek to promote rapid native vegetation recovery through enrichment, assisted regeneration or natural revegetation, depending on the site condition and restoration strategy.

Prevention will also be central to the project's approach. Restoration activities will prioritize native species selected according to ecological suitability, altitudinal range, soil conditions, functional traits and restoration objectives. Plant material for restoration will be sourced from forest nurseries with appropriate certification or quality controls, including ICA-certified nurseries where applicable, and will be screened to avoid the introduction of invasive, non-native or inappropriate species. In restoration interventions, the project will use native species; non-native species associated with productive transformation activities, if any, will be managed separately and will not be introduced into restoration areas.

The project will also apply biosecurity and operational controls to prevent the accidental spread of invasive species during field activities. These controls will include avoiding the transfer of soil, plant residues or propagules from invaded areas to restoration sites, cleaning tools and equipment where relevant, managing plant waste from invasive species appropriately, and avoiding the use of materials that may contain viable seeds, roots or fragments of invasive species. Any removed invasive biomass will be handled in a way that prevents re-establishment or dispersion to adjacent areas.

The project's invasive species management approach will be aligned with Colombian public guidance, including the National Plan for the Prevention, Control and Management of Introduced, Transplanted and Invasive Species, as well as applicable national guidance for the control and ecological restoration of areas affected by *Ulex europaeus* and *Genista monspessulana*. These references will guide the project's approach where relevant, particularly for species that require specialized management protocols.

Monitoring will be conducted throughout implementation to verify the effectiveness of control measures and detect re-sprouting, recolonization or new invasion fronts. The project will record baseline conditions, site preparation actions, species used, invasive species control activities, maintenance cycles and field monitoring results in the project monitoring system. Where feasible, the project will use the SMART platform to consolidate spatial information, field forms, cartography, planning records, implementation

data, maintenance and monitoring information, allowing traceability of decisions and adaptive management over time.

Responsibilities for invasive species management will be assigned across the project team. The Ecological Restoration Lead will define the technical restoration approach, species selection and invasive species management strategy. Restoration Leads and field teams will verify site conditions, implement control measures and monitor re-sprouting or recolonization. Extensionists will support field inspections, community-level reporting and documentation of control activities. The Safeguards Specialist will verify compliance with ESMP requirements and ensure that exclusion criteria, biosecurity measures and corrective actions are applied. The M&E Coordinator will consolidate monitoring information, including invasive species control results, into periodic project reporting.

If monitoring identifies that invasive species are re-establishing or spreading because of project activities, corrective actions will be triggered. These may include additional maintenance cycles, redesign of the restoration approach, reinforcement of native vegetation recovery, modification of site preparation practices, or suspension of activities in areas where the risk cannot be adequately managed. This adaptive management approach will ensure that restoration and EbA interventions do not contribute to the spread of invasive species and remain aligned with the project's biodiversity conservation and ecosystem resilience objectives.

Identified risks

Sub-category	Identified Risk	Risk Level	Mitigation Measure
Restoration	Habitat fragmentation: Installation of EbA equipment in protected or ecologically important areas.	Low	Avoidance and microlocation: Definition of exclusion zones for wetlands and use of pre-existing routes.
Restoration	Physical damage to wildlife: Use of unsuitable materials (barbed wire) in restoration fencing.	Low	Functional connectivity: Design of permeable fences and escape ramps in ditches every 25m.
Restoration	High plant mortality: Use of unsuitable species or poor-quality plant material.	Moderate	Plant material quality: Selection of local native species and use of mycorrhizae.
Restoration	Invasive species: Accidental introduction during active restoration.	Low	Biosecurity protocols: Strict phytosanitary controls and use of the prohibited species list.
Restoration	Invasive species: Presence and proliferation of existing invasive species	Low-moderate	Site screening, exclusion of highly invaded areas, and structured removal, containment and maintenance measures, with continuous monitoring

			and adaptive management aligned with national guidelines.
Restoration	Waste pollution: Inadequate management of debris during active restoration sessions.	Moderate	Segregated Management: Mandatory protocols for storage, transport, and final disposal.
EbA Infrastructure	Localized habitat disturbance, vegetation loss or habitat fragmentation from the installation of rainwater harvesting systems, poultry modules or other livelihood-support infrastructure in ecologically sensitive areas.	Moderate	All EbA infrastructure will be subject to prior environmental screening, site-specific exclusion criteria and technical validation. Installations will be located only in already transformed, previously intervened or compatible productive areas, avoiding natural ecosystems, wetlands, riparian buffers, ecological corridors, water source protection areas and high-priority habitats. Designs will minimize land disturbance, avoid unnecessary vegetation removal and maintain ecological connectivity.
EbA Infrastructure / Hydrology	Alteration of local water flows, drainage patterns, runoff dynamics or ecological flows due to poorly located or poorly designed rainwater harvesting systems.	Moderate	Rainwater harvesting systems will be designed and installed to avoid erosion, waterlogging, uncontrolled discharge, slope instability or changes to natural drainage pathways. Design will prioritise existing roofs, productive areas or previously intervened surfaces, and will not interfere with ecological flows or water-dependent ecosystems.
EbA Infrastructure / Pollution Prevention	Soil or water contamination from inadequate management of poultry modules, including manure, organic waste, runoff or hygiene conditions.	Moderate	Poultry modules will incorporate environmental management practices for organic waste, manure handling, drainage control, hygiene and pollution prevention. Modules will only be installed where adequate operation, maintenance and waste-management capacity can be ensured. Corrective measures will be applied if pollution risks are identified during monitoring.
Livelihoods	Alteration of ecological flows: Excessive water extraction for irrigation or production systems.	Low	Flow Management: Installation of meters and systems that respect the defined ecological flow.
Livelihoods	Habitat fragmentation: Installation of production modules or tanks in sensitive farm areas.	Low	Farm-adapted Design: Adjustment of microlocation to avoid displacing native vegetation at the plot level.

Livelihoods	Physical damage to wildlife: Use of hazardous materials in silvopastoral or potato fencing.	Low	Safe Materials: Exclusive use of smooth wire or mesh that poses no risk to local fauna.
Critical habitats screening	Impacts of EbA equipment in ecologically important areas, including habitat fragmentation, vegetation loss, and alteration of water dynamics	High	Apply site screening and exclusion criteria; avoid interventions in critical habitats; redesign activities to prevent habitat fragmentation

Indicators

Indicator	Justification	Target
ESS021: Number of hectares of natural and/or critical natural habitats negatively impacted by the project.	This indicator tracks the plan's core objective to avoid habitat loss or degradation during EbA equipment installation and restoration activities.	0 hectares
Percentage of EbA infrastructure installations screened against site-specific exclusion criteria and activity-level mitigation requirements prior to installation.	Ensures that rainwater harvesting systems, poultry modules and related infrastructure are reviewed before implementation to avoid sensitive habitats, ecological corridors, vegetation loss and hydrological impacts.	100% of EbA infrastructure installations screened before implementation.
Percentage of installed EbA infrastructure verified during implementation for compliance with siting, drainage, vegetation clearance and waste-management requirements.	Confirms that mitigation measures are applied not only during design and screening, but also during field installation and operation.	100% of installed EbA infrastructure subject to field verification.

Functions and responsibilities

Position	ESMP responsibility
Safeguards Manager	General oversight of safeguard compliance, validation of risk reports, and coordination of the response to non-compliance.
Safeguards Specialist	Technical application of the project's evaluation instrument on a monthly and quarterly basis for contractors and grantees.
Grants and Contracts Manager	Ensuring the inclusion of mandatory safeguard clauses in 100% of execution agreements and contracts.

Ecological Restoration Lead	Guaranteeing the technical quality of plant material, compliance with biosecurity protocols, and the design of functional connectivity (permeable fences).
Restoration Leads	Coordinating field implementation, defining exclusion zones through microlocation, and monitoring native species survival rates.
Social Coordinator / Social Leads	Supervising livelihood projects to ensure they do not fragment habitats and that they comply with all socio-environmental commitments.
Extensionists	Conducting daily/weekly visual inspections, verifying GPS use in intervention zones, managing waste, and collecting field data.
Hydrological Modeling Coordinator	Weekly monitoring and recording of ecological flows to ensure water extraction does not impact moorland (páramo) ecosystems.
Security Specialist	Training personnel in occupational health and safety (OHS) and verifying the strict daily use of Personal Protective Equipment (PPE).
M&E Coordinator	Consolidating performance indicators (survival rates, biosecurity compliance) and generating quarterly compliance reports.
Project Leader / Component Directors	Providing necessary resources for mitigation, managing moderate-level risks, and ensuring strategic alignment with the agency's safeguard framework.

8.2 Environmental and Social Management Plan (ESMP) – Climate Component (ESS10: Climate Risk and related disasters)

This component establishes the necessary measures to identify, prevent, and mitigate risks derived from climate variability and natural disasters associated with the project. Its scope encompasses the protection of Ecosystem-based Adaptation (EbA) equipment, the success of ecological restoration activities, and the guarantee of resilience for affected communities' sustainable livelihoods, integrating security and sustainability criteria.

Objective

To establish an operational and participatory framework that ensures the climate-proofing of physical interventions, restoration efforts, and livelihood support, while avoiding maladaptation processes that could increase the long-term vulnerability of populations or ecosystems.

Guiding Principles

- **Precautionary Principle:** When project activities pose a threat to people or the environment, precautionary measures must be taken even if some cause-and-effect relationships are not fully established scientifically.
- **Climate Proofing:** The integration of climate risk analysis (historical data and future scenarios) into engineering design to ensure that infrastructure resists extreme hydrometeorological events.
- **No Maladaptation:** Guaranteeing that proposed adaptation measures, ecological restoration activities, and sustainable livelihood support do not lead to an increase in the vulnerability of ecosystems or populations in the future.

Strategic Measures

1. **Resilient design (Proofing):** Implementing technical analyses that incorporate historical climate data and future scenarios into the design of EbA.
2. **Climate-Smart Interventions:** Selecting native species and agricultural practices with high tolerance to projected climate variability to ensure the success of restoration and livelihood modules.
3. **Adaptive budgetary planning:** Integrating climate risk variables into annual budgets to cover additional costs for delays, post-event repairs, or replanting.
4. **GHG Emission Management:** Evaluating and reducing direct and indirect greenhouse gas (GHG) emissions associated with project operations.

Risk and mitigation matrix: Climate Component

Sub-category	Identified Risk	Risk Level	Mitigation Measure
Infrastructure / EbA	Vulnerability of EbA equipment: Damage to rainwater-harvesting or productive modules caused by extreme events.	Moderate	Climate Proofing: Integration of historical climate data and future scenarios into engineering designs to ensure structural resistance.
Disaster Risk Management	Potential impact from natural disasters (such as hydrometeorological events, seismic activity, wildfires, or floods) that could threaten personnel safety, damage project infrastructure, disrupt	Moderate	Establishment and allocation of a \$40,000 USD Rapid Response Fund. This contingency budget is specifically designated to ensure immediate financial liquidity for emergency interventions, the swift repair of critical

	operational continuity, and threaten community benefits and project outcomes.		assets, and disaster recovery efforts, thereby minimizing project downtime.
Restoration	Climate-induced restoration failure: High plant mortality or habitat shift due to lack of consideration for future climate variability.	Moderate	Climate-Smart Selection: Selection of native species with high tolerance to projected temperature and rainfall variability.
Livelihoods	Maladaptation of productive systems: Livelihood support measures that increase long-term vulnerability or rely on climate-sensitive resources.	Moderate	Resilience Diversification: Technical assistance to implement "climate-smart" agricultural practices and crop diversification to ensure food security.
Operations	Excessive GHG Footprint: Project operations failing to meet emission reduction targets.	Low	Emission Management: GHG accounting for field operations and transition to low-carbon energy sources or efficient route planning.
Social / Safeguards	Disaster-related exclusion: Marginalized groups excluded from climate adaptation benefits or disaster response.	Moderate	Inclusive Disaster Planning: Development of participatory contingency plans that explicitly identify vulnerable groups, including women, elderly populations, persons with disabilities and rural communities. The approach includes targeted outreach, communication protocols adapted to local conditions, definition of roles during emergency response, and inclusive preparedness activities. These measures will be coordinated with local authorities, including municipal disaster risk management entities and relevant sectoral institutions, to ensure alignment with existing emergency response systems and effective integration of project interventions at the territorial level.
Ecosystem Protection	Potential impact on biodiversity and local livelihoods due to the occurrence of uncontrolled wildfires.	Moderate	Strengthening local capacities through community-based fire brigade training workshops.

The Disaster Risk Management rapid response fund is established as a contingency reserve available during the full implementation period of the project. Its purpose is to finance unforeseen climate-related

damage to critical project implementation activities, particularly where such damage could affect the integrity of restoration, conservation or livelihood measures and compromise the generation of expected hydrological benefits.

The fund may be used, for example, to repair or replace restoration works, fencing, planting material or other project-financed interventions damaged by extreme rainfall, droughts, floods, landslides or other documented climate-related events. By design, the fund protects the integrity of Outputs 1.1 and 1.2, ensuring that climate shocks do not undermine the proof of concept for Volumetric Water Benefits or the livelihood benefits expected from project-supported interventions.

Decisions on the use of the contingency reserve will be validated by the Project Technical Committee, based on a technical justification prepared by CI-Colombia and the relevant implementing partners. The fund may only be used for eligible climate-related repairs or corrective actions affecting project-financed interventions. It will not be used to cover ordinary cost overruns, planned activities that were not properly budgeted, or unrelated operational expenses.

The contingency may be triggered when three conditions are met: the event is climate-related and documented by local authorities, meteorological information or field evidence; the damage affects interventions financed by the project; and the proposed repair is necessary to maintain expected environmental, hydrological or livelihood outcomes. The operational process will include notification and rapid assessment by implementing partners, preparation of a short technical note describing the damage and proposed corrective action, fiduciary and eligibility review by CI-Colombia, endorsement by the Project Technical Committee, purchase of required goods and services, and tracking of the repair through the project's M&E and financial systems.

The proposed amount of USD 40,000 has been estimated with reference to the project's approximate full restoration cost of USD 7,250 per hectare in high-Andean ecosystems. This unit cost represents a conservative benchmark because most climate-related contingency events are expected to require partial repairs, reinforcement or replacement of specific elements rather than full restoration from zero. On this basis, the reserve is equivalent to approximately five to six full hectares of complete restoration cost and is expected to cover a larger number of localized repair events across the project landscapes. The amount is therefore considered proportionate to the nature of the expected contingency needs, while avoiding an excessive reservation of grant resources that would otherwise reduce funds available for planned project activities.

The rapid response fund is designed as an implementation-period reserve and is not intended to remain as a permanent open-ended fund after project closure. Post-project sustainability will be addressed through resilient design, preventive maintenance, local capacity building, clear handover arrangements and integration of lessons learned into future water resilience and restoration investments. Repairs financed through the reserve will be documented and reported in ESMP and project progress reports, including the nature of the event, corrective measures adopted, costs incurred and lessons learned for future design and risk management.

Indicator	Justification	Target
ESS101: Percentage of measures implemented by the project to avoid or mitigate vulnerabilities to climate change and related disasters identified at project design stage	It captures the implementation of resilient design engineering and the selection of climate-smart native species intended to withstand extreme events.	100% implementation of mitigation measures

Functions and responsibilities

Role	Responsibility
Hydrological Modeling & Spatial Analysis Coordinators	Generate future climate scenarios and integrate hydrometeorological data into EbA climate-proofing design.
Ecological Restoration Lead	Guarantees that native species selection for restoration is climate-smart, resistant to projected temperature and rainfall variability.
Reconversion Coordinator	Ensures that agricultural and livelihood modules are diversified to avoid maladaptation and maintain food security during extreme events.
Environmental Monitoring Specialist & M&E Coordinator	Supervise direct and indirect GHG-emission reduction targets and monitor post-disaster restoration survival rates.
Safeguards Manager & Gender Manager	Ensure inclusive resilience planning by involving women and indigenous groups in disaster contingency designs.
Safeguards Manager	Oversee the implementation of the GRM, including compliance with accessibility requirements, staff training, and verification that all grievances, including those submitted orally, are properly documented, tracked and resolved
Extensionists	Conduct daily field inspections of EbA equipment and restoration plots to report early signs of climate-induced damage.

8.2.1 Resource Efficiency and Pollution Prevention Plan

To implement procedures to prevent and control pollution derived from ecosystem restoration and agricultural livelihood activities, ensuring the efficient use of natural resources in compliance with ESS 5 Standard.

Identified Risks

Based on environmental and social assessment, the following key risks have been prioritized:

- Contamination by agricultural inputs: Improper use of chemical pesticides in potato crops and productive transformation.
- Waste generation (NbS/EbA): Solid and liquid waste from nursery operations (specifically plastic bags) and equipment installation (rainwater harvesting, poultry modules).
- Water and soil pollution: Contamination from agricultural processing runoff and inadequate waste segregation.
- Ecological flow risks: Excessive water extraction for irrigation or consumption that compromises downstream users or ecosystem health.

1. Macro-metering and other activities for Community Water Systems

The macro-metering component under Activity 1.2.3 is conceived as one of the technical strengthening measures available to improve the management, efficiency and resilience of community-run water supply systems, specifically *rural aqueducts*. Its implementation will be subject to the results of technical, operational and institutional diagnostics to be carried out during project implementation, so that the final configuration of each intervention responds to the specific needs, capacities and priorities of each beneficiary system. Macro-metering is part of the eligible activities included under Window C of the Grants Manual.

Macro-metering will be applied exclusively at system level. It will not constitute individual household metering, micro-metering, or a mechanism for direct billing of final users. The intervention is therefore designed as an operational management tool for community water providers rather than as a user-level regulatory or tariff instrument. Its purpose is to improve the understanding of water flows within each system, support water accounting, identify losses and abnormal consumption patterns, and generate useful information for decision-making by community water operators.

