**Project Title: Adaptation to Climate Impacts in Water Regulation and Supply for the Area Chingaza-Sumapaz-Guerrero**

**Organizations involved**: GEF Project and IADB[1] as Implementing Agency. The project is executed by the Ministry of Environment and Sustainable Development of Colombia in agreement with Conservation-International Colombia, with the participation of other organizations such as: IDEAM[2], CAR[3], CORPOGUAVIO[4], EAB[5] and contributions from UAESPNN[6] of Colombia.

**Country:** Colombia

**Project Objective**: Strengthen the hydrological buffering and regulation capacity of the upper watershed of the Chingaza-Sumapaz-Guerrero area, which supplies water to the metropolitan area of Bogotá and the adjoining rural municipalities.

**General Information**: This is a 5-year project aiming to reduce vulnerability to the adverse impacts to climate variability and change, at different levels, through information and knowledge management for sectorial development and land use planning. The results presented in this document are related to the first year and a half of implementation.

**Project Area**: The Chingaza−Sumapaz−Guerrero Corridor, which was designed and proposed by the Bogotá Water Utilities (Empresa de Agua y Alcantarillado de Bogotá, EAB) and Conservation International-Colombia in 2011, is located in the Eastern Cordillera of the Colombian Andes and is home to approximately 20 percent of the country's population. It has a surface area of more than 1.7 million hectares (ha) that cover 104 municipalities in three different departments: Cundinamarca (66%), Meta (22%) and Boyacá (12%). The Eastern Cordillera ranges in altitude from 1,000 to 4,100 msnm, with a high level of ecosystem and sociocultural diversity.

The fourteen (14) watersheds located within the Corridor are strategic for water supply to Bogotá and its adjoining rural municipalities. Five of these municipalities (Bogotá, Sumapaz, Chivor, Duda and Fúquene) form part of the Madgalena River watershed; the remaining municipalities (Ariari, Guacavía, Guamal, Guatiquía, Guavio, Guayuriba, Humea, Blanco and Río Negro) form part of the Orinoco River watershed

The conceptual and methodological framework is based on a Territorial Approach to EbA. It includes an integrated vulnerability assessment of main eco-hydrological services provided to the inhabitants of the city of Bogotá (aprox 8 million) and its surroundings (aprox 2 million). This

[1] IADB: Inter-American Development Bank.
[2] IDEAM: National Institute of Hydrology, Meteorology and Environmental Studies.
[3] CAR: Regional Environmental Authority of Cundinamarca.
[4] CORPOGUAVIO: Regional Environmental Authority of Guavio.
[5] EAB: Bogota's Water Utility.
[6] UAESPNN: Unidad Administrativa Especial de Parques Nacionales Naturales.

territory includes the upper watersheds of key areas providing water to the city of Bogotá and 22 municipalities located in this area.

The 1st component of the project is about Knowledge Management. It has been accomplished and ecosystem management for climate change adaptation is being mainstreamed in planning development of the Cundinamarca Department and 22 municipalities of the Chingaza-Sumapaz-Guerrero area.

Some of the main outputs of this component are aimed to introduce the climate change component in adaptive land use planning and facilitate the implementation of adaptation measures at local level, in strategic areas for water regulation. These results are:

- Climate change scenarios downscaled for the project area. These scenarios are based on AR5 models, and are aligned with the Climate Change Scenarios included in the 3rd National Communication.
- Hydrological Response assessment completed for 4 priority watersheds.
- Climate Risk Perception Survey, prioritizing water scarcity and management.
- Socio-ecological Vulnerability Assessment at local level, in order to understand socio-ecological processes related to water use and water management and help communities in building resilience.
- Ecological Adaptive Structure (EETA, similar to Green or Ecological Infrastructure), prioritizing water management, developed for 22 municipalities in the Chingaza-Sumapaz-Guerrero area.

The 2nd. component, of the project is about Adoption of adaptation measures to address the impacts of climate variability and change on the water balance of priority areas.

Some of the main outputs of this component aims at increasing the adoption of climate adaptation measures in land-use and watershed planning and execution. The results are:

- Climate Risk Perception Survey, prioritizing water scarcity and management
- Management models for ecological restoration and adaptation of production systems mainly focused on water regulation, cultural consideration and gender based.
    - As part of the design of adaptation measures, were also completed, (i) an analysis of social context, (ii) a capacity building plan and (iii) a management strategy for information, Knowledge and communication.

**Results:**

- Climate change scenarios downscaled for the project area. In addition to the hydrological national information, regional, local and private hydrological information was included.
- Eco-hydrological based models to support climate smart agriculture, land use change in high mountain agroecosystems and complementary actions to build resilience of high

mountain and moorland (páramo) ecosystems and communities depending on their services.

