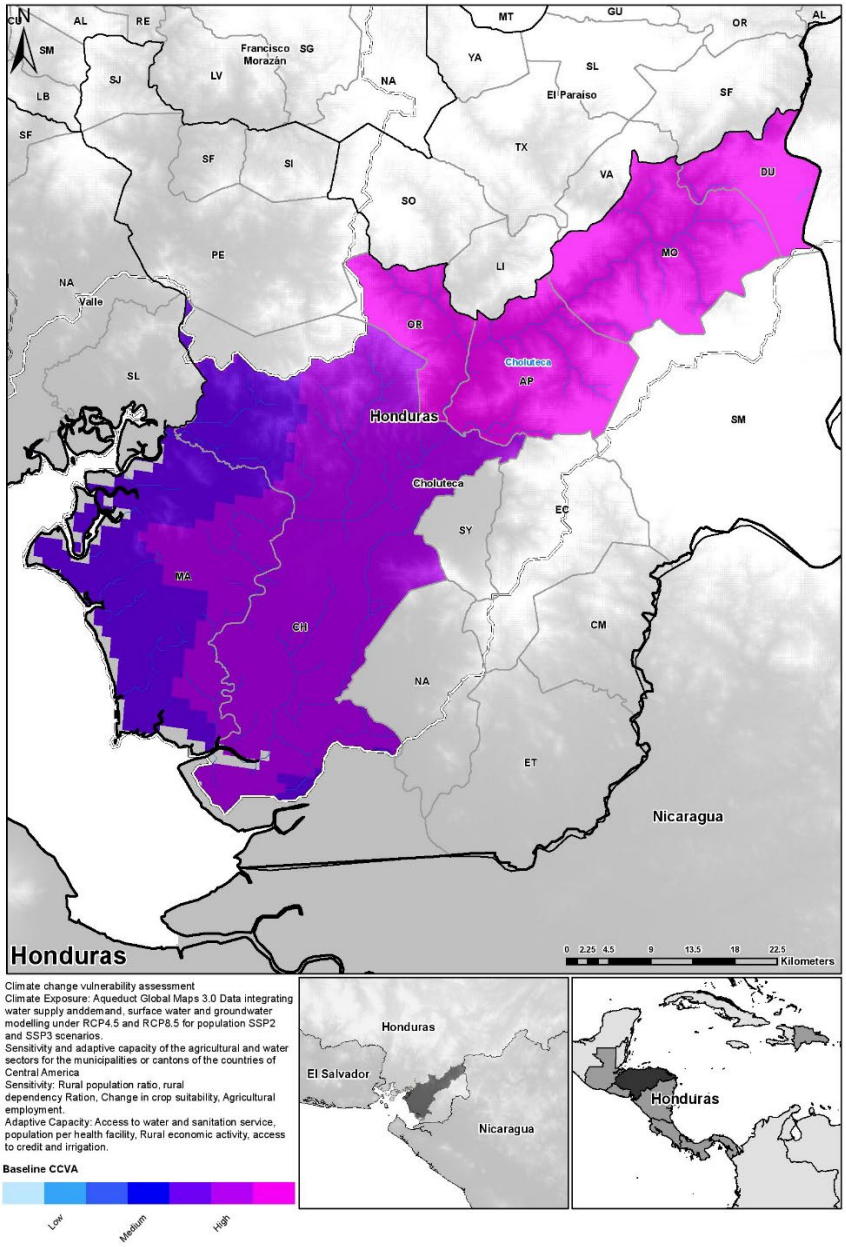

LOCAL EbA STRATEGY FOR THE CHOLUTECA BASIN

HONDURAS

April 2021

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1. Context

The Central American Dry Corridor (CADC) and the Arid Zones of the Dominican Republic are among the world's most vulnerable tropical regions to the impacts of climate change, with Honduras, Nicaragua, Guatemala, the Dominican Republic and El Salvador recognised as being among the sixteen most vulnerable countries in the world to extreme climate events for the period 1998-2017 (Eckstein, Hutfils and Winges 2018). The term "Dry Corridor" emerged in the last three decades to describe the increasing frequency and intensity of droughts in the region. These droughts are linked to El Niño events, which are occurring more frequently and intensely as a result of climate change and have had severe impacts on agriculture and food security in the region. The impacts of droughts during El Niño are contrasted by an increase in the frequency and severity of extreme rainfall events linked to concurrent changes in La Niña. The resulting extreme rainfall leads to reductions in aquifer recharge, as well as increased surface runoff and soil erosion. These impacts are exacerbated by poor land management practices — which result in extensive environmental degradation — and widespread poverty.