In this sense, the intervention will contribute to resource efficiency by strengthening the capacity of *rural aqueducts* to monitor water entering and circulating through their systems, detect leakages or operational inefficiencies, and prioritize corrective actions. The expected contribution is linked to improved system management, reduction of physical losses, optimization of abstraction volumes under existing concession arrangements, and better operational planning. The project does not envisage the introduction of tariff-setting measures or changes to household-level access conditions as part of this activity.

The efficient water use systems component aims to strengthen the capacity of community-managed water systems to manage water resources more efficiently, sustainably and resiliently in the face of climate variability, growing demand and operational constraints. The component is designed as an integrated intervention combining institutional strengthening, technical assistance and targeted operational improvements.

The first dimension of the component focuses on strengthening the capacities of community-based water providers. Based on diagnostic assessments carried out for each beneficiary organization, the project will develop training, technical assistance and peer-learning activities to improve knowledge and practices related to efficient water use, water-saving measures, loss management, preventive maintenance, community water governance, basic monitoring, climate adaptation, risk management and the administrative sustainability of rural water systems.

The second dimension focuses on identifying and implementing technical and operational improvements. Through field visits and technical assessments, the project will review the main points affecting system performance, including *water intakes*, conveyance lines, storage tanks, distribution networks, treatment elements, monitoring equipment and other relevant components. Based on these diagnostics, the project may prioritize measures such as rehabilitation of intake structures, optimization of conveyance and distribution systems, replacement of deteriorated pipes or accessories, improvement of storage tanks, repair of leakages, reduction of physical losses, improvement of treatment processes or minor adaptations to increase reliability and efficiency.

The specific interventions will be defined during implementation according to the needs of each system and the project's prioritization criteria described in the grants manual. This flexible approach allows the project to combine capacity building, operational strengthening and technical improvements in a way that is proportionate to each *Acueducto veredal (rural aqueduct)*, while contributing to water efficiency, reduced losses, improved continuity and increased resilience of community water services.

Scope and technical function

Macro-metering systems will be installed at **strategic infrastructure points**, including **water intake, and storage tanks**, allowing for real-time or periodic measurement of water flows entering and circulating within the system.

The primary functions of the macro-metering activity are to:

- Strengthen **water accounting** by enabling system-level monitoring of inflows and distribution volumes
- Detect **physical water losses (leakages)** within the system
- Identify **abnormal consumption patterns** at system level
- Support **efficient water management** and optimization of abstraction volumes under water concessions

The intervention does **not include micrometering or household-level metering** and therefore does not introduce billing mechanisms or tariff-setting changes for final users.

Macro-metering systems will be installed at strategic infrastructure points of the selected *Acueductos veredales*, including "*bocatomas*" (*system intake*), "*captaciones*" (*water intakes*), storage tanks and, where technically justified, other system-level nodes that allow measurement of inflows, storage volumes or main distribution flows. The final location of each device will be determined through diagnostic assessments that consider the hydraulic configuration, infrastructure condition, operational capacity and monitoring needs of each system.

The function of macro-metering is to generate reliable information on water volumes managed by the community system. This information will strengthen water accounting by allowing the *Acueductos veredales* to compare inflows, storage and distribution patterns, identify inconsistencies, detect possible leakages and prioritize technical actions to reduce physical losses. In addition, the information generated may support more efficient planning of abstraction, storage and distribution, contributing to the optimization of volumes associated with water concessions.

The intervention is not intended to establish individual consumption records, introduce household-level micrometering or modify tariff structures. Given that water concessions and tariff arrangements are subject to existing regulatory frameworks and local institutional conditions, the project will not use macro-metering as a direct tariff-setting mechanism. Its role is limited to improving operational knowledge, efficiency and transparency at system level.

The safe water component under Activity 1.2.3.3 is intended to contribute to improved access to safer water conditions in beneficiary community systems through solutions adapted to the specific needs, infrastructure and operational capacities of each *Acueducto veredal*. Given the diversity of rural systems in terms of size, number of users, source-water quality, infrastructure conditions, organizational capacity and available resources, the project does not prescribe a single treatment technology or uniform method for all systems.

During implementation, technical, operational and social diagnostics will be carried out to identify the main gaps related to water access, handling, storage, distribution and quality. Based on these diagnostics, the project may support improvements to existing infrastructure, optimization of supply systems, strengthening of storage and distribution arrangements, or incorporation of appropriate small-scale water quality improvement measures where technically feasible and operationally sustainable.

The project will evaluate decentralized or modular technologies suitable for rural community systems, particularly at the system-output or community-supply level. These may include context-appropriate micro-components for potabilization or water quality improvement, depending on the characteristics of the source and the operational capacity of the beneficiary organization. The project does not envisage the construction of centralized wastewater treatment plants or PTARs under this component, as the purpose of Activity 1.2.3.3 is to improve drinking-water conditions within community water supply systems, not to address sanitation infrastructure at municipal or watershed scale.

Sustainability after project implementation will be addressed through capacity building, technical accompaniment and the selection of solutions that can be operated and maintained by the *Acueductos veredales*. Operators and local water boards will receive practical training, and the project will provide support materials such as operational guides, maintenance instructions or simplified manuals adapted to the context of each organization. The intention is to ensure that any solution implemented is technically appropriate, financially realistic and compatible with local operation and maintenance capacities.

Institutional arrangements and responsibilities

The implementation of the macro-metering component will involve the following entities:

- **Specialized consulting firm role (implementation partner to be defined as an open procurement process):** Responsible for diagnostic, technical design, installation of equipment, and provision of initial training to local operators

- **Acueductos veredales:** Responsible for **long-term operation and minor maintenance** of the systems, following capacity-building support
- **Fondo Acción:** Responsible for **oversight, procurement (of equipment and services), monitoring and integration with the project-level GRM**, as well as coordination of community-level engagement processes

A specialized consulting firm will be responsible for providing the technical support required to identify, formulate, implement, and follow up on the measures prioritized for each beneficiary system, including the potential incorporation of macro-metering and associated operational monitoring tools. This includes technical diagnosis, definition of feasible intervention alternatives, support to system design, technical accompaniment during implementation, and capacity building for local operators.

Fondo Acción will be responsible for overall project coordination, procurement, and oversight, ensuring that macro-metering interventions and other interventions remain aligned with project objectives, safeguard requirements, community participation processes, and monitoring arrangements. It will also manage stakeholder engagement and ensure that any concerns, complaints, or requests for clarification related to this component are addressed through the project-level grievance redress mechanism (GRM), which includes channels for grievance registration, processing, documentation, and escalation.

Acueductos veredales will remain responsible for the long-term operation of the systems where macro-metering is installed. This includes routine use of the equipment, basic interpretation and recording of generated information, identification of abnormal readings or potential losses, and execution of minor maintenance tasks within their technical and organizational capacity.

To support this, the project will provide targeted capacity building and technical accompaniment to water boards, system operators, and fontaneros (plumbers), who will act as first-line operators for system verification, routine monitoring, and basic response actions. Training will focus on understanding the purpose of macro-metering, interpreting key operational data, identifying leakages or anomalies, conducting preventive maintenance, and applying information to improve water management decisions.

The project will prioritize equipment and solutions compatible with the technical capacities of community providers, in order to reduce dependence on external support and promote sustainable use after installation. More complex maintenance requirements, if identified, will be addressed during the diagnostic and design phase and incorporated into the implementation arrangements for each system.

Recognizing that some rural systems may have limited experience with monitoring technologies or structured water management practices, the macro-metering component will be introduced progressively as a system-strengthening measure. It will be complemented by training, communication, and institutional support to ensure adequate understanding and adoption. Importantly, the intervention is not intended as a household-level control or billing mechanism, but as a tool to improve system-level management by the Acueductos veredales.

Community engagement will focus on clearly explaining the purpose, scope, and limitations of macro-metering. Particular emphasis will be placed on clarifying that the intervention aims to identify losses, improve operational efficiency, and strengthen water management, and does not imply household micrometering, individual billing, or tariff changes. This is critical to prevent misunderstandings and minimize the risk of social resistance.

Finally, the project will support gradual behavioral adaptation where needed, through practical guidance on efficient water use, loss reduction, preventive maintenance, and basic system monitoring. These

measures are designed to strengthen local ownership and ensure that macro-metering is understood and adopted as a community management tool rather than an external control mechanism.

Implementation approach

The installation of macro-metering equipment, materials and related technological solutions will be implemented under Grant Window C (See Grants Manual), following the project's in-kind modality and the procurement, contracting (procurement and contracting will be realized by Fondo Acción) and implementation procedures. Under this window, beneficiary community-run water supply systems do not receive financial transfers, instead, Fondo Acción directly procures and delivers the equipment, materials and technical assistance required for implementation.

At this stage, no predefined technical specifications are established. In line with Window C procedures, all technical requirements will be defined progressively following the grant selection and prioritization process, and based on system-specific diagnostics and intervention planning.

The implementation process will follow a structured sequence:

- Identification and prioritization of eligible *Acueductos veredales* through an open call, administrative screening, and technical evaluation conducted by Fondo Acción.
- Technical diagnostic assessments carried out by specialized consulting firms to identify infrastructure gaps, operational inefficiencies, water losses, and capacity-building needs.
- Preparation of tailored intervention plans for each selected system, which will define the scope of investments, including macro-metering systems, water loss reduction measures, efficient water use practices, and drinking-water treatment improvements, as applicable.
- Formalization of in-kind grant agreements and procurement of equipment, materials, and services by Fondo Acción based on these intervention plans.

As a result, the equipment to be procured will depend on the technical configuration of each *Acueducto veredal*, including the type of infrastructure, measurement points, hydraulic characteristics, accessibility, operation conditions and maintenance capacity. The project will avoid a one-size-fits-all approach and will instead select context-appropriate solutions that are technically feasible, proportionate to the scale of the system and compatible with the operational capacities of the community water provider.

Installation will be undertaken under a specialized consulting firm's following applicable quality control requirements. The installation process will include verification of the selected points, basic operational testing, initial handover to the *Acueducto veredal*, and training for the operators responsible for system-level use and minor maintenance.

Community-run water supply organizations will actively participate throughout implementation by providing system information, facilitating field activities, and committing to the operation and maintenance of installed equipment and infrastructure. Beneficiary selection and intervention scope will be contingent upon compliance with eligibility, safeguards, and prioritization criteria defined under Window C.

Given the in-kind and demand-driven nature of this grant window, all technical specifications and final equipment configurations will be defined only after completion of the diagnostic and intervention planning phases, ensuring full alignment with system-level needs, grant eligibility conditions, and long-term operational sustainability.

A diagnostic assessment will be conducted prior to installation to:

- Identify eligible *Acueductos veredales*
- Define technical requirements and installation points
- Assess operational capacity and training needs

Social and institutional considerations

The intervention has been designed to avoid negative impacts on communities and ensure feasible adoption in rural contexts where metering practices are not commonly implemented. Key considerations include:

- **No direct impact on end-users:** As macro-metering operates at system level, it does not affect household-level billing or access to water
- **Community-based operation model:** Local water boards and operators (*plumbers*) will be trained as first-line operators for system monitoring and basic maintenance
- **Capacity building:** A specialized consulting firm will deliver targeted training to support system operation, interpretation of data, and basic response actions (e.g., leak detection)
- **Potential indirect cost implications:** While the intervention does not introduce direct tariff-setting mechanisms, there is a potential for indirect financial implications at the system level, particularly associated with operation, maintenance, calibration, or eventual replacement of equipment. These costs could, over time, influence system-level financial management decisions, including tariffs, depending on the governance arrangements of each community water provider. To mitigate this risk, the project incorporates:
 - Diagnostic assessments and intervention planning to ensure that only technically and financially viable solutions are selected, aligned with the operational and financial capacity of each system.
 - Assessment of recurrent costs and sustainability, including maintenance requirements, as part of the intervention plans developed under Grant Window C.
- Safeguards screening processes, as established in the Grants Manual, which will be applied during beneficiary selection and intervention prioritization to identify and mitigate any potential adverse social or economic impacts prior to implementation. **Behavioral adaptation:** Where needed, simple procedures for water-use optimization and system management will be introduced gradually through training and operational guidance
- **Grievance management:** Any concerns associated with system implementation, performance or management will be addressed through the project-level GRM, under the coordination of Fondo Acción
-

Overall, the macro-metering component is conceived as a non-intrusive, system-level intervention aimed at improving water resource efficiency and operational management without altering existing user-level service conditions. As the intervention does not involve household-level metering, it is not linked to tariff-setting mechanisms or billing structures, which remain governed by the applicable regulatory frameworks

and existing institutional arrangements. The approach prioritizes operational transparency, loss reduction and improved system performance while maintaining current access conditions for end-users. In addition, the project will, where technically and operationally feasible, assess the incorporation of small-scale drinking water quality improvement measures at the system output level, through decentralized or modular technologies, rather than centralized treatment plants, ensuring adaptability to rural contexts and compatibility with existing infrastructure. This integrated approach allows the project to strengthen water management capacity at the community level while minimizing social risks and ensuring that technical solutions remain context-appropriate, scalable and aligned with local institutional realities.

Risk Mitigation & Monitoring Matrix

Sub-category	Identified Risk	Risk Level	Mitigation Measure
Agricultural Inputs (IPM)	Pollution from chemical pesticides in potato crops related project activities and restoration activities.	Moderate	Prioritization of biopesticides and Integrated Pest Management (IPM). Strict prohibition of WHO Category IA, IB, and II, as those are part of the CI-GEF/GCF ESMF Exclusion List.
EbA Equipment Waste	Contamination from inadequate management of NbS/EbA equipment waste (treatments, systems).	Moderate	Implementation of strict segregation, transport, and final disposal protocols for surplus materials and adequations waste.
Seedling Procurement & Planting	Contamination of soil and water bodies due to improper disposal of plastic bags from purchased seedlings at planting sites.	Moderate	1. Inclusion of "take-back" clauses in procurement contracts (suppliers must collect empty bags). 2. On-site collection protocols and transport to authorized recycling centers. 3. Training for planting crews on "Zero Waste" field operations.
Community / GRM Accessibility	Limited access to grievance mechanisms for vulnerable groups due to literacy, language or access barriers	Moderate	The GRM will include oral grievance channels, supported registration through trained personnel, simplified communication formats, and mandatory training of all project staff to ensure effective accessibility for vulnerable groups.
Water Quality	Contamination from agricultural runoff and processing discharges in high Andean ecosystems.	Substantial	Installation of biofiltration swales, sediment traps, and "Chemical-Free Zones" (CFZ) within 100m of water sources.
Ecological Flows	Compromise of water dynamics due	Substantial	Rainwater harvesting will be prioritized, together with the installation of drip/micro-sprinkler

	to excessive extraction for irrigation or resilient systems.		systems and macro-meters. Implementation of extraction caps based on seasonal flow availability.
Soil Stability	Sediment movement into water bodies due to bare soil in restoration plots.	Moderate	Use of coir logs, mulching, and micro-terracing to prevent runoff and stabilize soil after disturbance.
Livelihoods	Waste pollution: Improper disposal of bio-input containers or equipment waste.	Moderate	Segregated Management: Protocols for safe final disposal and triple-rinsing of biological/chemical containers.
Macrometering	Limited adoption or inadequate operation of macro-metering systems	Moderate	Prior to installation, a diagnostic assessment will be conducted to confirm technical feasibility, suitable installation points and operational capacity of each <i>Acueducto veredal</i> . A specialized consulting firm will lead the technical design, procurement, installation and initial training, including targeted capacity building for water boards and <i>fontaneros</i> as first-line operators. Long-term use and minor maintenance responsibilities will be assigned to the <i>Acueductos veredales</i> , while Fondo Acción will oversee monitoring and grievance management through the project GRM. The intervention will remain at system level and will not involve household-level metering, micro-metering or tariff-setting changes for final users.

Indicators

Indicator	Justification	Target
ESS052: Number of measures implemented to avoid or minimize pollution from project activities/adverse impacts on human health and the environment.	This monitors the installation of biofiltration swales, sediment traps, and the execution of waste segregation protocols for construction materials.	100% implementation of mitigation measures

Functions and Responsibilities

Project Role	Specific Responsibility in the ESMP
Environmental Monitoring Specialist	Technical lead for the component. Responsible for water quality monitoring (nitrogen/phosphorus), auditing of farm inputs, and reporting environmental indicators.

Safeguards Manager / Specialist	Supervision of compliance with Conservation International's ESS 5 standard. Verification of mitigation measure implementation and validation of reports for donors.
Procurement Manager	Contractual management with suppliers. Responsible for including "reverse logistics" clauses for seedling plastic bags and ensuring purchased pesticides are not on prohibited lists.
Director of Component 1	Supervision of productive transformation (potato) and restoration activities. Ensures that the budget for each activity includes proper waste management.
Ecological Restoration Lead	Field supervision of erosion barrier installation (coir logs) and plastic waste management during planting sessions.
Conservation Coordinator	Coordination of field teams to prevent discharges in sensitive areas and ensure compliance with Chemical-Free Zones (CFZ).
Extensionists	Direct training for producers on Integrated Pest Management (IPM), collection of bag return certificates, and daily monitoring of waste management on farms.
Hydrological Modeling Coordinator	Technical support for defining ecological flow thresholds and conducting impact analysis of water extractions.

2. Agrochemical Management, Regulatory Compliance and Pollution Monitoring

Given that project activities involve the agricultural sector, the project will strictly adhere to Conservation International's CI-GEF/GCF Exclusion List, which prohibits the use and/or procurement of pesticides and hazardous materials that are unlawful under national or international legislation, including substances classified under WHO Categories IA, IB and II.