- Proposal of Ecological Structure required for adaptation to climate change in territories located in high mountain and moorland ecosystems. It identifies priority areas for conservation, connectivity and land uses consistent with the maintenance of the ecological functions required to guarantee the supply and regulation of water in the 22 municipalities..
- 12 Development plans at municipal level and 1 at departmental level, including hydrological vulnerability assessments, prioritizing actions for ecosystem restoration and land use change, guaranteeing water regulation. Information used include Eco hydrological Vulnerability Assessments developed by the Integrated Regional Climate Change Plan (PRICC)[7] at subnational and highlighting main vulnerabilities in water provision, including quality, quantity and regulation.

**Activities in Progress:**

- Pilot process at national level for the gradual replacement of productive activities, land use change and ecological restoration, based on climate risk and vulnerability, including gender and cultural considerations. These models are supported by ecosystem based approaches, highlighting the relevance of water regulation, and the role of communities in water management. It includes participatory assessments of socio-ecological vulnerability, community agreements, recovery of traditional knowledge and technology transfer.
- Adaptive territorial agreements at community level, mainly focused on water regulation, and gender based.
- Climate change information and vulnerability assessment are being disseminated through education, information strategies and communication, in order to increase adaptive capacity at municipal and community levels.
- Knowledge communities developed with the participation of local leaders, social organizations, scientific and educational institutions.

**Lessons Learned:**

<u>Eco-hydrological models and information:</u>

- In mountain areas, in-depth studies on the particular vulnerability of key ecosystems such as High Andean forests and moorlands (paramos) on a detailed spatial scale are essential, taking into account the hydro-climatic conditions that determine these ecosystems. This information should be complemented by detailed condensation and fog frequency studies, supplemented by specific experimental studies and field verification.

[7] This Study was developed by IDEAM and Conservation International-Colombia.

- The eco-hydrological models provide essential information on spatial and temporal variations in water supply, including quantity, quality, and accessibility as well as regulatory capacity. This information is fundamental to develop and prioritize local actions to adapt to climate variability and change.
- The areas on which water supply depends should be prioritized and the data network strengthened to ensure a permanent supply of information on water quantity, quality and accessibility. The densification of monitoring networks and its quality is very important. Local communities should be involved in the monitoring process.
- The eco-hydrological models must include groundwater, although this aspect is not always considered, due to the absence of reliable data.
- The most appropriate models should include ecological information, including vegetation and soils, in order to be able to evaluate with better criteria the impact of adaptation measures.

Perception Surveys:

- Perceptual studies on water availability and management, based on in-depth interviews with key stakeholders, surveys of all relevant actors and sectors, are key tools that complement integrated vulnerability assessments.
- Communities' perceptions of changes in water availability are strongly associated with deforestation and land use change, rather than with climate change.
- Communities living in water catchment areas, such as high mountain and moor ecosystems, do not receive direct benefits for their conservation. This reflects the undervaluation of peasant production systems and prevailing development models. This significantly affects the possibilities of ensuring hydrological regulation in the medium and long term.
- Main impacts perceived are mainly due to climatic variability, which are manifested mainly in agricultural systems, affecting food security. This is evidenced in loss of crops, reduction of food quality or pest proliferation. In addition, there is displacement of traditional agriculture, by monocultures and uses of the land that do not protect the soil.
- Urban development models, which are highly demanding of ecosystem services, tend to significantly affect the sustainability of the rural areas that supply them.
- There is a significant increase in conflicts over land use, due to the expansion of the agricultural frontier and land tenure.
- Current organizational cultures do not allow for creativity and innovation. There is distrust of local communities, with respect to local institutions. And there is a lack of communication.
- Local governance systems should be strengthened, and the stakeholder's expectations should be taken into account.

Ecological Adaptive Structure for Land Use Planning**:**

- This study is the first at the national level, which identifies the main Ecological Structure required for adaptation to climate change in territories located in high mountain and moorland ecosystems. It identifies priority areas for conservation, connectivity and land uses consistent with the maintenance of the ecological functions required to guarantee the supply and regulation of water in the 22 municipalities. Additionally, it includes critical areas of connectivity with adjacent territories, to ensure the flow of species and ecological processes.
- According to this study, to ensure the adaptation of the territory to the impacts of climate change, it's necessary to increase the areas of connectivity, conservation, restoration and changes in production systems, more than 20% of existing areas, equivalent to 100.000 ha
- To achieve this, it is necessary to urgently promote strategies that generate economic benefits for the local population, such as eco-tourism, compensation and payment for ecosystem services, conservation incentives, establishment of land banks, value chains and local product markets.
- Promote research and innovation strategies with local participation, as well as the development of appropriate legal instruments to consolidate EETA in the long term.

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