The CADC extends from the southern part of Mexico to Panama, concentrating 90% of the Centro American population. Drought events are hitting the economic activities of two million people. Sixty percent of them live in conditions of poverty or extreme poverty and depend on agriculture for their living hood.

Changes in temperature will also have an impact on the ranges of certain crop yields. For example, as cooler highland areas warm up, they will become more suitable for specific crops which may be pushed beyond thermal limits in lowland areas. However, the desire to shift crops into these highland areas will likely catalyse forest clearing in what are critical water recharge zones of river catchments, thereby reducing aquifer recharge. This impact, coupled with an increase in extreme rainfall events, will increase the likelihood and severity of flooding. Climate change will also increase the frequency of wildfires, causing further forest degradation and threatening farming, forest-based livelihoods and fuelwood supply.

In response to the above-described climate threats, GCF loan, grant and guarantee finance are requested to initiate a paradigm shift in the regional approach to catchment and water management in the Dry Corridor and Arid Zones. This shift will see governments of the seven participating countries — Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama and the Dominican Republic — promoting large-scale EbA. At the same time, smallholder and commercial farmers, as well as entrepreneurs in rural communities, will have increased access to the financial resources and technical skills required to implement impactful adaptation interventions.

2. Site-specific EbA intervention plans

2.1 Rationale and objectives of site-specific EbA intervention plans

The programme includes the development of site-specific intervention plans through Activity 1.1. Sub-activity 1.1.3 for each of the seven catchment areas during the first year of the project.

These plans will be the basis for the allocation of grants ensuring that activities to be funded do contribute to a cohesive catchment approach targeting actions that reflect on the following principles:

- Reducing pressure on ecosystems and the services they provide (wood extraction, agricultural burning, or water use)
- Enhancing the social or economic resilience of human populations vulnerable to climate change,
- Reducing risks associated with climate events in production activities
- In their implementation protecting, restoring or using biodiversity and ecosystems in a sustainable manner, and
- Having a positive impact on individuals' economy in the short term.

The plans will also provide an assessment on additional EbA interventions that could contribute to building resilience of the catchment and can be financed through concessional financing and other enabling conditions that also need to be strengthened to ensure the sustainability of the EbA interventions in the future.

The development will be based on a consultative climate risk assessment with the communities, making use of available scientific data and information (climate scenarios, hydrological analysis and ecosystem services) to identify: critical risks, hotspots for adaptation interventions, capacity building needs, relevant planning instruments to be strengthened and investment opportunities for priority vulnerable groups.

The site-specific intervention plans (catchment scale) will be revised at least every two years along the project to incorporate new information derived from the implementation of the project and to update priorities and needs.

The objective of this document is to present a sample for the Choluteca basin (selected basin in Honduras) of how these site specific EbA plans will be developed based on the initial assessments undertaken during the preparation of this proposal between 2017 and 2020 and revised and validated during the first year of implementation to guide the territorial execution of the programme.

2.2 Site-specific EbA plan development process

The elaboration of this site-specific intervention plan will follow a four-step approach in the seven participating countries. All participating countries have completed the initial steps, and the remaining steps will be concluded during the first year of programme implementation as described below.