In addition, the project will comply with applicable Colombian environmental and agricultural regulations governing the use of agrochemicals and the protection of high mountain ecosystems. This includes alignment with:

- regulations for sustainable management and protection of páramo ecosystems, which restrict activities that may affect water regulation functions and biodiversity
- national guidelines on low-impact production systems and environmentally sustainable agricultural practices
- national provisions related to pesticide management, environmental protection and natural resource conservation

In accordance with these regulatory frameworks, the project will implement an Integrated Pest Management (IPM) approach as the primary strategy for agricultural and restoration activities. This approach prioritizes prevention, biological control methods and low-impact practices, minimizing reliance on chemical inputs and ensuring compatibility with ecosystem conservation objectives.

The use of agrochemicals will be considered only as a last resort and will be subject to strict technical validation. Any use must comply with national regulations, CI-GCF exclusion requirements, and project-level environmental safeguards. The project will implement verification mechanisms to ensure compliance, including review of inputs used by beneficiaries and contractors, and enforcement of Chemical-Free Zones (CFZ) in sensitive areas such as wetlands, riparian buffers and high Andean ecosystems.

To operationalize compliance with the CI-GCF Exclusion List and Colombian regulations, the project establishes explicit agrochemical exclusion criteria applicable to all project-supported activities. The project will not allow the use, procurement or promotion of:

- Highly Hazardous Pesticides (HHPs), including all substances classified under WHO Classes Ia (extremely hazardous) and Ib (highly hazardous)
- Agrochemicals banned, restricted or not registered under Colombian regulation
- Substances identified as Persistent Organic Pollutants (POPs) under international conventions such as the Stockholm Convention
- Agrochemicals with high persistence, bioaccumulation and toxicity in high mountain ecosystems
- Substances known to have high toxicity to aquatic organisms, pollinators or soil biota

Indicative examples of excluded substances include (but are not limited to):

- | | |
|--------------|-----------------|
| - Paraquat | - Monocrotophos |
| - Aldicarb | - Parathion |
| - Carbofuran | - Methamidophos |
| - Endosulfan | |

The project will also prohibit the use of agrochemicals within sensitive ecosystems, including:

- páramos
- wetlands
- riparian buffers
- water recharge zones

Chemical-Free Zones (CFZ) will be established with a minimum buffer of 100 meters from water bodies and ecologically sensitive areas. This exclusion framework is aligned with the CI-GCF Exclusion List and relevant Colombian regulatory instruments and will be updated where necessary to reflect changes in applicable legislation or scientific knowledge.

These restrictions are directly linked to biodiversity conservation objectives under ESS6. The control of hazardous agrochemicals reduces risks to native species, prevents contamination of aquatic ecosystems, protects soil ecological processes and avoids impacts on ecological connectivity. This is particularly critical in páramo and high Andean ecosystems, where ecological resilience is highly sensitive to chemical disturbance.

The use of agrochemicals is not permitted in restoration areas or natural regeneration sites, ensuring that ecological recovery processes are not compromised.

The project will also implement structured pollution monitoring to identify, prevent and manage potential contamination risks associated with agricultural and restoration activities. Monitoring will include:

- periodic field inspections of project sites
- verification of compliance with IPM practices and exclusion lists
- monitoring of runoff risks and potential contamination pathways
- verification of waste management practices and disposal of agrochemical containers
- assessment of soil and water conditions where relevant

Monitoring will specifically include verification of compliance with agrochemical exclusion criteria, including field-level validation of substances in use, inspection of storage and handling practices, and review of procurement records where applicable.

Where necessary, monitoring may include targeted verification of contamination indicators, such as signs of chemical runoff, presence of residues in sensitive areas, and impacts on vegetation or aquatic systems.

Any identified contamination risk or event will trigger immediate corrective actions. These may include reinforcement of IPM practices, restriction or suspension of agrochemical use, adjustment of field practices, remediation measures or additional training for field staff and beneficiaries.

These measures ensure that pollution risks are not only mitigated through planning and design, but are actively monitored, managed and controlled throughout project implementation, in line with both CI-GCF safeguard requirements and Colombian environmental regulatory frameworks.

8.2.2 Safety and Security Plan

The security component of the project's Environmental and Social Management Framework (ESMF) is strategically anchored in three fundamental instruments of Conservation International Colombia that articulate the organization's prevention, operational response, and road safety culture. This comprehensive framework is sustained by:

- Security and Protection Protocol (PT-CICL-01): Establishes preventive parameters and planning for self-care in field work.
- Procedure for Attention to Security Incidents (PRC-CICL-01): Dictates tactical actions to face crisis situations and imminent threats.
- Road Safety Strategic Plan Policy (SST-PO-004): Formalizes the institutional commitment to the protection of life during work-related displacement.

This Safety and Security Plan also incorporates community-facing safety and security measures under ESS 8.

Community-facing safety and security approach

In addition to personnel security measures, this Safety and Security Plan consider a community-facing approach to manage risks to project-affected people in accordance with ESS 8 and Conservation International standards. This approach applies to all field activities implemented in rural properties, protected areas, community spaces, and other intervention sites, and is intended to prevent project implementation from creating, exacerbating, or transferring safety and security risks to local communities.

The Plan adopts three complementary operational principles:

- First, an acceptance-based approach will be applied as the primary protection measure for field operations. This means that all field presence will be preceded and accompanied by transparent communication, prior coordination with relevant local actors, and clear identification of authorized project personnel, with the objective of maintaining community trust, social legitimacy, and informed acceptance of project activities. This measure complements the existing protocols on identity verification, advance notification, and grievance reporting already established under this Plan.
- Second, the Plan applies an institutional risk monitoring approach, whereby security assessments and decisions on field deployment will rely primarily on official sources, competent authorities, and institutional security networks, rather than requesting community members or local leaders to assume security-related information gathering functions. This is intended to reduce the risk of exposing local actors to retaliation, pressure, or unnecessary responsibility in contexts of public order concern. Risk information will continue to be reviewed prior to field deployment and used to guide access, scheduling, and operational modalities.
- Third, the Plan establishes an adaptive traffic-light operational mechanism for community-facing activities in areas where public order conditions may affect safe implementation. Under this mechanism, field activities may proceed under normal conditions, be adjusted with reinforced precautions, or be temporarily suspended and rescheduled, depending on the level of risk identified through the existing security review procedures. Temporary suspension shall be the preferred response where risk levels rise beyond acceptable thresholds, without implying the permanent withdrawal of project support from vulnerable communities. Once minimum safety conditions are re-established, activities may resume following the corresponding authorization and verification procedures

Fire Brigade Implementation and Safeguards Integration

Fire brigade-related activities under the project will focus on capacity strengthening, technical accompaniment, and the provision of basic equipment, rather than the establishment or full operational deployment of autonomous fire brigades. These actions are framed within the project's disaster risk management and climate resilience approach and are aligned with existing institutional mandates and national fire management systems.

Specifically, the project with the support of the Alexander von Humboldt Institute (IAVH), will develop a forest fire risk management strategy under an Integrated Fire Management (MIF) approach, including participatory diagnostics with protected area staff and local communities to assess existing capacities and identify gaps. Based on this, the project will design and implement a context-specific strengthening plan focused on prevention, early detection, monitoring, and safe response.

As part of this support, the project will deliver basic fire management kits (one per protected area or sustainable landscape) to strengthen existing control, surveillance, and monitoring functions. These kits are not intended for high-risk fire suppression operations but to enhance preparedness, situational awareness, and low-risk response capacity in line with participants' training level.

These activities will follow Conservation International's Environmental and Social Management System (ESMS), the Gender Action Plan (GAP), and applicable SEAH prevention measures. Participation in fire brigade training will be designed to be inclusive, actively promoting the involvement of women, rural populations and other vulnerable groups, while ensuring that training methodologies are adapted to local capacities and do not create barriers to participation.

All training and related field activities will be implemented under strict health and safety protocols. Prior to any activity, field teams will conduct risk assessments and safety briefings, in line with CI's internal operational procedures. Activities will incorporate clear guidance on acceptable levels of engagement, prioritizing fire prevention, early detection and safe response, and explicitly avoiding high-risk fire suppression actions beyond the capabilities and training level of community participants.

Where required, the project will provide basic safety equipment and personal protective elements, consistent with the nature of the activities. These may include protective gloves, appropriate clothing, first aid kits and essential field safety materials. All participants will be trained in their safe use. Emergency response arrangements, communication protocols and incident reporting procedures will be mandatory components of all training sessions.

The implementation of these activities will be supported by CI's existing field protocols, including pre-deployment checklists, safety verification procedures, and incident response systems, ensuring that all fire brigade-related interventions are aligned with institutional safety standards and national disaster risk management frameworks.

Landmine and Explosive Hazard Risk Management

The project has conducted a preliminary assessment of risks related to landmines, unexploded ordnance (UXO) and explosive remnants of war (ERW) across the intervention landscapes.

According to official information from the Office of the High Commissioner for Peace (AICMA), supported by historical conflict analysis and publicly available data, the project intervention landscapes in Bogotá D.C. and the municipalities of Cogua, Tausa, Zipaquirá, Villapinzón, Chocontá, Sesquilé, Guatavita and

Guasca have been declared territories free from suspected landmine contamination. As a result, the overall risk associated with landmines, UXO and ERW is considered low.

Notwithstanding this classification, the project applies a precautionary approach in line with CI's Safety and Security framework. Prior to the implementation of any field activity, project teams will verify local security conditions through consultation with relevant authorities, community representatives and available institutional information systems.

All field personnel, contractors and implementing partners will comply with CI's established safety protocols, which include:

- Verification of local conditions before entering new areas
- Use of established and verified access routes
- Continuous communication with designated security focal points
- Implementation of field checklists and risk assessments prior to deployment

In addition, personnel will receive basic awareness on identification of potential explosive hazards and appropriate response measures. In line with CI guidance, in the event of suspected explosive hazards, personnel will apply the principle of:

"Do not touch – Do not move – Mark – Report"

and immediately activate institutional reporting procedures.

These procedures are reinforced by CI's internal incident response framework, which establishes clear responsibilities for reporting, escalation and coordination with relevant authorities.

Given the low-risk classification, no specialized demining or high-risk clearance activities are envisaged under the project. However, the risk will be continuously monitored and re-evaluated as needed throughout project implementation, particularly if expanding activities to new locations.

Risk Mitigation and Performance Matrix

Following the ESMF mitigation hierarchy (avoid, minimize, and manage), the following matrix defines the operational response to identified risks:

Identified Risk	Risk Level	Mitigation & Prevention Measure (ESMF Alignment)
Public Order & Armed Groups	High	Security Coordination & Tactical Planning: 1. Specialized Support: Ongoing coordination with the CI Colombia Security Coordinator for situational analysis and risk assessment. 2. Pre-movement Verification: Mandatory verification of public order conditions 48 hours prior to any field movement to confirm safe access. 3. Safe Operational Standards: Strict adherence to "Low Profile" protocols and the "Do No Harm" principles to prevent escalating local tensions or creating new security risks.
Road Safety Accidents	Moderate	Daily vehicle inspections (FMT-CICL-03). Compliance with PESV policy and ESS 7 OHS standards.

Landmines (MAP) / Medical Emergencies	Low	Immediate stop protocols; no electronic devices near suspected MAP. Advance identification of health centers.
Theft or Robbery	Low	Prioritize personal integrity over material goods. Avoid night travel (river or land).
Risk of external actors or criminal groups posing as project staff to gain unauthorized access to private properties (<i>fincas</i>) or engage in fraudulent activities.	Moderate	Identity Verification & Communication Protocol: 1. Advance Notification: Prior communication to landowners and community leaders regarding visit dates and the specific names of authorized personnel. 2. Official Branding: Mandatory use of official ID cards and distinctive project gear (e.g., branded vests or uniforms) for all field staff. 3. GRM Activation: Implementation of an active Grievance Redress Mechanism (GRM) as a verification channel to report and address suspicious behavior or attempted identity theft.
GBV and SEAH (Sexual Exploitation and Harassment)	Moderate	Comprehensive Prevention & Response Framework: 1. Strict Policy Application: Enforcement of SEAH/GBV prevention policies and confidential reporting protocols. 2. Capacity Building: Mandatory training for all personnel on VBG/SEAH protocols and national legal frameworks. 3. Survivor Support: Provision of safe, ethical documentation and access to an emergency fund for immediate survivor assistance. 4. Referential Alignment: Procedures are further detailed in the Grievance Redress Mechanism (GRM) and the Gender Action Plan (GAP). Further details are provided in section 8.2.3 below.

Incident Response Protocols (Crisis Situations)

- Contact with Armed Groups: Do not offer resistance; stay calm; do not make promises; follow instructions as a subordinate.
- GBV/SEAH Incidents: Activate confidential reporting and response survivor-centered protocols immediately. Ensure safe and ethical documentation, prioritize survivor safety, and facilitate access to specialized services and redress modalities.
- Landmines (MAP): Stop immediately; do not use electronic devices (may activate circuits); return via the same footprint if possible.
- Cyber-crimes: Coordinate with the IT department and report via the National Police virtual portal "A Denunciar".

Indicators

Indicator	Justification
ESS082: Percentage of measures implemented to ensure that risks or potential impacts to the health, safety and security of project-affected communities are avoided and mitigated.	It measures the adoption of community-facing safety protocols, including codes of conduct and GBV/SEAH response mechanisms.

Responsibility Matrix

To ensure accountability, roles are mapped to the project's organizational structure:

Role in Project Structure	Key Responsibility within ESMP
Project Director / Executive	Provide resources for security compliance and oversee high-level risk management.
Program Operations Director	Supervise administrative effectiveness and legal compliance of security measures.
Security Specialist	Main Security Coordinator: Monitor public order, authorize field trips, and activate emergency protocols.
Component Director	First level of supervision for field activities; ensures teams submit checklists.
Safeguards Manager / Specialist	Monitor compliance with ESS 7 & 8; document incidents in the PIR and ESMF reports.
Gender Manager / Specialist	Ensure security protocols are gender-sensitive and manage SEAH-related risks.
Field Leads / Extensionists	Mandatory compliance with protocols, daily vehicle checks, and immediate reporting of field variations.

8.2.3 SEAH Risk Management Plan

In line with CIGEF/GCF ESMF, the project has identified potential risks of Gender-Based Violence (GBV) and sexual exploitation, abuse and harassment (SEAH), particularly in rural intervention contexts. These risks are associated with pre-existing structural gender inequalities, limited participation of women in decision-making processes, and operational dynamics such as remote field activities, engagement with contractors, and farm-level technical assistance. The gender analysis highlights that, although incidence rates vary across intervention landscapes, underreporting and social barriers may conceal significant risks, requiring a precautionary and systemic approach to prevention and response.

To address these risks, the project adopts a “Do No Harm” and survivor-centered approach, integrating preventive, monitoring, and response measures across all components. This approach is supported by gender Action Plan (GAAP) and implemented through the project-level Grievance Redress Mechanism (GRM), which includes differentiated procedures for handling SEAH-related complaints in a confidential, safe and culturally appropriate manner. Preventive measures include capacity building of project personnel on gender-sensitive approaches and Prevention of Sexual Exploitation and Abuse (PSEA), field-level safeguards to ensure safe participation, and proactive engagement strategies to address gender norms and reduce risks of backlash linked to women’s empowerment processes.

As established in the GRM, clear reporting channels, referral pathways and an accountability structure are in place to ensure that all SEAH-related grievances are managed effectively and in accordance with international standards. This includes confidential intake mechanisms, trained focal point, and coordination with specialized external services (health, psychosocial support, legal assistance), as well as internal compliance systems.

Together, these measures ensure that SEAH risks are systematically managed throughout project implementation, with continuous monitoring and alignment with the GAAP and institutional safeguards frameworks.

Attention is given to activities involving fieldwork in remote areas and contractor engagement, where potential exposure to SEAH risk may be higher.

Element	Description	Source
Risk identified	The project recognizes risks of GBV and SEAH in rural intervention landscapes, linked to structural gender inequalities, underrepresentation in decision-making and potential underreporting of violence.	GAAP
High-risk activities	Potential high-risk contexts include field-based activities in remote areas, engagement with contractors and extension personnel and farm-level technical assistance (farm-to-farm visits), where women may be exposed to isolated or male-dominated environments.	GAAP – ESMP structuring
Mitigation measures	The project implements a “Do No Harm” and survivor-centered approach, including gender-risk monitoring, engagement with men to address gender norms, and structured prevention measures to reduce risks associated with empowerment processes. In addition to this, all staff, implementing partners, sub-grantees and contractors are required to receive training on SEAH and all contracts and agreements flow-down a clause on the zero tolerance approach from CI to SEAH. Further, to prevent the project activities from increasing the risk of GBV, it is adopting an approach that works from the household level, engaging men, to avoid adverse reactions to women increased participation and empowerment, through project activities. The project has budgeted for emergency fund for immediate survivor assistance (as reflected in the GAP).	GAAP and ESMP
Operational procedures	A differentiated procedure for SEAH grievances includes disclosure, immediate safety assessment, confidential registration, informed consent, referral and follow-up, ensuring survivor-centered handling.	GRM
Reporting pathways	Multiple reporting channels are available through the CI Colombia PQRS System and confidential mechanisms such as Ethics Point, ensuring safe and accessible intake of SEAH-related grievances.	GRM
Referral pathways	Defined referral pathways connect survivors to specialized external services (health, psychosocial, legal protection) and	GRM - GAP

	internal CI compliance mechanisms, activated based on informed consent	
Accountability chain	Roles include GRM focal points, the Grievance Mechanism Committee, CI ethics and compliance bodies, and external specialized institutions, ensuring clear responsibilities and coordination.	GRM
Field-level supervision	Preventive field measures include trained personnel, gender-sensitivity, facilitation, safe engagement protocols, coordination with community structures and requirements for PSEA training for extension staff	GAAP
SEAH focal point	Dedicated GRM focal points and the Gender Specialist are responsible for handling SEAH cases, ensuring confidentiality, survivor-centered support and coordination of referrals.	GRM - GAAP
Indicators	Monitoring includes grievance resolution rates, awareness activities, referral pathway mapping and GAAP Indicators related to participation, access and gender-responsive implementation.	GRM - GAAP

This section consolidates and operationalizes GBV and SEAH risk management measures defined across the project's safeguards instruments, ensuring their integration into the ESMP and alignment with CI-gef/GCF requirements for a comprehensive and responsive risk management system.

Responsibility Matrix

To ensure accountability, roles are mapped to the project's organizational structure:

Role in Project Structure	Key Responsibility within ESMP
Project Management Unit (PMU) / Project Coordinator	Ensure overall implementation of ESMP and GRM; guarantee that grievance management (including SEAH) is operational, resourced, and aligned with CI-GEF/GCF ESMF and reporting requirements.
Safeguards Specialist	Oversee compliance with ESMP and GRM procedures; ensure that sensitive cases are handled according to differentiated protocols and safeguards principles.
Gender Specialist	Lead implementation of the GAAP and SEAH risk mitigation measures; manage SEAH cases with a survivor-centered and confidential approach; coordinate referral pathways and ensure alignment with national GBV services; deliver capacity building on PSEA/SEAH.
GRM Focal Point	Act as safe and confidential entry points for grievances (including SEAH); receive disclosures, conduct initial safety assessments, explain options, register cases securely, and coordinate referrals based on informed consent
Grievance Mechanism Committee	Oversee GRM implementation; review and manage grievances at institutional level; ensure confidentiality and alignment with CI policies; analyze anonymized data to improve prevention and response measures.

CI Ethics and Compliance Mechanisms	Receive and address SEAH cases involving project personnel; apply Codes of Conduct, investigations, and disciplinary procedures in coordination with GRM focal points, respecting confidentiality and survivor consent
Field team / Extensionist	Support access to GRM at community level; facilitate grievance submission; ensure inclusive communication; identify risks and refer cases to GRM channels without attempting to manage sensitive cases directly.
Contractors and Implementing Partners	Comply with Codes of Conduct and SEAH zero-tolerance policies; ensure staff training; report grievances through GRM; cooperate with corrective and disciplinary processes when required.
M&E Coordinator	Track GRM performance (grievances received, resolution status, patterns of use); support periodic reporting and adaptive management of safeguards measures.

8.3 Environmental and Social Management Plan (ESMP) – Labor and working conditions Component

The project is committed to protecting the fundamental rights of all workers and providing a safe and healthy working environment in strict adherence to CI's Environmental and Social Standard 7 (ESS 7): Labour and Working Conditions. This component serves as the high-level management framework to ensure that all project-related labor practices, including those of direct workers, contracted personnel, community workers, and primary suppliers — comply with national laws and the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work.

Institutional Framework of the Executing Entities

As the Executing Agency, CI Colombia operates under a robust set of existing internal policies and procedures that already meet and exceed these international standards. While these policies govern CI's internal operations, the measures outlined in this ESMP focus specifically on ensuring that contractors and sub-grantees align their practices with the same high standards of integrity and safety.

General Requirements and Commitments

Existing Institutional Capacity: CI Colombia's labor management is governed by the following institutional policies and its Global Code of Ethics, which ensure a professional and ethical workplace:

- CI Code of Ethics: The foundational document promoting integrity, transparency, and accountability.
- Professional Conduct, Non-Discrimination, and Anti-Harassment Policy: Ensuring a workplace free from bias and hostility.
- Staffing, Recruitment, and Job Description Policy: Standardizing fair and transparent hiring processes.
- Remuneration (Compensation) and Benefits Policies: Ensuring competitive and fair pay in line with national standards.
- Workplace Drug and Alcohol-Free Policy: Maintaining a safe and focused working environment.

- Flexible Work and Time Recording Policies: Promoting work-life balance and accurate labor tracking.
- Performance Management and Personnel Records Policies: Systematizing career growth and data privacy.
- Background Check and Personal Relationships Policies: Preventing conflicts of interest and ensuring personnel integrity.
- Separation from Service and Relocation Policies: Managing transitions and mobility with fairness and legal compliance.
- Fair Treatment and Non-Discrimination: All recruitment, hiring, and treatment of workers (including those of contractors) will be based on principles of equal opportunity. Specific measures, detailed in the Gender Action Plan (GAP), will be implemented to prevent harassment and exploitation, with safe, ethical, and confidential procedures for handling GBV and SEAH complaints.
- Working Conditions: All project personnel, particularly those hired through sub-grantees and contractors, will be provided with clear documentation of their employment terms, regular payment of wages, and adequate rest periods in accordance with national legislation. Contractors must submit registries of employment contracts, verifiable payroll records demonstrating compliance with national minimum wage laws, legal working hour limits, and social security contributions (where applicable) to the Project Management Unit (PMU).
- Protection of Workforce: The project maintains a zero-tolerance policy regarding child labor and forced labor across the entire supply chain, requiring all subcontractors to sign compliance clauses.
- Occupational Health and Safety (OHS): CI Colombia will ensure that OHS measures are strictly followed in the field. This includes identifying potential hazards, providing Personal Protective Equipment (PPE) at no cost to the worker, and implementing emergency response arrangements.
- Site Inductions and Tool-Box Talks: No worker or visitor shall access work fronts without a documented Health and Safety Induction. Contractors must conduct regular 15-minute "Tool-box Talks" addressing specific daily field hazards in the local language spoken by the workforce.

8.3.1 Community Restoration Labour and Worker Documentation

Given the nature of the project, community-based labor may be required for restoration, conservation, EbA-related works, water-system support activities, and associated field implementation tasks. These activities may involve direct workers, contracted workers, contractor personnel, sub-grantee personnel, community workers, local field teams, and, where applicable, voluntary participants.

The project recognizes that rural labor markets in intervention landscapes may include informal practices, particularly for short-term field work and restoration-related. To prevent unclear labor arrangements, the project will apply a documented labor-management procedure before the start of any field activity involving community labor. This procedure will define: i) the applicable labor or participation modality; ii) the responsible contracting or implementing entity; iii) the expected scope of work; iv) duration and working schedule; v) remuneration, compensation or voluntary nature of the activity, as applicable; vi)

OHS requirements; vii) PPE obligations; viii) insurance or applicable protection measures; ix) code of conduct requirements; and x) GRM access.

For paid restoration work, contractor-led activities and sub-grantee implementation, the project will require written documentation that clearly defines the relationship between the worker or community participant and the entity responsible. Where a standard employment contract is not the legally or operationally appropriate instrument, CI Colombia will review and validate an alternative documented mechanism under Colombian requirements that provides equivalent clarity on work conditions, payment terms, OHS obligations, and grievance access. The use of undocumented verbal arrangements for project-supported paid work will not be permitted.

Where voluntary participation is proposed, the project will ensure that volunteering is genuine, free, informed, non-coercive and not used to replace paid labor. Voluntary arrangements will be documented through a simple participation form or equivalent record, confirming the voluntary nature of the activity, expected tasks, duration, OHS provisions, PPE requirements, right to withdraw, and access to the GRM. Voluntary participation will not be used for activities that are functionally equivalent to paid restoration labor or that involve material occupational risks without appropriate safeguards.

The extent of community restoration labor will be further clarified in the relevant ESMP implementation sections and in activity-level work plans. Prior to implementation, the PMU and safeguards team will identify which activities are expected to involve community labor, contractors, sub-grantees or volunteers, and will maintain a labor modality register for monitoring purposes.

8.3.2 Contractual and Sub-grantee Requirements

All contractors, sub-grantees and implementing partners involved in restoration, conservation, field implementation or community labor arrangements will be required to comply with the project's labor-management requirements. Their agreement will include provisions on:

- Clear documentation of worker or participant conditions.
- Prohibition of child labor and forced labor.
- Non-discrimination and equal opportunity.
- Equal remuneration for work of equal value.
- Safe working conditions and provision of PPE at no cost to workers.
- Mandatory induction and OHS training before field deployment.
- Code of conduct compliance, including GBV and SEAH prevention.
- Access to the project GRM.
- Record keeping and reporting obligations.
- Corrective actions in the event of non-compliance.

Contractors and sub-grantees will be required to maintain records of worker rosters, payment evidence, signed codes of conduct, OHS induction records, PPE delivery, toolbox talks, incidents, corrective actions and GRM dissemination. These records will be reviewed periodically by the PMU and safeguards team.

8.3.3 Equal Pay and Employment Conditions Enforcement

The project recognizes gender-related risks associated with unequal pay, informal labor practices and differentiated employment conditions, particularly in rural contexts where community-based labor arrangements and short-term field activities are common. In response, the ESMP establishes explicit measures to ensure that all project-related labor practices are aligned with principles of equal remuneration, non-discrimination and fair working conditions.

All executing entities, contractors, sub-grantees and implementing partners involved in project activities shall comply with the principle of **equal pay for work of equal value**, in accordance with national labor legislation and applicable International Labour Organization (ILO) conventions. This principle applies to all categories of workers, including direct workers, contracted workers, community-based labor, and personnel engaged through sub-grants or field implementation arrangements.

The project's institutional framework is supported by Conservation International's internal policies, including its **Remuneration Policy** (*Política de Remuneración*), which establishes transparent and standardized compensation structures, promotes equal opportunity, and prevents discriminatory practices in remuneration and employment conditions.

To operate these principles within the project context, the ESMP includes the following enforcement mechanisms:

- **Standardized documentation of labor conditions:** All labor arrangements must clearly define remuneration or compensation conditions, scope of work, working hours and applicable benefits, in line with Section 8.3.1.
- **Contractual enforcement:** All contracts and sub-grant agreements must include explicit clauses requiring compliance with equal remuneration, non-discrimination and fair employment conditions, as established in Section 8.3.2.
- **Verification of labor practices:** Contractors and sub-grantees must maintain verifiable records, including payroll documentation where applicable, worker registries and evidence of compliance with agreed compensation terms. These records will be subject to periodic review by the Project Management Unit (PMU) and safeguards team.
- **Integration with safeguard instruments:** Equal pay and non-discrimination principles are reinforced through the Gender Action Plan (GAP) and monitored through the ESMP indicators and reporting system.
- **Corrective measures:** Any identified breaches related to unequal pay, discriminatory practices or non-compliance with agreed employment conditions will trigger corrective actions, including contractual remedies and, where necessary, suspension of activities or agreements.

These provisions are particularly relevant in community-based and decentralized implementation contexts, where the project ensures that informal or ambiguous labor arrangements do not result in unequal or unfair treatment of workers, especially women and vulnerable groups.

Labour Management and Monitoring Matrix

Identified Risk	Risk Level	Mitigation Measure
Field/Biological Accidents	Moderate	Implementation of OHS protocols according to ESS 7 (page 169), including mandatory safety training and provision of PPE.
Supply Chain Breaches	Moderate	Mandatory screening of primary suppliers' fundamental rights and inclusion of remedial clauses in contracts per ESS 7 (page 172).

Inappropriate Conduct	Moderate	Strict enforcement of GBV and SEAH prevention policies. Integration of the Grievance Redress Mechanism (AGM) equipped with specific, confidential procedures for the safe and ethical handling of GBV/SEAH cases, including follow-up and redress modalities for survivors.
Health and safety risks (PPE): Non-use of protective equipment by subcontracted field personnel.	Moderate	Safety Protocols: Mandatory use of PPE and training in occupational health and safety (OHS).
Use of voluntary participation in a manner that could substitute for paid labor.	Moderate	Voluntary participation will only be accepted where it is genuine, informed, non-coercive, documented and not equivalent to paid labor. Voluntary participants will receive OHS orientation, PPE where required, and GRM access.
Limited access to GRM by community workers due to literacy, digital, geographic or social barriers.	Moderate	The GRM will include oral grievance intake through trained field staff or safeguards/social personnel. GRM information will be provided during inductions, toolbox talks and community meetings. Complaints may be submitted confidentially and without retaliation.
Non-compliance by contractors or sub-grantees with labor documentation and OHS requirements.	Moderate	Labor clauses will be included in contracts and sub-grant agreements. Contractors and sub-grantees must maintain worker records, payment evidence, PPE records, induction records and GRM dissemination evidence. The PMU and safeguards team will conduct periodic verification.
Unequal pay or inconsistent remuneration practices, particularly among contractors and sub-grantees	Moderate	Enforcement of equal pay for work of equal value across all workers, including contractors and sub-grantees, through contractual clauses, standardized documentation, verification of labor practices, and corrective actions as detailed in Section 8.3.3

Note: Accountability. All workers have the right to use the project-level Grievance Redress Mechanism (GRM) to report any breaches of labor rights or inappropriate behavior without fear of retaliation, through CI's established confidential channels.

Indicators

Indicator	Justification	Target
ESS071: Percentage of measures implemented to address the gaps identified during the ESS screening on the minimum requirements for working and labor conditions.	This captures the project's compliance with ILO principles, the delivery of PPE at no cost, and the enforcement of non-discrimination policies.	100% implementation of mitigation measures
Percentage of workers and community participants receiving GRM information before starting activities.	Ensures that all workers, including community participants, know how to submit grievances safely and without retaliation.	100% of workers and community participants informed of GRM channels before starting work.
Percentage of contractors and sub-grantees with labor clauses and GRM	Ensures flow-down of labor conditions requirements to	100% of relevant contracts and sub-grants

access requirements included in agreements.	third parties implementing field activities.	include labor and GRM clauses.
Percentage of workers (including community-based labor) with documented remuneration conditions aligned with equal pay principles.	Ensure that all labor arrangements are formalized and that equal remuneration is applied consistently across genders and labor modalities.	100% of workers and community participants have documented and verified compensation conditions.

Functions and responsibilities.

Position	ESMP Responsibility
Safeguards Manager	Oversees the enforcement of SEAH (Sexual Exploitation, Abuse, and Harassment) and GBV (Gender-Based Violence) policies. Ensures the integration and accessibility of the Policy 4 Grievance Redress Mechanism (EthicsPoint) for all workers.
Security Specialist	Establishes and maintains Occupational Health and Safety (OHS) measures and identifies potential hazards. Ensures the provision of Personal Protective Equipment (PPE) at no cost and manages emergency preparedness and response arrangements.
Grants and Contracts Manager	Conducts mandatory screening of primary suppliers regarding fundamental rights. Includes remedial clauses in contracts to ensure zero tolerance for child or forced labor per ESS 7 standards.
Safeguards Specialist	Implements OHS protocols in the field, including mandatory safety training and active safety supervision of activities. Verifies that all recruitment and hiring practices follow non-discrimination and equal opportunity principles.
M&E Coordinator	Monitors performance indicators, including the rate of field activities under OHS supervision and supply chain incident reports. Verifies that 100% of project personnel have signed the mandatory Code of Conduct.
Project Leader / Component Directors	Maintains high-level commitment to the ILO Declaration on Fundamental Principles and Rights at Work. Ensures all personnel are provided with clear documentation of employment terms, wages, and leave.
All Project Personnel	Responsible for strictly adhering to the project's Code of Conduct and OHS protocols. Retain the right to report breaches of labor rights through confidential grievance channels without fear of retribution.

1.1. Process Framework for the Restriction of Access to and Use of Natural Resources (ESS3)

1. Project background and paradigm shift

The ultimate objective of the project is to increase water resilience in the Bogotá region by demonstrating

the viability of mobilizing large-scale financing through quantifiable Volumetric Water Benefits (VWBs). The project logic is designed to overcome dependency on traditional short-term grants. Component 1 provides a robust proof of concept at the plot and watershed scale through Ecosystem-based Adaptation (EbA) and productive transformation. The true paradigm shift lies in Component 2, which uses this evidence to activate long-term financial mechanisms, such as an environmental investment component in the water tariff and private-sector investment to compensate. Therefore, any grant awarded under Component 1 must be strictly justified as an integral part of future private-sector funding and water tariffs, constituting the only acceptable exit strategy and mitigating external dependency.

The selection of watersheds in the upper Bogotá River area—including vital reservoirs such as Tominé and Neusa, which were fundamental during the 2024 Chingaza water shortage—was based on a rigorous multicriteria assessment. The decisive factor was the capacity to address climate vulnerability, evidenced by shifts in temperature and precipitation patterns that alter evapotranspiration and runoff regimes while exacerbating both drought risk and high-flow events.

2. Implications and Risks (ESS3)

The project does not contemplate involuntary physical resettlement under any circumstances. However, the implementation of conservation measures and new water regulations will generate temporary impacts and opportunity costs for resource users:

- **Economic Displacement:** Management decisions regarding land or water use could limit access, causing economic displacement for small-scale farmers and requiring direct compensation.
- **Legal Insecurity:** The lack of clear land titles or overlapping boundaries may generate social conflicts and legal disputes regarding traditional land use during execution.
- **Regulatory Tensions:** Incipient conflicts originating from restrictions on traditional access and extraction rights within conservation zoning at the farm level.