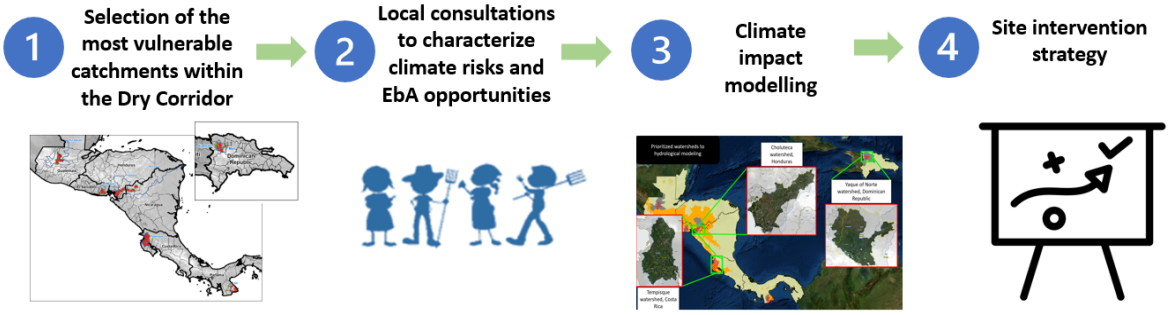


Figure 1. Steps for the elaboration of site specific intervention plan

Step 1. Selection of the most vulnerable catchments within the Dry Corridor (already done for the 7 countries)

- Step 1.1 National identification of up to four prioritized catchment areas within the Dry Corridor: The selection of up to four catchments areas of interest per country at the Dry Corridor and the arid zones of the Dominican Republic was done through workshops held with government representatives.
- Step 1.2 Regional climate change vulnerability assessment: For each of the prioritized catchment areas, vulnerability assessments were developed. Variables used for exposure, sensitivity and adaptive capacity included access to credit and irrigation, agricultural employment, among others.
- Step 1.3 Workshops and consultations for final catchment selection: Governments selected 5-6 bordering municipalities within one of the prioritized catchment areas, based on their vulnerability to climate change and other criteria.

Step 2. Local consultations to characterize climate risks and EbA opportunities (already done for the 7 countries. To be reinforced during the first year of programme implementation)

- Step 2.1 Assessment on territory and identification of key actors: A characterization of the territory and key actors was done. Variables assessed included: demographics, indigenous communities, main regulatory and legal framework, livelihoods, and financial mechanisms available.
- Step 2.2 Analysis of main ecosystems, climate risks and perceived climate impacts: The consultation methodology included a land use classification by participants, in which they analyzed main ecosystem's benefits/use, climate risks, perceived impacts, among other, in a sex-disaggregated manner.

- Step 2.3 Participatory identification of adaptation options: Consultation participants proposed adaptation measures based on the potential impact on the identified climate risks, ecosystems, livelihoods, and specific needs.
- Step 2.4 Perceived barriers and mitigation strategies during consultations: Participants identified main barriers they perceived could jeopardize the implementation of the proposed adaptation measures and the project in general.
- Step 2.5 Alignment with demand analysis from microfinance institutions: Financial institutions in the area were interviewed about their existing portfolios and demand. Climate risks identified during the consultation were compared and aligned with those identified by these institutions.

Step 3. Climate impact modelling (done for Costa Rica, Honduras and Dominican Republic. To be developed for the remaining countries during the first year of programme implementation and validated for the three initial countries)

- Step 3.1 Selection of the Piedras River sub-basin for the modelling purpose in Honduras: The Soil Water Assessment Tool (SWAT) used for the hydrological modelling of climate change potential impacts and impacts of EbA interventions. Water catchment areas are characterized through land use cover, digital elevation model and soil characterization. Based on topography, the basin is divided into sub-basins, and further divided into Hydrologic Response Units (HRU) based on unique combinations of slope, soil, and land cover. SWAT input data are precipitation, temperature, digital model elevation (DEM), soil cover, land use, and drainage network.
- Step 3.2 Identification of the main climate risks: The scenarios considered for modelling climate change impacts include a baseline, RCP 4.5 2050, RCP 4.5 2100, RCP 8.5 2050, and RCP 8.5 2100. The hydrological variables to estimate climate change impacts include soil water, percolation, water yield and erosion.
- Step 3.3 Impact modelling for main EbA interventions: A modelling scenario was generated to analyse the potential impact of EbA interventions individually or in combination under the RCP 4.5 climate change scenario. Selected interventions included those prioritized through the local consultations and a matrix was generated for the evaluation of impacts for different levels of intervention intensity.
- Step 3.4 Conclusions of the climate impact modelling: Results from the hydrological model were discussed through the analysis of changes in the hydrological variables for the Climate change RCP 4.5 scenarios with and without EbA interventions.