Sub-category	Identified Risk	Risk Level	Mitigation Measure
Access restriction	Tensions due to water use regulations affecting traditional rights	Moderate	Apply Process Framework; ensure participatory planning and recognition of traditional access rights
Livelihoods	Voluntary restrictions on access to land or natural resources under Payment for Conservation agreements	Moderate	Implementation of voluntary Payments for Conservation agreements with benefit-sharing mechanisms, livelihood restoration measures, application of the Process Framework, and continuous monitoring of affected livelihoods.
Land tenure	Legal insecurity and land tenure conflicts	Moderate	Conduct tenure validation; require boundary agreements before intervention

The restriction of access to resources has a disproportionate impact on historically disadvantaged or vulnerable groups, to whom specific protection protocols are directed:

- Rural Women: They face barriers such as "time poverty" (high unpaid care burdens) and low or non-existent formal land ownership. The framework will mitigate this by ensuring their status as de facto users grants them the same right to compensation and by involving them at the household level in decision-making.
- Indigenous Peoples (Muisca Community in Sesquilé): Although the operational polygon does not directly overlap with the project, intervention landscapes interact with their ancestral "broad territory".
- Youth, Elderly, and Migrants: Specific risks of isolation during disasters, forced migration due to a lack of rural economic incentives, and information barriers will be addressed.

Economic Displacement, Conservation Agreements, and Livelihood Restoration (ESS3)

The project recognizes that the implementation of Activity 1.1.1, 1.1.2 and 1.2.1 introduce voluntary restrictions on access to land, water or natural resources currently used by participating smallholders.

These restrictions are expected to be site-specific, limited in scale and based exclusively on voluntary participation. The project does not involve physical displacement and will avoid involuntary economic displacement.

To ensure compliance with ESS3, all restrictions will be implemented through voluntary Conservation Agreements, Climate Resilient Farm Agreement⁵ that include clearly defined benefit-sharing and livelihood restoration measures. These agreements will be based on free, prior and informed consent and will transparently define obligations, benefits, duration and grievance mechanisms. Conservation Agreements will take place as a previous step to access the Payments for Conservation.

The project will ensure that any restriction of access to natural resources is accompanied by compensation mechanisms that offset or exceed potential economic impacts. These mechanisms may include direct incentives (access to payments for conservation), technical assistance, climate-smart agriculture practices, productivity improvements, diversification of income sources, and improved access to ecosystem services and water resources.

A Process Framework will be applied in all cases where voluntary economic displacement may occur. This framework will include identification of affected participants, assessment of impacts, definition of livelihood restoration measures, formalization of agreements, monitoring of outcomes, and implementation of corrective actions if necessary. This will be done at the farm-level.

⁵ Climate-Resilient Farm Agreements – These agreements cover productive transformation and restoration activities. Landowners receive in-kind support, including goods and inputs, as well as technical assistance. Land-use and natural resource restrictions are defined in a farm plan, where production and conservation areas are jointly agreed upon with the family.

Livelihood restoration are embedded into the project activities and will be designed proportionally to the level of restriction and will aim to ensure that affected individuals are not worse off and, where possible, improve their socio-economic conditions.

The project further clarifies that restrictions are not expected to be widespread, as interventions are based on voluntary participation, localized implementation and plot-level agreements. This approach limits the scale of potential impacts and ensures that ESS3 risk levels remain within the current project categorization.

All agreements will be documented and monitored, and any concerns related to access restrictions or livelihood impacts will be addressed through the project-level Grievance Redress Mechanism (GRM).

The Process Framework is a core operational tool to ensure that all voluntary restrictions associated with Conservation Agreements are properly assessed, compensated and monitored.

3. Process Framework for Voluntary Economic Displacement

To manage cases where voluntary restrictions on access to land, water or natural resources may result in economic impacts, the project will implement a structured Process Framework aligned with ESS3 requirements.

The Process Framework will be triggered whenever a Conservation Agreement or Climate Resilient Farm Agreement introduces restrictions that may affect the income, production systems or resource access of participating households. The framework operates through the following steps:

I. Screening and Identification

Prior to signing any agreement, the project will screen each intervention landscape to determine whether proposed restrictions may affect current land or resource use. This includes identification of affected individuals, types of restriction (e.g. land use change, exclusion from certain activities, water use limitations), and potential livelihood implications.

II. Participatory Impact Assessment

A participatory assessment will be conducted with the affected household or producer to evaluate the magnitude and type of economic impact. This will include analysis of current productive activities, dependence on restricted resources, and potential income loss or opportunity cost.

III. Definition of Livelihood Restoration Measures

Based on the assessment, the project will define tailored livelihood restoration measures proportional to the level of impact. Productive transformation actions are designed to ensure reliable water availability and efficient use, reduce dependence on external inputs, support the production of food for household

consumption, promote market-oriented production, and stabilize the economic income of rural households. These may include:

- financial incentives through Payments for Conservation schemes
- technical assistance for production improvement
- transition to climate-smart agriculture
- diversification of income sources
- support for alternative productive activities
- improved access to water and ecosystem services

IV. Agreement Formalization

All measures will be clearly documented within the Conservation Agreement and/or Climate Resilient Farm Agreement, including:

- Compensation and benefits, value and payment modality (cash or in-kind) Access to the GRM, dispute resolution mechanisms
- Scope of the area covered
- Commitments of the beneficiaries and the executing entity
- Duration of the agreement
- Monitoring and follow-up arrangements
- Complementary actions (e.g., restoration inputs, training on sustainable production)
- Grounds for termination
- Property rights

Participation will be based on free, prior and informed consent provided by household members at the farm level, ensuring that no agreement is imposed on participants.

V. Implementation and Monitoring

The project will monitor implementation of both restrictions and livelihood restoration measures. Monitoring will include periodic verification of:

- compliance with agreements
- delivery of compensation measures
- performance of alternative livelihood activities

VI. Verification of Livelihood Restoration

Verification of livelihood restoration will be supported through gender-responsive monitoring tools, including periodic household surveys (shared with the surveys to monitor the GAP). These surveys will incorporate targeted questions to assess changes in income, access to resources, decision-making power, and perceived well-being, disaggregated by sex. Indicators proposed are as follows:

- Percentage of persons (disaggregated by gender) who report that their household is not worse off after implementation of agreements
- Percentage of persons (disaggregated by gender) reporting stable or improved income compared to baseline
- Number and percentage of persons (disaggregated by gender) who received livelihood restoration benefits (disaggregated by type)
- Percentage of persons (disaggregated by gender) who report adopting improved productive or climate-resilient practices
- Percentage of women with increased access to productive assets (land, water, inputs) as a result of the project
- Percentage of women who have control over productive assets and/or income generated through project-supported activities
- Percentage of consultation participants who report that their views and recommendations were incorporated into agreements
- Number of persons voluntarily economically displaced and percentage effectively compensated through livelihood restoration measures
- Percentage of women who report greater autonomy over their use of time as a result of project-supported activities

Baseline and follow-up data will be used to verify that affected individuals, particularly women, are not worse off as a result of voluntary restrictions and that livelihood restoration measures are equitable and effective.

VII. Corrective Actions

If monitoring identifies that livelihood restoration objectives are not being achieved, corrective measures will be implemented. These may include:

- adjustment of compensation mechanisms
- additional technical assistance
- modification of agreement terms
- temporary suspension or redesign of restrictions

These steps ensure that the Process Framework is not only a procedural tool, but an operational mechanism that guarantees that voluntary restrictions do not result in unmitigated economic impacts.

The GRM will be available at all stages of the process to address concerns related to agreements, restrictions, compensation or livelihood impacts.

4. Participation and Consultation Process

Any restriction generating economic displacement will be negotiated through a rigorous process of participation and consultation:

1. Inclusive Recognition: Exhaustive mapping of land users (including those with formal tenure as well as informal, customary, and seasonal occupants), granting compensation rights to de facto users.
2. Muisca Protection: Interactions in Sesquilé will follow the Indigenous Peoples Plan (IPP). Respect for the Muisca spiritual calendar, ritual routes to sacred sites (Piedra del Sapo, La Chorrera), and the non-commodification of traditional agrological knowledge without explicit FPIC will be ensured.

5. Mitigation, Compensation, and Benefits

The primary mechanism to mitigate opportunity costs will be voluntary Conservation Agreements, which will provide sustainable economic alternatives aimed at improving livelihoods:

- Resilient Productive Practices: Implementation of silvopastoral systems to replace high-impact dairy production, introduction of agroecological practices in traditional potato crops, and modernization of community aqueducts for water efficiency.
- Market Development (Component 1.2.2): Technical assistance to open commercialization channels and develop resilient business models through local producer associations.
- Connection with Component 2 (Financial Sustainability): The economic support received by communities will not be temporary. To ensure payments continue after the project ends, funding will come from two stable sources: the new environmental fee in the Bogotá Water Utility tariff and investments from private companies interested in water stewardship. Thus, initial aid will transition into a constant long-term income.

6. Normative Framework and Community Monitoring

Based on the premise of co-management and territorial governance:

- Community Design: Rules for delimitation, access to restored areas, water use, and agricultural schedules will be established directly by the communities, respecting their customary and organizational dynamics (e.g., Community Action Boards).
- Sanctions System: Vertical punitive approaches are rejected. Any penalty for non-compliance with Conservation Agreements will be jointly constructed, culturally appropriate, and primarily executed through conditional adjustments to the benefit package provided.

7. Grievance Redress Mechanism (GRM)

To ensure the integrity of this Process Framework, a structured Grievance Redress Mechanism (GRM) will be established:

- It will provide an independent, free, and confidential platform to resolve local disputes regarding boundaries, exclusion from benefits, or conflicts over use rights.
- It will feature specialized, safe, and survivor-centered routes for reporting Gender-Based

Violence (GBV) and Sexual Exploitation, Abuse, and Harassment (SEAH), ensuring that all subcontracted personnel act under strict codes of conduct and the "do no harm" principle.

The project GRM is explicitly designed to be accessible, inclusive and tailored to vulnerable and disadvantaged populations. It incorporates multiple accessibility measures and differentiated procedures to ensure that all stakeholders, including women, smallholder farmers, community-based organizations and other vulnerable groups, can effectively submit grievances and receive appropriate responses.

The GRM provides multiple accessible channels, including institutional platforms, community-level support, and facilitated submission during field activities, ensuring that barriers related to literacy, connectivity or mobility are minimized. It allows for anonymous submissions, guarantees confidentiality and protection against retaliation, and ensures that grievances can be submitted verbally with support from trained project staff, enabling access for individuals with limited literacy or formal access to digital tools.

Additionally, the project will implement a dedicated WhatsApp-based channel as a complementary intake mechanism, designed to facilitate rapid and user-friendly access for rural populations. This channel will be operated under protocols that ensure secure handling of personal data, the possibility of anonymous or confidential reporting, and the formal registration and traceability of each grievance within the GRM system, guaranteeing follow-up and resolution in accordance with established procedures.

To ensure inclusion, the mechanism incorporates adapted communication and outreach strategies, including the use of simple language, visual materials, oral explanations, and targeted engagement with vulnerable groups such as women, youth and community organizations.

The GRM will also be available to address grievances related Conservation Agreements and potential impacts on access to land, water or natural resources.

Together, these measures ensure that the GRM is not only available, but functionally accessible, trusted and responsive to the needs of vulnerable populations throughout the project lifecycle.

Potential Impacts of Improved Water Management and Support to the Development of Studies to Implement a Water tariff for Environmental Investments in Bogotá

Activity 1.2.3 supporting community-run water supply systems (acueductos veredales):

For activity 1.2.3 under which the project will support acueductos veredales, given the in-kind and demand-driven nature of this grant window, all technical specifications and final equipment configurations will be defined only after completion of the diagnostic and intervention planning phases, ensuring full alignment with system-level needs, grant eligibility conditions, and long-term operational sustainability.

A diagnostic assessment will be conducted prior to installation to:

- Identify eligible "Acueductos veredales"
- Define technical requirements and installation points

- Assess operational capacity and training needs

Social and institutional considerations

The intervention has been designed to avoid negative impacts on communities and ensure feasible adoption in rural contexts where metering practices are not commonly implemented. Key considerations include:

- No direct impact on end-users: As macro metering operates at system level, it does not affect household-level billing or access to water
- Community-based operation model: Local water boards and operators (plumbers) will be trained as first-line operators for system monitoring and basic maintenance
- Capacity building: A specialized consulting firm will deliver targeted training to support system operation, interpretation of data, and basic response actions (e.g., leak detection)
- Potential indirect cost implications: While the intervention does not introduce direct tariff-setting mechanisms, there is a potential for indirect financial implications at the system level, particularly associated with operation, maintenance, calibration, or eventual replacement of equipment. These costs could, over time, influence system-level financial management decisions, including tariffs, depending on the governance arrangements of each community water provider. To mitigate this risk, the project incorporates:
 - o Diagnostic assessments and intervention planning to ensure that only technically and financially viable solutions are selected, aligned with the operational and financial capacity of each system.
 - o Assessment of recurrent costs and sustainability, including maintenance requirements, as part of the intervention plans developed under Grant Window C.
- Safeguards screening processes, as established in the Grants Manual, which will be applied during beneficiary selection and intervention prioritization to identify and mitigate any potential adverse social or economic impacts prior to implementation.

Behavioral adaptation: Where needed, simple procedures for water-use optimization and system management will be introduced gradually through training and operational guidance

- Grievance management: Any concerns associated with system implementation, performance or management will be addressed through the project-level GRM, under the coordination of Fondo Acción

Overall, the macro-metering component and other eligible interventions under Sub-Activity 1.2.3.1 are conceived to not causing negative impacts via tariff increase for rural households . The macro-metering component is conceived as a non-intrusive, system-level intervention aimed at improving water resource efficiency and operational management without altering existing user-level service conditions. As the intervention does not involve household-level metering, it is not linked to tariff-setting mechanisms or

billing structures, which remain governed by the applicable regulatory frameworks and existing institutional arrangements. The approach prioritizes operational transparency, loss reduction and improved system performance while maintaining current access conditions for end-users. In addition, the project will, where technically and operationally feasible, assess the incorporation of small-scale drinking water quality improvement measures at the system output level, through decentralized or modular technologies, rather than centralized treatment plants, ensuring adaptability to rural contexts and compatibility with existing infrastructure. This integrated approach allows the project to strengthen water management capacity at the community level while minimizing social risks and ensuring that technical solutions remain context-appropriate, scalable and aligned with local institutional realities. For further details refer to the section on Resource Efficiency and Pollution Prevention.

Activity 2.1.1- Incorporate an environmental investment component into the water tariff for Bogota city:

This activity supports the development of the tariff-based pathway through which the water facility of the city of Bogota (EAAB) may recover the cost of additional environmental investments linked to the protection of watersheds and water sources. The legal basis is the specific regulatory architecture formed by Article 164 of Law 142 of 1994, Decree 1207 of 2018, Resolution 874 of 2018 and Resolution CRA 1032/2026 (CRA, 2026) (Ministerio de Vivienda, Ciudad y Territorio, 2018a) (Ministerio de Vivienda, Ciudad y Territorio, 2018b). Under that framework a utility may incorporate into the water tariff the costs of eligible categories of additional environmental investments provided the investments are technically attributable to source-water protection, are not double-counted with other tariff components, and are documented and reported in the form the regulator requires.

The activity is organized into three sub-activities. Sub-activity 2.1.1.1 builds the technical evidence base, the indicators, methodologies and costed Watershed Investment Portfolio that demonstrate the cost-effectiveness of the investments. Sub-activity 2.1.1.2 operationalizes the reporting architecture that places that evidence before CRA (the regulator) in the form the regulation requires, and that documents the results of EAAB's co-financed interventions over time. Sub-activity 2.1.1.3 turns the resulting experience into a replication package so that other utilities in the Bogotá Region, including those that cannot follow the tariff route, can finance equivalent watershed protection through the tariff or complementary channels. The project will not directly support the implementation of the tariff-based pathway through which the water facility of the city of Bogota (EAAB) may recover the cost of additional environmental investments linked to the protection of watersheds and water sources, but will support the development of key technical studies that are enabling conditions for it to happen. The activity does not affect rural aqueducts, but only the water facility of Bogota city.

In Colombia, water tariff regulation and social safeguards are heavily structured around the national Socioeconomic Stratification System, protecting the most the poorest socioeconomic groups, using a cross-subsidization model, with households in strata 1, 2 and 3, receiving tariff subsidies, which are funded by strata 5 and 6. The city of Bogota also implements the "Minimum Water Vital", providing a basic consumption amount for households in stratum 1 and 2, free of cost. All of these protection measures will be applicable to any changes in tariffs, as reflected in the following regulations:

- Political Constitution of Colombia (Art. 367): Establishes that tariff regimes for public services must incorporate principles of solidarity and income redistribution, alongside cost recovery criteria.
- Law 142 of 1994 (Art. 87): Defines the tariff regime principles, including efficiency, neutrality, solidarity, income redistribution, financial sustainability, simplicity, and transparency.
- Law 142 of 1994 (Art. 87.3): Establishes the principle of cross-subsidization, whereby higher-income users and commercial/industrial sectors contribute to financing access for lower-income households.
- Law 142 of 1994 (Arts. 99 and 99.7): Mandates direct subsidies for residential users in strata 1 and 2, and potentially strata 3, reducing the effective tariff burden for vulnerable households.
- Law 142 of 1994 (Art. 99.9): Provides criteria for prioritizing national and subnational subsidies toward municipalities with limited fiscal capacity.
- Law 142 of 1994 (Arts. 2.2 and 2.9): Establishes that State intervention must ensure affordability mechanisms and proportional tariff regimes for low-income users.
- Regulatory tariff methodologies (Law 142, Arts. 73.11, 86, and 88.1): Tariffs must follow formulas defined by Regulatory Commissions, ensuring that increases are not discretionary and incorporate subsidy/contribution schemes based on socioeconomic strata.
- Tariff structure safeguards: The final tariff paid reflects consumption, reference tariff, and subsidy/contribution percentage, ensuring reduced effective payments for vulnerable households.
- Supervision and control (SSPD – Art. 79): The Superintendence of Public Utilities exercises inspection, surveillance, and control, including verification of proper subsidy allocation and regulatory compliance.
- Transparency provisions (Law 142, Art. 87.6): Require that tariff structures be explicit, public, and accessible, strengthening accountability in tariff adjustments.
- Citizen participation mechanisms (Law 142, Arts. 2.8 and 63.4): Establish Social Control and Development Committees, enabling communities to oversee subsidy allocation and tariff decisions.
- CRA Resolution 1032 of 2026: Incorporates affordability considerations, transparency, regulatory oversight, and social inclusion principles in tariff-setting for water and sanitation services, including the integration of environmental investments through the Water Sustainability Plan (PSH).

Environmental investment controls (CRA Resolution 1032 of 2026): Require technical justification, planning (PSH), and regulatory oversight (SSPD) for investments incorporated into tariffs, ensuring accountability in tariff changes. Together, these provisions ensure that any tariff adjustments remain governed by robust affordability safeguards, regulatory oversight, and redistribution mechanisms that protect vulnerable populations.

Furthermore, any modification of the water tariff is not a decision taken unilaterally by the utility's management: under Colombian law it must be approved by EAAB's Board of Directors (Junta Directiva). The Board is composed of nine members and, in accordance with Law 142 of 1994 and the utility's bylaws (Marco Estatutario, Board Agreement No. 05 of 2019), three of them — one third of the Board — are vocales de control, that is, representatives of the users elected through the Comités de Desarrollo y Control Social de los Servicios Públicos Domiciliarios. Water users therefore hold seats, with voice and

vote, on the very body that must approve any tariff change, as was the case for the most recent tariff update adopted through Board Agreement No. 208 of 28 February 2025. The presence of user representatives in tariff decision-making constitutes an additional, institutionalized safeguard against decisions that could disproportionately affect households, and ensures that any incorporation of an environmental investment component into the tariff is subject to social oversight before it can take effect.

Moreover, the magnitude of the tariff effect associated with EAAB's environmental investment in the Susagua watershed is not expected to be significant. The total investment is approximately USD 5.84 million (about COP 21,608 million at 3,700 COP/USD), executed over a three-year period. Under the CRA methodology (Resolution CRA 907 of 2019, Articles 55.E–55.F), the environmental investment enters the tariff through a unit investment cost (CMIP) equal to the annual investment cost — straight-line depreciation plus a regulated return on the asset base — divided by the volume of water consumed, corrected for losses. Because restoration and productive-reconversion interventions, which represent about 84% of the investment, are classified as "forest plantation" assets with a 30-year regulated useful life, the cost is spread thinly over time. Applying the methodology to EAAB's 2024 metered consumption of approximately 299 million m³ per year (EAAB Sustainability Report 2024), the resulting CMIP is on the order of COP \$10 (aprox 0.0030 USD) per m³ in the first year of application — when the recoverable cost is highest — and declines thereafter. This is equivalent to roughly 0.4–0.5% of the current unsubsidized, non-surcharged variable (consumption) charge of COP 2,268.44 per m³ (Estram 4, Board Agreement No. 208 of 2025). An increment of well under one percent of the variable charge, applied only to the consumption component and operating on top of the cross-subsidy and Minimum Vital Water protections already described, confirms that the activity does not entail a material affordability impact for users, including the most vulnerable socioeconomic groups.

The regulations and protections in place, make the risk of disproportionate negative impacts for vulnerable socioeconomic groups minimum. The project, under the scope of the enabling activities that will be supported to enable this pathway, will:

- 1) Engage with the regulatory authorities frequently to ensure any technical studies, including the cost-effectiveness ones, are aligned with the regulations in place.
- 2) Ensure that the methodology proposed and indicators to be developed and monitored, incorporate socioeconomic dimensions, not just environmental and hydrological ones.

With this and the robust regulatory framework in place, the environmental and social risks associated to this project activity, considering its scope, are minimum to low.

In order to further strengthen affordability safeguards, the enabling studies to be supported under Activity 2.1.1 will explicitly include affordability and distributional analysis by socioeconomic stratum, building on Colombia's existing cross-subsidy and Minimum Vital Water schemes. Where any potential affordability risks for vulnerable users are identified, the studies will assess options within the existing tariff framework to refine subsidy parameters or introduce additional concessionality mechanisms, in coordination with CRA, SSPD and user representatives on EAAB's Board of Directors. These requirements, combined with the small expected magnitude of the environmental-investment component and the existing legal protections, confirm that residual affordability risks for low-income households remain minimal to low.

Responsibilities and roles

Position	ESMP Responsibility
Safeguards Manager	• Overall responsibility for ensuring compliance with GCF ESS, CI ESMS, and the project's ESMF, including economic displacement and voluntary agreement safeguards • Ensure that conservation agreements, PES schemes, and other voluntary mechanisms are designed and implemented on a fully voluntary, transparent, and informed basis • Identify and oversee mitigation of economic displacement risks, including restrictions on access to land or natural resources • Ensure that livelihood impacts are avoided, minimized, or mitigated, and that support measures are in place where needed • Supervise the functioning of the GRM and ensure quality, consistency, and safeguards compliance • Provide technical guidance on safeguards-related grievances and ensure appropriate classification and escalation • Oversee handling of high-risk and sensitive cases, ensuring alignment with GBV/SEAH protocols and “do no harm” principles • Consolidate GRM data and contribute to semi-annual and annual reporting to the GCF
GRM Focal Points (Project Safeguards Expert + trained staff)	• Operate the project GRM as an accessible and confidential channel for affected stakeholders • Register, screen, and categorize grievances (including those linked to livelihood impacts or agreements) • Ensure timely processing and referral to appropriate resolution levels • Act as safe entry points for GBV/SEAH-related cases, following survivor-centered approaches • Maintain data confidentiality and ensure traceability of cases
Grievance Mechanism Committee (CI Colombia)	• Review and resolve escalated grievances, including those related to: ◦ Access restrictions or livelihood impacts ◦ Voluntary agreements and benefit distribution • Define corrective actions and monitor implementation • Ensure compliance with CI policies, GCF ESS, and Gender Action Plan • Analyze trends and recommend improvements to project design
Project Management Unit (PMU) / Project Leadership	• Ensure that ESS requirements (especially ESS5) are embedded in project planning, budgeting, and implementation • Allocate resources for livelihood safeguards, community engagement, and GRM operation • Ensure that corrective actions related to access restriction or livelihood impacts are implemented in a timely manner • Coordinate with government and partners to ensure legal compliance and institutional alignment

Position	ESMP Responsibility
	Oversee reporting on safeguards performance to GCF (APR, ESS reporting)
Implementing Partners and/or sub-grantees	- Implement voluntary agreements ensuring: - Full understanding of terms by participants - Free, prior, and informed participation - Clear communication of rights, benefits, and obligations - Monitor and report livelihood impacts, access restrictions, and unintended economic effects - Support design and delivery of livelihood support and benefit-sharing mechanisms - Facilitate access to the GRM and ensure complaints are properly referred - Ensure contractors comply with safeguards and Code of Conduct obligations
Public Authorities (EAAB, SDA and other competent entities)	- Ensure alignment of project activities with national regulations on land use, public services, and environmental management - Participate in oversight of conservation agreements and PES implementation - Support resolution of grievances related to land use, tariffs, and environmental restrictions - Provide enforcement and institutional response where required - Ensure consistency with public policy and regulatory frameworks
Field Teams	- Conduct community consultations and participatory processes for voluntary agreements - Ensure that all participants clearly understand agreements and that participation is voluntary and documented - Identify and report early risks of economic displacement or reduced access to resources - Support vulnerable groups (women, indigenous peoples, smallholders) to ensure equitable participation - Facilitate access to the GRM and support grievance submission (oral, written, anonymous) - Ensure culturally appropriate engagement and trust-building

8.4 Environmental and Social Management System (ESMS) for Sub-grantees and the Financial Mechanism development

Sustainability commitment and regulatory framework

This project is fully committed to adhering to the Environmental and Social Management System (ESMS) established under Conservation International (CI) standards. This framework ensures that all investments, subprojects, and activities mobilized under the financial component operate to the highest

sustainability standards, strictly complying with Environmental and Social Standard 9 (ESS 9: Private Sector Direct Investments and Financial Intermediaries).

Implementation structure

The ESMS adopted by the project serves as a strategic and preventive management tool is CI Safeguards System. The responsibility for environmental and social (E&S) assessment, risk management, and monitoring will be flowed down by CI Colombia to sub-grantees.

In cases where a different organization is in charge of the due diligence, the following steps are mandatory during the selection process or once the entity is selected:

- ESS Capacity Assessment: To verify that the entity has the necessary personnel, systems, and track record for effective implementation.
- Gap Analysis (Comparative Analysis): A detailed study comparing the third party's ESMS with the CI-GEF/GCF ESMF to ensure there are no gaps in protection standards.

Critical Components of CI's ESMS

The system has the following core components:

- Policy on Environmental and Social Safeguards: Articulates E&S commitments and states the requirements and standards that apply to the financial mechanism's lending or investment activities.
- Procedures to identify, monitor, and supervise risks: A structured process to identify subproject E&S risks and impacts, including a risk classification system (High, Medium, or Low).
- Subproject/sub-grantees due diligence: responsibility for the E&S risk and impact assessment of its subprojects and sub-grantees. CI periodically reviews the results of this due diligence and the overall effectiveness of the ESMS.
- Management programs and mitigation hierarchy: Measures and actions that address identified subproject risks consistent with the mitigation hierarchy (avoid, minimize, mitigate, and offset).
- Organizational capacity and competency: Designated personnel with E&S responsibilities and the expertise to ensure effective implementation across the organization.
- Monitoring and Reporting: Procedures to measure the effectiveness of the management program. The mechanism must submit annual E&S reports to CI on the implementation of its ESMS.

The project will support the design of a financial mechanism, but it will not flow down GCF resources through it. Nevertheless, while designing the mechanism, the project will embed environmental and social safeguards procedures into its operational framework.

8.4.1 Flow-down of ESMS, Gender and SEAH requirements to sub-grantees and Payment for Conservation arrangements

Under this project, safeguard requirements are not implemented through sub-granting arrangements. Instead, they are operationalized through a structured framework of institutional agreements with the Secretaría Distrital de Ambiente (SDA) and binding conservation and Payment for Conservation agreements with participating households.

This approach ensures the effective application and enforcement of environmental, social, gender, and SEAH requirements across all levels of implementation, consistent with Conservation International's Environmental and Social Management Framework (ESMF) and the project's Process Framework. Details on procedures for subgrantees are described in the Grants Manual.

This approach is based on Conservation International's ESMF and is operationalized through legally binding agreements, standardized grant conditions and supervision procedures, ensuring that safeguard requirements are not only defined at project level but effectively transferred and enforced across all levels of execution.

Under this framework, all sub-grantees and implementing entities are contractually required to comply with:

- The Environmental and Social Management Plan (ESMP) and all applicable instruments derived from the ESMF
- The Gender Action Plan (GAP) and associated inclusion and participation requirements
- Conservation International's Code of Conduct and ethical standards
- Zero-tolerance policies on Sexual Exploitation, Abuse and Harassment (SEAH), including reporting and response procedures
- Applicable national legislation and international safeguards standards

At the community level, these requirements are operationalized through conservation agreements and Payment for Conservation arrangements with beneficiary households, as described in the Process Framework. These agreements constitute the primary mechanism for “flow-down” of safeguards and include:

- Explicit incorporation of ESMP obligations, including environmental management measures and restrictions on land and natural resource use
- Clear definition of rights, responsibilities, and expected practices for participating households
- Documentation that participation is fully voluntary, based on prior and informed consent, and free of coercion
- Measures to ensure that any restrictions on access to land or resources do not result in unmitigated economic displacement, including identification of support measures where needed
- Provisions for equitable benefit-sharing, including in-kind incentives, technical assistance, and livelihood support
- Mandatory adherence to Code of Conduct and SEAH policies, including awareness and reporting channels
- Access to the project Grievance Redress Mechanism (GRM)

In line with the Gender Action Plan, conservation agreements will be signed with adult members of the household, ensuring:

- Recognition of intra-household decision-making dynamics
- Inclusive participation of women and other household members, where culturally appropriate
- Greater transparency and shared understanding of rights, obligations, and benefits

Additionally, the project will verify during agreement preparation and implementation that:

- Households have a clear understanding of the agreement terms and implications

- Participation does not disproportionately affect vulnerable groups or individuals with limited access to information
- Communication and engagement processes are inclusive, culturally appropriate, and gender-responsive

Compliance with these requirements will be monitored through:

- Regular field verification and supervision by project teams and SDA
- Application of the GRM as an accountability mechanism
- Periodic reporting aligned with GCF ESS and CI ESMS requirements

Through this combined institutional and community-based approach, the project ensures that ESMS, gender, and SEAH requirements are effectively embedded in all conservation and Payment for Conservation arrangements, maintaining consistency with GCF safeguards while reflecting the project's implementation structure.

Importantly, the financial resources used for Payment for Conservation incentives will not be financed by the GCF, but will instead come from co-financing sources mobilized alongside the project. The role of the GCF-funded intervention is to provide technical and operational support (enabling conditions) necessary to design, strengthen, and implement the Payment for Conservation scheme.

For greater clarity:

- (i) Payment for Conservation incentives are provided by the Secretaría Distrital de Ambiente (SDA), the Government of Cundinamarca, and the Empresa de Acueducto y Alcantarillado de Bogotá (EAAB);
- (ii) Conservation agreements led by the SDA and the Government of Cundinamarca are directly signed between these institutions and the beneficiary; and
- (iii) Conservation agreements financed by EAAB are signed by Conservation International Colombia (CI-Colombia) with the beneficiary, within the framework of a formal cooperation agreement.

As a result, the scope of safeguard flow-downs to individual beneficiaries is adjusted accordingly. Since the project does not directly transfer GCF funds to households, safeguard compliance is primarily ensured through institutional arrangements, eligibility criteria, and contractual mechanisms governing the Payment for Conservation scheme, rather than through direct financial accountability requirements at the household level. This approach maintains alignment with GCF safeguards while ensuring proportionality and feasibility for participating communities.

Conservation agreements are structured as performance-based arrangements linked to conservation outcomes, while safeguard compliance is ensured through:

- Contractual agreements (called conservation agreements) between implementing partners and individual landowners.
- Technical supervision and monitoring arrangements
- Integration of ESMP, stakeholder engagement and GRM provisions into all agreements

This approach ensures that:

- Participating landowners are not required to assume regulatory or administrative safeguard responsibilities beyond their capacity
- Safeguard compliance remains under institutional oversight (CI, Fondo Acción, implementing partners)
- Environmental and social risks are managed through structured support, supervision and contractual enforcement

The implementation of gender-related requirements under sub-grants are supported through the dedicated resources and budget allocations established under the Gender Action Plan (Annex 8).

Risk and mitigation matrix: ESMS - Financial Mechanism

Sub-category	Identified Risk	Risk Level	Mitigation Measure
Financial Intermediation	Perverse incentives and impact leakage: Risk of financing activities (Payment for Conservation) that indirectly harm adjacent ecosystems.	Moderate	Screening and Exclusion: Strict application of CI's exclusion list and risk categorization before subproject approval.
Financial Intermediation	Sub-grantees: Non-compliance with safeguard commitments by the intermediary or its sub-grantees.	Moderate	Institutional Due Diligence: Mandatory ESS Capacity Assessment and Gap Analysis of the third party's ESMS against CI standards. Inclusion of contractual clauses in agreements with sub-grantees. Screening of environmental and social risks of sub-grants, tailored to their size and scope. Oversight and supervision of adequate implementation in field activities by sub-grantees.
Financial Intermediation	Lack of technical capacity: Designated personnel lack the expertise to identify or manage E&S risks.	Moderate	Capacity Strengthening: Mandatory training programs on applicable ESS standards for the sub-grantees' key staff.
Restoration	Non-compliance with safeguards by sub-grantees: Risk in the technical execution of restoration activities.	Moderate	Compliance assurance: Inclusion of mandatory safeguard clauses in grant agreements and use of CI's screening process described in the Grants Manual.

Indicators

Indicator	Justification	Target
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ESS09: Number of actions implemented by EA/EE/FI and Funds to monitor and supervise that sub-projects/sub-grantees/investees are adequately implementing requirements.	This tracks supervision visits, audits, and training sessions required to ensure third-party compliance with safeguards.	100% implementation of mitigation measures
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Functions and responsibilities

Position	ESMS Responsibility
Executing Entity	Responsible for day-to-day E&S assessment, subproject risk management, and monitoring. They must screen subprojects against the exclusion list and submit annual E&S reports to CI.
Safeguards Manager	Conducts the mandatory ESS Capacity Assessment and Gap Analysis for third-party entities. Performs periodic reviews of subproject due diligence and supervises the overall effectiveness of the third-party's ESMS.
CL Program Grants and Contracts Manager	Ensures that 100% of financial agreements include mandatory and binding E&S safeguard clauses. Manages the selection process to ensure misalignment risks are mitigated through contracts.
M&E Coordinator	Responsible for the portfolio review and selective field audits as part of the Annual E&S Report process. Tracks performance indicators related to the mitigation hierarchy across all subprojects.
Project Leader / Component Directors	Oversee the technical supervision of the financial mechanism and ensure that all activities adhere to CI's sustainability standards (ESS 9).
Safeguards Specialist	Supports the technical supervision of the FI, provides mandatory training programs for the intermediary's key staff, and conducts semi-annual competency audits.
Finance Manager	Collaborates on the financial and institutional due diligence of the third-party entity to ensure they possess the necessary track record for implementation.
Extensionists / Field Staff	Support selective field audits and monitoring of subproject activities to ensure no indirect harm or "impact leakage" occurs in adjacent ecosystems.