Step 4. Site intervention strategy (Pre-drafted for Honduras and Costa Rica. To be developed in consultation with key actors for all remaining countries during the first year of programme implementation)

The site intervention strategy will include the following components:

- Definition of the problem statement: Based on the results from the community consultations and the climate impact modelling, the problem statement can be defined identifying the main climate risks and barriers for adaptation to climate change.

- Intervention objective: The specific objective of the programme is defined with a clear identification of the expected results in terms of EbA interventions, enabling conditions and objective population.
- Intervention structure: The intervention logic describes the components that will shape the project, their contribution and their interconnection towards the main objective.
- Grant-financed EbA interventions to address prioritised climate risks in the Choluteca basin (Output 1.2): A number of EbA interventions will be financed through a grant mechanism as demonstration pilots for the target territory. This section describes what EbA interventions have been prioritized for the specific climate impacts.
- Grant facility established to promote an EbA business ecosystem (Output 1.3): The establishment of a Grant facility will then finance a series of EbA intervention, supporting business and distribution models through a competitive bottom-up approach. A number of criteria is raised to identify potential projects and beneficiaries at the community level, and this facility is also expected to leverage demand for EbA loans.
- Loan and guarantee facility to accelerate access to finance for other relevant EbA interventions for the Choluteca basin (Output 2.2): An EbA Lending Facility will be set at below-market conditions to enable financing for small- and large-scale EbA investments at farm-, enterprise- and household-level. A number of criteria for the selection of PFIs and of possible beneficiaries and EbA interventions to be financed is also predefined.
- Building capacities of key actors (Output 1 and 3): To ensure sustainability and as a complementary activity of the Grant and Lending facility, trainings will be organized at the local and national level, based on identified needs with targeted stakeholders.
- Mainstreaming EbA into key policy and planning frameworks (output 1 and 3): Technical assistance will be provided to strengthen the capacity of policy makers and decision makers and identify entry points of the integration of EbA in policy and regulatory frameworks at the local, national and regional level.
- Monitoring and evaluation framework: The implementation strategy of an M&E framework and a proposed set of indicators are included in the intervention plan to support the communities in the established of an M&E framework during the first year of the programme.

→ Validation of Site-specific EbA plans

A final step for validation of the site plans has been added for the pre-defined site plans in Costa Rica and Honduras where the initial year of implementation will be focused on strengthening the hydrological model and validating and confirming the specific sites for the grant interventions and the refinement of the elegibilty criteria for the grant and loan component in consultations with communities, experts and the financial institutions.

2.3 Considerations for the revision and validation of the site-specific EbA intervention plan during first year of implementation

Elaborating the site-specific plans is a fundamental process during the launch of the project to consider the specific context and needs (institutional, information, cultural, social, technical) and ensure ownership and participation of all key actors to maximize the efficiency of implementation and sustainability of EbA interventions.

The definition of these plans should not be considered as a one-document objective. The process of development of the plans is fundamental for the proper implementation of the project. It is important that these plans are further developed when funding is available so they can benefit from the proper technical inputs, dialogue spaces and serve as a process to bring communities on board for the implementation of the programme.

There are therefore important aspects that will need to be considered for the validation of these plans in the initial stages of the programme.

Ensuring environmental and Social Safeguards considerations

By elaborating this Site-specific intervention plan to respond to the donors' request, the first year of the project will still be crucial in engaging with local communities for the validation of these draft Site -specific EbA implementation plans to ensure alignment with all ESS. Indeed, the first ESS requires for an assessment to be elaborated through the evaluation of environmental and social risks and impacts, engaging with affected communities and other stakeholders throughout the process.