8.5 Cultural Heritage Management Plan (CHMP)

The CHMP is a mandatory instrument designed to identify, protect, and manage both tangible and intangible cultural heritage affected by project activities. It ensures that all interventions respect the cultural integrity and spiritual values of the Mhuysqa Chuta Fa Aba Indigenous Resguardo.

This plan covers all project intervention landscapes, particularly within the watersheds of Sesquilé and Guatavita, where activities intersect with broad ancestral territories.

Guiding principles and legal requirements

- Mitigation Hierarchy: Priority is given to the avoidance of any physical or spiritual interference with cultural assets.
- Mandatory FPIC: No mitigation or project activity affecting Indigenous heritage shall proceed without documented Free, Prior, and Informed Consent (FPIC).
- Confidentiality: The project will respect the community's right to keep certain sacred locations or traditional knowledge confidential to protect their integrity.

Cultural Heritage mitigation and risk matrix

Management Action	Associated Risk	Description and Cultural Considerations
Exclusion of Sacred Zones	Interference with sacred sites (Piedra del Sapo, La Chorrera, Camino del Cajón).	Establish strict non-intervention zones around identified sites. No technical or restoration work is permitted in these areas without explicit ceremonial clearance.
Ritual Path Safeguarding	Restriction of ritual mobility and disruption of ancestral routes.	Establish protected corridors for the Road to Piedra del Sapo and Road to La Chorrera. All field mobilization must ensure these paths remain accessible for traditional use.
Traditional Knowledge Protocols	Loss of traditional knowledge and unauthorized use of biocultural information.	Any sharing of ecological or agricultural knowledge (e.g., native seeds or medicinal plants) must be voluntary, subject to FPIC, and ownership must remain with the community.
Temporal Alignment	Spiritual misalignment and interference with the ritual calendar.	Fieldwork must be suspended or rescheduled during the Four Fires and ZHA periods to respect Mhuysqa times of reflection and ceremony.
Gender-Specific Protection	Disruption of women-led spiritual water care and seed stewardship.	Project activities in micro-watersheds must explicitly consult with women water caretakers to avoid interfering with ritual bathing sites and ceremonial gardens.
Non-Commodification	Unauthorized commercial use or commodification of cultural elements.	Prohibit the use of sacred imagery, myths, or rituals in branding or marketing materials without an equitable benefit-sharing agreement reached through FPIC.

Chance-Find Procedure

To strengthen mitigation measures related to incidental discoveries of cultural heritage, the project will formally adopt and implement the Chance Find Procedure in accordance with the Colombian national

protocol issued by the Instituto Colombiano de Antropología e Historia (ICANH) (Protocolo de Hallazgos Fortuitos de Bienes Arqueológicos, 2020).

This procedure will be mandatory for all activities involving ground disturbance, including restoration works, installation of Ecosystem-based Adaptation (EbA) equipment, and improvements to community water systems. In the event of a chance finding, the project will strictly comply with national requirements, including:

- Immediate suspension of all works in the area where the finding occurred
- Securing and delimitation of the site to prevent damage, removal, or alteration of the findings
- Immediate notification to ICANH and the project safeguards team
- Strict prohibition of handling, collecting, or relocating materials by project personnel or community members
- Professional Assessment: Consult qualified experts and national heritage authorities to determine the significance of the find.
- Resumption of activities only after formal authorization from the competent authority (ICANH), following technical evaluation by authorized specialists

To ensure effective application of these measures:

- The Chance Find Procedure will be incorporated as a binding obligation in all contractor, partner, and field team agreements
- All relevant personnel will receive training on cultural heritage risks and ICANH procedures prior to implementation
- Compliance will be monitored through the project's Environmental and Social Management System (ESMS)
- These measures will be coordinated with the Indigenous Peoples Plan (IPP) where applicable

Indicators

Indicator	Justification	Target
ESS061: Number of cultural resources, both tangible and intangible, identified and protected in the project area.	This tracks the proper documentation of sacred sites (like Piedra del Sapo) and ancestral knowledge to prevent disturbance.	100% implementation of mitigation measures

Roles and Responsibilities

Role	Key Responsibility within CHMP
Safeguards Manager & Safeguards Specialist	Overall coordination and oversight of the CHMP. Ensures compliance with ESS 6, manages FPIC documentation for traditional knowledge, and oversees the Chance-Find reporting protocol.

Director of Component 1	Ensures that all restoration, watershed, and productive activities strictly avoid sacred sites and ritual routes. Responsible for adjusting field schedules to align with the Mhuysqa spiritual calendar (e.g., avoiding <i>ZHA</i>).
Ecological Restoration Lead & Conservation Coordinator	Supervises physical field activities and enforces buffer zones around cultural assets. Responsible for immediately halting work and securing the site if a chance-find occurs.
Gender Manager, (designated SEAH focal point), supported by Gender Specialists 1 & 2	Ensures the active participation and protection of traditional practices led by women, specifically concerning women water caretakers and native seed stewardship.
Social Coordinator & Social Leads	Acts as the primary liaison with traditional authorities (Cabildo) for daily operations, facilitating dialogues, and ensuring cultural protocols are respected in the field.
Extensionists	Frontline field staff. Mandatory adherence to non-intervention zones, respect for ritual paths, and immediate reporting of any unexpected archaeological or cultural artifacts.
Mhuysqa Traditional Authorities (External)	Grants Free, Prior, and Informed Consent (FPIC), conducts permit ceremonies, validates non-intervention zones, and assesses the cultural significance of any chance-finds.

8.6 Indigenous Peoples Plan (IPP)

The IPP is provided as an independent document accompanying this ESIA/ESMP and describing in detail all risks and proposed mitigation measures.

8.7 ESMP expenditures

The following table summarizes the environmental, social, and operational monitoring and risk-management expenditures associated with project implementation. It outlines the specific sub-activities, frequency, nature of the costs, and indicative unit costs required to ensure compliance with environmental and social safeguards, climate-risk management, labor and occupational safety standards, and biodiversity and water-quality monitoring. These expenditures are essential to support adaptive management, transparency, accountability, and the long-term integrity of project outcomes across the intervention micro-watersheds.

Plan / Component	Specific Sub-activity	Frequency / Timing	Nature of Expenditure	Unit Cost (USD)	Notes / Scope
Biodiversity	Survival monitoring in permanent plots	Recurrent (Annual)	Technical services: field team (2–3 people), travel, data processing	<i>Include as part of the Activity 1.1.1</i>	One annual monitoring campaign across the 8 micro-watersheds for 4 years
Climate	GHG emissions monitoring and auditing	Annual	Audit services	<i>Included as part of the responsibilities of M&E Senior Manager</i>	Implemented in years 2 to 5
Climate	Grievance management and adaptation assemblies	Recurrent (Annual)	Social staff and logistics	<i>Included as part of the responsibilities of the Safeguards Manager and Social Coordinator</i>	
Climate	Contingency fund for climate-related repairs	Permanent (entire project duration)	Financial reserve	44,288	Reserve for damages caused by extreme events affecting minor works, fence damage, etc.
Pollution	Laboratory analysis (water and soil quality)	Recurrent (Annual)	Laboratory services	16,249	Direct laboratory costs only; sediment, nutrient, and key contaminant analyses at hydrological monitoring points. Three sampling points per

Plan / Component	Specific Sub-activity	Frequency / Timing	Nature of Expenditure	Unit Cost (USD)	Notes / Scope
					micro-watershed, twice a year
Livelihoods	Socioeconomic census and participatory mapping	One-off (Project outset)	Social staff and GIS	<i>Included with the baseline detailed in GMP</i>	Budgeted through Conservation International staff
Occupational Health and Safety	Daily vehicle technical inspection (Road Safety Plan – PESV)	Recurrent	Preventive maintenance	0	Not required, as vehicles will be rented as a service that includes a driver.
Occupational Health and Safety	Security verification prior to field travel	Recurrent (Per visit)	Security personnel	<i>Covered by CI-Col staff as an usual practice determined by CI policies</i>	Security risk analysis, coordination with authorities
Occupational Health and Safety	Provision and replacement of personal protective equipment (PPE)	Recurrent (Annual / As needed)	Equipment procurement	65,000	Initial purchase + replacements in years 3 and 5; helmets, boots, gloves, goggles, etc.
Occupational Health and Safety	Training workshops on OHS and Code of Conduct	Recurrent (Annual)	Training services	<i>Covered by CI-Col staff as an usual practice determined by CI policies</i>	Delivered by CI staff and through online courses; annual refresher required due to staff turnover
Financial ESMS	Due diligence of sub-grantees	One-off (Initial)	Consultancy	<i>Already budgeted</i>	

9 Project-level Grievance redress mechanism

The Project-Level Grievance Redress Mechanism (GRM) is provided as an independent document accompanying this ESIA/ESMP.

10 Disclosure, Monitoring and reporting

The Safeguards Manager will be responsible for monitoring all the indicators contained in this ESMP. This reporting will be aligned with the general project reporting schedule. Sensitive incidents or grievances will be immediately reported to the CI-GCF Agency. The implementation of the measures outlined in this ESMP is fully integrated into the project budget.

Disclosure and Information Accessibility (GCF Category B Compliance)

The project will ensure compliance with the Green Climate Fund (GCF) Information Disclosure Policy applicable to Category B projects, which requires relevant environmental and social information to be disclosed in a timely, accessible and culturally appropriate manner to affected stakeholders.

The project-level Grievance Redress Mechanism (GRM) will be disclosed and made available for stakeholder review.

Disclosure activities will include as applicable:

- Availability of key safeguards instruments, including the ESMP, Stakeholder Engagement Plan (SEP), and relevant environmental and social assessments
- Communication of project objectives, activities, potential impacts and mitigation measures
- Dissemination of information on the project-level Grievance Redress Mechanism (GRM), including channels for grievance submission and follow-up
- Periodic communication of project progress and relevant updates

Information will be disseminated through a combination of methods adapted to the local context, including community meetings, printed materials, simplified communication formats, and digital channels where feasible. Special attention will be given to ensuring accessibility for vulnerable groups, including women, children, elderly populations, persons with disabilities, illiterate individuals, and rural communities with limited access to formal communication channels.

The project-level Grievance Redress Mechanism (GRM) will ensure full accessibility for all stakeholders. In addition to written and digital channels, the GRM will explicitly incorporate the possibility of submitting grievances orally. Oral grievances may be raised through direct communication with field staff, extensionists, community facilitators or designated focal points during project activities, community assemblies or field visits.

To ensure traceability and formal processing, all oral grievances will be supported by trained project personnel, who will assist in documenting the grievance in written form within the GRM system. This ensures that individuals are not excluded due to literacy, language or access barriers, while maintaining proper registration, tracking and follow-up of all cases.

The GRM will operate through multiple accessible entry points, grievance boxes, telephone, supported registration by project personnel, and digital channels where feasible. Information about the GRM will be communicated in clear, simple and culturally appropriate formats.

All project personnel interacting with communities, including field teams, extensionists, contractors and implementing partners, will receive mandatory training on GRM procedures. This training will include guidance on handling requirements, handling oral grievances, respectful engagement with vulnerable groups, confidentiality principles, and appropriate documentation and escalation procedures.

These measures ensure that the GRM is not only available but effectively accessible in practice, particularly for populations facing barriers to formal complaint mechanisms.

11 References

- (UPRA), U. d. (2020). *Índice de informalidad. Indicador de informalidad en la tenencia de la tierra en Colombia*. Vigencia 2020. Obtenido de https://upra.gov.co/sites/default/files/publicaciones/documentos//indice_de_informalidad.pdf
- Abud, M., Guerrero, J., Suárez, F., Prüssmann, J., & Urbano, C. (2022). *Análisis de vulnerabilidad ries o climático en la transición Andes, Amazonía y Orinoquía. Cuencas abastecedoras a los Par ues Nacionales Naturales Sumapaz, Cordillera de los Picachos, Sierra de la Macarena, Tinigua y Serranía de Chiribiquete*. . Serranía de Chiribiquete. Publicación de WWF Colombia en el marco del proyecto Áreas Protegidas y Paz.
- ADP. (2021). *Associativity in the Bogotá metropolitan region: coordination challenges in a fragmented region*. Obtenido de [https://www.researchgate.net/publication/348581137_Associativity_in_the_Bogota_metropolit an_region_coordination_challenges_in_a_fragmented_region](https://www.researchgate.net/publication/348581137_Associativity_in_the_Bogota_metropolit_an_region_coordination_challenges_in_a_fragmented_region)
- Agencia Nacional Minera. (2025). Obtenido de <https://annamineria.anm.gov.co/Html5Viewer/index.html?viewer=SIGMExt&locale=es-CO&appAcronym=sigm>
- Agencia_Noticias_UNAL. (11 de septiembre de 2018). *Agencia UNAL*. Obtenido de Economía campesina de Choachí en alto riesgo: <https://agenciadenoticias.unal.edu.co/detalle/economia-campesina-de-choachi-en-alto-riesgo>
- Alcaldía La Calera. (2023). *Información económica*. Obtenido de <https://www.lacalera-cundinamarca.gov.co/MiMunicipio/Paginas/Informacion-Economica.aspx>
- Angulo, D. J. (29 de Septiembre de 2023). *Ruralidad en Bogotá: Usme y su rol clave en la producción alimentaria*. Obtenido de Radionacional de Colombia: <https://www.radionacional.co/actualidad/campo-colombiano/ruralidad-en-bogota-usme-y-su-rol-clave-en-la-produccion-alimentaria>
- Armenteras, D., Gast, F., & Villareal, H. (2003). Andean forest fragmentation and the representativeness of protected natural areas in the eastern Andes, Colombia. doi:[https://doi.org/10.1016/S0006-3207\(02\)00359-2](https://doi.org/10.1016/S0006-3207(02)00359-2)
- Asociación Interamericana para la Defensa del Ambiente (AIDA). (22 de 03 de 2023). *Towards just water governance in Colombia: A dialogue on the Transformative Water Pact*. Obtenido de <https://aida-americas.org/en/event/towards-just-water-governance-colombia-dialogue-transformative-water-pact>
- Baca Gamboa, A. E., A., I., Calderón Arias, A. M., Ramírez Padilla, B. R., Pizano Gómez, C., Castellanos Castro, C., . . . Hurtado, V. (2021). Lista Roja de Plantas Vasculares Endémicas de la Alta

- Montaña de Colombia. *Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Unión Europea.*
- Calvo, E. (2024). *Formulación de indicadores para evaluar el potencial de restauración de la conectividad superficial del río Tunjuelo con humedales y zonas de amortiguamiento.* Obtenido de Tesis Maestría UniSalle: <https://ciencia.lasalle.edu.co/items/c311c886-cc9d-40b5-8ed1-cad50f7c8e96/full>
- CAR. (2025). *Capa de la Estructura Ecológica Principal de la jurisdicción CAR establecida mediante Resolución CAR 20217000599 del 7 de diciembre de 2021.* Retrieved from https://datosgeograficos.car.gov.co/datasets/1f8e2ce0193948eeba521bb43d4614fe_0/about
- Carlos M. Jimenez Aguilar and Ulf Thoene. (2020). *Associativity in the Bogotá metropolitan region: coordination challenges in a fragmented region.* Obtenido de <https://asomuna.org/documentos/Associativity-in-the-Bogota-Metropolitan-Region-Coordination-Challenges-in-a-Fragmented-Region.pdf?t.com>
- Castañeda, D. V., & Ocampo, L. C. (2023). Estudio de la dieta de *Procambarus clarkii* en el distrito de riego del Alto Chicamocha, Tibasosa, Boyacá. *Universidad de La Salle.*
- CCB. (2024). *Cámara de Comercio de Bogotá.* Obtenido de https://www.ccb.org.co/en/specialized-information/observatory/economic-analysis/yearly-gpd-variation?utm_source=chatgpt.com
- CDN - DANE. (2018). *Microdatos.* Obtenido de <https://statics.teams.cdn.office.net/evergreen-assets/safelinks/2/atp-safelinks.html>
- CI. (2020). *Estudios técnicos sobre restauración ecológica en Bogotá.*
- Clerici, N. e. (2023). *Are protected areas actually protecting our biodiversity? Universidad del Rosario.* . Obtenido de <https://urosario.edu.co/en/advances-in-science/environment/are-protected-areas-actually-protecting-our-biodiversity>
- Conservation International. (2020). *Estudios técnicos sobre restauración ecológica en Bogotá.*
- Cundinamarca Gobernación. (2022). *Perfiles municipales de Cundinamarca.*
- DANE. (2018). *Proyección poblacional* . Obtenido de <https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/proyecciones-de-poblacion>
- Enel_Colombia. (19 de Septiembre de 2022). *enel.com.* Obtenido de La Central Hidroeléctrica El Guavio opera a más del 99% de su capacidad instalada: <https://www.enel.com.co/es/prensa/news-2022/09/operacion-guavio.html>
- Environmental Justice Colombia. (2020). *Protection of páramos.* Obtenido de <https://www.environmentaljusticecolombia.com/protectionofparamos3>

- Etter, A., Andrade, A., Saavedra, K., Amaya, P., & Arévalo, P. (2017). *Estado de los Ecosistemas Colombianos: una aplicación de la metodología de la Lista Roja de Ecosistemas (Vers2.0). Informe Final*. Pontificia Universidad Javeriana y Conservación Internacional-Colombia, Bogotá.
- Gallini, S. (03 de 02 de 2024). *Water in Bogotá: Introduction*. Obtenido de Environment & Society Portal.: <https://www.environmentandsociety.org/exhibitions/water-bogota/introduction>
- Gallo, C. (13 de Julio de 2020). *Periodicodelmeta.com*. Obtenido de <https://periodicodelmeta.com/22759-2-sembradores/>
- Global Forest Watch. (2025). Obtenido de <https://www.globalforestwatch.org/map/country/COL/15/48/?mainMap=eyJzaG93QW5hbHlzaXMiOnRydWV9&map=eyJjZW50ZXliOmsibGF0Lj0Ljc1ODUwNjc3NDc2ODA2MywibG5nljotNzMuOTMwMDMwMzExNTcxODN9LCJ6b29tIjoxMC4wNjMyMzI2MTUwMDM2MjQsImNhbkJvdW5kljpmYWxzZX0%3D>
- Google Looker Studio. (2018). *Report on land cover distribution in páramo complexes*. Retrieved from https://lookerstudio.google.com/reporting/018f4d0a-753e-4b52-94f7-cb4015f7b170/page/p_kg5mbpe6pc
- Green Earth. (01 de 07 de 2021). *Nature in urban spaces - What the wetlands of Bogota have achieved?* Obtenido de Green Earth Blog: <https://www.green.earth/blog/wetlands-of-bogota>
- IDEAM. (2019). *Informe de gestión 2013-2018*. Retrieved from https://ideam.gov.co/sites/default/files/transparencia/planeacion/informe_gestion_2013_2018_componente_misional.pdf
- IDEAM. (2022b). *Estado de los páramos de Colombia: Sumapaz*. Obtenido de IDEAM: <https://www.ideam.gov.co/documents/10182/1465276/Estado+de+los+paramos+de+Colombia+Sumapaz.pdf>
- IDEAM. (2024). *Mapas Ecosistemas Continentales, Costeros y marinos 100k*. Retrieved from <https://e436.short.gy/MEcosis2024>
- IDEAM. (2025). *Registro Único Nacional de Áreas Protegidas (RUNAP)*. Obtenido de <http://www.siac.gov.co/runap>
- Instituto Humboldt. (2017e). *Composición florística de tres fragmentos de bosque altoandino en los alrededores de la Sabana de Bogotá. 4510 registros, aportados por: Norden, N. (Contacto del recurso), Muñoz, J.C.. (Creador del recurso, Autor), Hurtado, A.B. (Autor), Hernández, M. (Au*. Retrieved from http://i2d.humboldt.org.co/ceiba/resource.do?r=rrbb_bogota_plantae_2017
- Instituto Humboldt. (2019a). *Estructura ecológica principal para el ordenamiento territorial*. Obtenido de <https://reporte.humboldt.org.co/biodiversidad/2019/cap4/404/#seccion4>

Instituto Humboldt. (2019b). *Especies Endémicas, Áreas Protegidas y Deforestación en Colombia, año 2018*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Obtenido de <https://geonetwork.humboldt.org.co/geonetwork/srv/api/records/5635ef41-994f-4867-b5b2-efb12b6c1b5d/attachments/biodiversidad-2018-203.zip>

Instituto Humboldt. (2021). *Bosques que sobreviven alrededor de Bogotá resguardan una gran variedad de especies de plantas*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Retrieved from <https://www.humboldt.org.co/noticias/bosques-que-sobreviven-alrededor-de-bogota-resguardan-una-gran-variedad-de-especies-de-plantas>

Instituto Humboldt. (2021b). *Bosques que sobreviven alrededor de Bogotá resguardan una gran variedad de especies de plantas*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Retrieved from <https://www.humboldt.org.co/noticias/bosques-que-sobreviven-alrededor-de-bogota-resguardan-una-gran-variedad-de-especies-de-plantas>

Instituto Humboldt. (2023). *Glosario: Reporte de estado y tendencias de la biodiversidad continental de Colombia*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Retrieved from <https://reporte.humboldt.org.co/biodiversidad/glosario>

Instituto Humboldt. (2025, 11 04). *Geonetwork*. Retrieved from [geonetwork.humboldt.org: https://geonetwork.humboldt.org.co/geonetwork/srv/spa/catalog.search#/metadata/01a9f181-f309-486e-92c3-81c68e49ae30](https://geonetwork.humboldt.org.co/geonetwork/srv/spa/catalog.search#/metadata/01a9f181-f309-486e-92c3-81c68e49ae30)

Instituto Humboldt. (2025b). *Distribución de especies endémicas*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Obtenido de <https://geonetwork.humboldt.org.co/geonetwork/srv/api/records/5606c573-9b59-49e9-8449-b397dbbce12a/attachments/Riqueza.zip>

LaVilla. (15 de Enero de 2018). Obtenido de El páramo de Guerrero es productivo pero insostenible: <https://lavilla.com.co/2018/01/15/el-paramo-de-guerrero-es-productivo-pero-insostenible/>

León Rincón, A., Cruz Méndez, L. A., López Muñoz, M. T., & Peña, L. C. (2022). *Bioindicadores: señales para comprender el lenguaje del agua*. Fundación Natura Colombia.

Luis A. Guzman. (n.d). *City Profile: The Bogotá Metropolitan Area That Never Was*. Obtenido de [https://discovery.ucl.ac.uk/id/eprint/10042955/1/City%20Profile%20Bogota%20V8.pdf?utm_s](https://discovery.ucl.ac.uk/id/eprint/10042955/1/City%20Profile%20Bogota%20V8.pdf?utm_source%20e)

Ministerio de Ambiente y Desarrollo Sostenible & Instituto Humboldt. (2017). *Biodiversidad y servicios ecosistémicos en la planificación y gestión ambiental urbana*. Retrieved from https://hac2-api.minambiente.gov.co/images/AsuntosambientalesySectorialyUrbana/pdf/Estructura_/BIODIVERSIDAD_Y_SERVICIOS_ECOSISTEMICOS_EN_LA_PLANIFICACION_Y_GESTION_AMBIENTAL_URBANA.pdf

Ministerio de Ambiente y Desarrollo Sostenible. (2012). *Política Nacional para la Gestión Integral de la Biodiversidad y sus Servicios Ecosistémicos (PNGIBSE)*. Retrieved from

<https://www.minambiente.gov.co/direccion-de-bosques-biodiversidad-y-servicios-ecosistemicos/politica-nacional-para-la-gestion-integral-de-la-biodiversidad-y-sus-servicios-ecosistemicos/>

Ministerio de Ambiente y Desarrollo Sostenible. (2019). *Política Nacional para la Gestión Integral de la Biodiversidad y sus Servicios Ecosistémicos*.

Ministerio de Ambiente y Desarrollo Sostenible. (2023a). *BIODIVERSIDAD Y SERVICIOS ECOSISTÉMICOS EN LA PLANIFICACIÓN Y GESTIÓN AMBIENTAL URBANA*. Retrieved from https://hac2-api.minambiente.gov.co/images/AsuntosambientalesySectorialyUrbana/pdf/Estructura_/BIODIVERSIDAD_Y_SERVICIOS_ECOSISTEMICOS_EN_LA_PLANIFICACION_Y_GESTION_AMBIENTAL_URBANA.pdf

Ministerio de Ambiente y Desarrollo Sostenible. (2023c). *Política Nacional para la Gestión Integral de la Biodiversidad y sus Servicios Ecosistémicos*. Retrieved from <https://www.minambiente.gov.co/direccion-de-bosques-biodiversidad-y-servicios-ecosistemicos/politica-nacional-para-la-gestion-integral-de-la-biodiversidad-y-sus-servicios-ecosistemicos/>

Ministerio de Ambiente y Desarrollo Sostenible. (2025a). *Bosques, biodiversidad y servicios ecosistémicos*. Dirección de Bosques, Biodiversidad y Servicios Ecosistémicos. Retrieved from <https://www.minambiente.gov.co/direccion-de-bosques-biodiversidad-y-servicios-ecosistemicos/>

Ministerio de Ambiente y Desarrollo Sostenible. (2025c). *Bosques, biodiversidad y servicios ecosistémicos*. Dirección de Bosques, Biodiversidad y Servicios Ecosistémicos. Retrieved from <https://www.minambiente.gov.co/direccion-de-bosques-biodiversidad-y-servicios-ecosistemicos/>

Montealegre, F., Hernando, C., & Leal, J. (2024). Loading capacity for strategic tourism areas in San Juanito - Meta Colombia. *Dictamen Libre*, 35, 215-223. doi:<https://doi.org/10.18041/2619-4244/dl.35.12179>

Mora, S. (2015). *Los agricultores y ganaderos de la sabana de Bogotá frente a las transformaciones del territorio, siglos XVI-XX*. Obtenido de Revista Colombiana de Sociología, 38(1), 1-25: http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S2027-46882015000100001

Morales, M., Otero, J., van der Hammen, T., Torres, A., Cadena, C., Pedraza, C., . . . Cárdenas, L. (2007). *Atlas de páramos de Colombia*. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Retrieved from <http://biblioteca.humboldt.org.co/es/component/k2/item/299-atlas-de-paramos-de-colombia>

Murad, C., Pearse, J., & Huguet, C. (2024). Multitemporal monitoring of paramos as critical water sources in Central Colombia. *Sci Rep*, 14, 16706. doi:<https://doi.org/10.1038/s41598-024-67563-z>

- Observatorio Ambiental de Bogotá. (2025). *Inventario preliminar de fauna silvestre en áreas verdes urbanas de Bogotá*. Secretaría Distrital de Ambiente. Obtenido de <https://oab.ambientebogota.gov.co/fauna/>
- Parques Nacionales Naturales. (2020-2023). *Informe al Congreso de la República*. Obtenido de https://www.minambiente.gov.co/wp-content/uploads/2023/07/Informe-al-Congreso-Sector-Ambiente-2022-2023.pdf?utm_source=chatgpt.com
- Parques Nacionales Naturales de Colombia. (2023). *Conectividad ecológica y restauración en los Cerros Orientales*. Obtenido de Parques Nacionales Naturales de Colombia: <https://old.parquesnacionales.gov.co/porta/es/conectividad-ecologica-y-restauracion-en-los-cerros-orientales/>
- PNGIBSE. (2019). *Política Nacional para la Gestión Integral de la Biodiversidad y sus Servicios Ecosistémicos*. Ministerio de Ambiente y Desarrollo Sostenible.
- Ramsar. (2022). *Informe sobre humedales y restauración ecológica*.
- RAPE. (septiembre de 2020). *Guarda Páramos*. Obtenido de Pago por servicios ambientales: <https://guardaparamos.regioncentralrape.gov.co/wp-content/uploads/2020/09/3.-PSA.pdf>
- Rojas, Meulder, & Shannon. (2015). *Water urbanism in Bogotá: Exploring the potentials of an interplay between settlement patterns and water management*. Obtenido de https://eprints.whiterose.ac.uk/id/eprint/133436/3/manuscript_water%20urbanism_revise%20version.pdf
- Salamanca, & Durán. (2023). *Stakeholder Engagement around Water Governance: 30 Years of Decision-Making in the Bogotá River Basin*. Obtenido de <https://www.mdpi.com/2413-8851/7/3/81>
- Scarpa , F., & Rizzi , M. (2024). *Socio-Economic analysis of Colombia: problems and potentials of the Andean State*. Obtenido de Mndointernazional: <https://mondointernazionale.org/focus-allegati/socio-economic-analysis-of-colombia-problems-and-potentials-of-the-andean-state>
- SDA. (2022). *Conoce unas de las plantas endémicas que más se ven en los ecosistemas de Bogotá*. Secretaría Distrital de Ambiente, Grupo de Monitoreo, Subdirección de Ecosistemas y Ruralidad. Retrieved from https://www.ambientebogota.gov.co/nota-principal/-/asset_publisher/vRkc1u7VgGg4/content/conoce-unas-de-las-plantas-endemicas-que-mas-se-ven-en-los-ecosistemas-de-bogota
- SDA. (2023). *La diversidad biológica de Bogotá*. Secretaría Distrital de Ambiente. Retrieved from https://www.ambientebogota.gov.co/historial-de-noticias/-/asset_publisher/VqEYxdh9mhVF/content/la-diversidad-biologica-de-bogota
- SDA. (2025). *Patrimonio ambiental de Bogotá! Conoce los 17 humedales protegidos que tiene la capital*. Secretaría Distrital de Ambiente. Retrieved from <https://www.ambientebogota.gov.co/noticias->

de-ambiente1/-/asset_publisher/CWsNLtoGa4f6/content/-patrimonio-ambiental-de-bogota-
conoce-los-17-humedales-protegidos-que-tiene-la-capital

Secretaría de Desarrollo Económico . (2015). *Estructura productiva de Bogotá*. Obtenido de <https://observatorio.desarrolloeconomico.gov.co/publicaciones/notas-editoriales/estructura-productiva-de-bogota/>

SiB Colombia. (2025a). *Biodiversidad en cifras. Sistema de Información sobre Biodiversidad de Colombia*. Retrieved from <https://cifras.biodiversidad.co/>

SiB Colombia. (2025a). *Biodiversidad en cifras. Sistema de Información sobre Biodiversidad de Colombia*. Retrieved September 10, 2025, from <https://cifras.biodiversidad.co/>

SiB Colombia. (2025b). *Consulta de datos e información. Sistema de Información sobre Biodiversidad de Colombia*. Retrieved from <https://biodiversidad.co/consultar>

IUCN. (2025). *The IUCN Red List of Threatened Species*. Retrieved from <https://www.iucnredlist.org/es/search?searchType=species>

Universidad Nacional de Colombia. (03 de 2026). Obtenido de El caso de Bogotá y Fómeque. Bitácora Urbano Territorial: <https://revistas.unal.edu.co/index.php/bitacora/article/view/120182/97395>

Urbina Cardona, J. N., Nori, J., & Castro, F. (2011). Áreas vulnerables a la invasión actual y futura de la rana toro (*Lithobates catesbeianus*: Ranidae) en Colombia: Estrategias propuestas para su manejo y control. *Revista Biota Colombiana*, 12(2), 23-34.

Weller, R., Hoch, J., & Huang, C. (2021). *The hotspot cities project: The case study of Bogotá 2050*. Obtenido de Landscape Architecture Frontiers, 9(1), 6-25: https://richard-j-weller.squarespace.com/s/rjla_1_2021_weller_v02.pdf

WWF Colombia. (2022b). *Trucha arcoíris: la mayor competencia para especies nativas en área protegida de Boyacá*. Obtenido de Trucha arcoiris, la mayor competencia para especies nativas en áreas protegidas de Boyacá: <https://www.wwf.org.co/en/?376091/Trucha-arcoiris-la-mayor-competencia-para-especies-nativas-en-area-protegida-de-Boyaca>

Zapata-Jiménez, J. A.-P. (2022). *Entre Páramos. ¿En qué estamos con los páramos en el siglo XXI? Ecological Carbon Offset Partners Suc. Colombia. Proyecto Modelos innovadores de conservación, Programa Páramos y Bosques de USAID. Bogotá. USAID*. Obtenido de https://drive.google.com/file/d/1NQadN7Ak7JSJHn26kchO2y907ula_toq/view

Zwarteveen, M., & Boelens, R. (2023). *Relationship Between Community Water Management, Conceptions, and Struggles for Justice in Southwest Colombia. Environmental Justice*, 16(3). Obtenido de <https://liebertpub.com/doi/full/10.1089/env.2022.0065>

12 Appendix

CI Exclusion list

CI will not finance projects that:

1. Contravene major international and regional conventions on environmental issues;
2. Propose to create or facilitate significant degradation and/or conversion of natural habitats of any type (forests, wetlands, grasslands, coastal/marine ecosystems, etc.) including those that are legally protected, officially proposed for protection, identified by authoritative sources for their high conservation value, recognized as protected by indigenous and local communities, or have significant negative socioeconomic and cultural impacts that cannot be cost-effectively avoided, minimized, mitigated and/or offset;
3. Involve adverse impacts on critical natural habitats, including forests that are critical natural habitats, including from the procurement of natural resource commodities, except for adverse impacts on a limited scale that result from conservation actions that achieve a net gain of the biodiversity values associated with the critical natural habitat;
4. Propose to carry out unsustainable harvesting of natural resources -animals, plants, timber and/or non-timber forest products (NTFPs)- or the establishment of forest plantations in critical natural habitats;
5. Propose the introduction of species that can potentially become invasive and harmful to the environment, unless there is a mitigation plan to avoid this from happening;
6. Involve involuntary resettlement, land acquisition, and/or the taking of shelter and other assets belonging to local communities or individuals; through coercion and/or undue influence;
7. Contravene major international and regional conventions on human rights, including rights specific to indigenous peoples;
8. Propose activities that result in the exploitation of and access to outsiders to the lands and territories of indigenous peoples in voluntary isolation and in initial contact;
9. Propose the use and/or procurement of materials deemed illegal under host country laws or regulations or international conventions and agreements, or subject to international phase-outs or bans, such as: a. ozone depleting substances, polychlorinated biphenyls (PCBs) and other specific, hazardous pharmaceuticals, pesticides/herbicides or chemicals; b. wildlife or products regulated under the Convention on International Trade in Endangered Species or Wild Fauna and Flora (CITES);
10. Propose the use and/or procurement of pesticides and hazardous materials that are unlawful under national or international laws, the generation of wastes and effluents, and emissions of short- and long-lived climate pollutants;
11. Involves the removal, alteration or disturbance of any non-replicable or critical cultural heritage, or the use of any intangible cultural heritage without the Free, Prior and Informed Consent of the communities who it belongs to;
12. Include the use of forced labour, trafficking in persons, and child labour. Child labour includes both (i) labour below the minimum age of employment and (ii) any other work that may be hazardous, may interfere with the child's education, or may be harmful to the child's health or to the child's physical, mental, spiritual, moral, or social development; and
13. Involve the design and construction new dams or rehabilitation of existing dams or financing agriculture and water resource management infrastructure that are highly dependent on the performance of dams that potentially affect their performance. (The CI-GEF/GCF Project Agency has not been accredited for the GEF Minimum Standard 7, Safety of Dams).