In-depth consultations are necessary to ensure that community health, safety and security are guaranteed in these plans (ESS4), that the proposed solutions do not lead to land acquisition or involuntary resettlement (ESS5) and to ensure full respect for indigenous peoples (ESS7). Additionally, traditional knowledge must be integrated to preserve immaterial cultural heritage (ESS 8) which can only be done through an in-depth consultation process.

Moreover, to ensure long-term biodiversity conservation and sustainable management of living natural resources (ESS7) the solutions must be integrated with the absolute support and ownership of the communities this project is going to work with.

Ownership and sustainability

The sustainability of the EbA interventions does not only depend on selecting those interventions that have the highest potential in reducing climate change impacts. It is absolutely essential to strengthen the enabling conditions related to institutional, capacity, information and cultural elements that need to be built through a solid empowerment and ownership building phase.

Guaranteeing the local communities' ownership of these interventions is fundamental to increase their adaptive capacity and promote a long-term result of these solutions. This must be emphasized during the first stage of implementation by revision the proposed interventions.

Additional EbA alternatives

The pre-identified measures included in this document should not be considered as the only EbA options, as there are certainly a much larger number of alternatives that could be more suited to specific environmental, social and cultural context of the Dry Corridor. For instance, the compilation of EbA alternatives used as a basis for discussion during the formulation process does not include EbA solutions on coastal management or resilient livestock management that could be highly relevant for the Dry Corridor territories. The current site-specific plan also requires more consultation to integrate traditional knowledge in the identification of appropriate interventions which are completely context-specific and require more in-depth analysis.

Considerations for the Site-specific EbA plan and the credit line

The Site-specific EbA plan will be critical to guide the implementation of prioritized landscape level interventions (grant), capacity building activities and specific technical assistance, however, the rule out of the loan component of this programme requires a certain level of flexibility in terms of the pre-identified EbA interventions to ensure adaptability to fluctuating markets and financial demands within the timeframe of the project. A number of eligibility criteria have already been defined for the loan facility and these can be strengthened through the development of Taxonomy systems with the MFIs based on the Site-specific EbA plans aligning EbA interventions to the main identified climate risks. It would be risky to pre-define a small number of EbA interventions to be financed through the loan component as the demand for financial support will vary in the lifespan of the project from very dry years to years of extreme rainfall events that will shift support needs in the region.

It is important to highlight that the loan component of the programme will NOT be extended to the entire Central American region, but will focus on the Dry Corridor that, by definition, is facing very similar potential impacts derived from climate change throughout the region.

Validation of hydrological modelling results

The hydrological modelling exercise undertaken for three specific basins in Costa Rica, Honduras and the Dominican Republic, focused on specific areas within the selected basins where sufficient information was available to run the simulations. These hydrological assessments should be expanded to cover the larger catchments beyond the pilot sites to evaluate climate risks and potential EbA impacts in order to ensure interventions that concentrate on addressing the key climate risks and on generating substantive impact for the Dry Corridor.

3. Step 1. Selection of the most vulnerable catchments within the Dry Corridor

3.1 Step 1.1 National identification of up to four prioritized catchment area within the Dry Corridor

Workshops were held with government representatives from each country to identify and select up to four catchments areas of interest per country in the Central American Dry Corridor or the arid zones of the Dominican Republic.

For Honduras, the Secretariat of Natural Resources and Environment prioritized four catchment areas of interest in the Dry Corridor region: Lempa, Goascorán, Nacaome and Choluteca.

3.2 Step 1.2 Regional climate change vulnerability assessment

Vulnerability assessments were then elaborated to select one of the four prioritized catchment areas. Variables used for the climate change vulnerability assessments included:

- Exposure: Data integrating water supply and demand, surface water and groundwater modelling under RCP4.5 and RCP8.5 scenarios.
- Sensitivity: Rural population ratio, rural dependency ratio, change in land use and agricultural employment.
- Adaptive Capacity: Access to water and sanitation service, population per health facility, rural economic activity and access to credit and irrigation.

For Honduras, a climate change vulnerability assessment was developed for the four prioritized catchments, as seen in the following map:

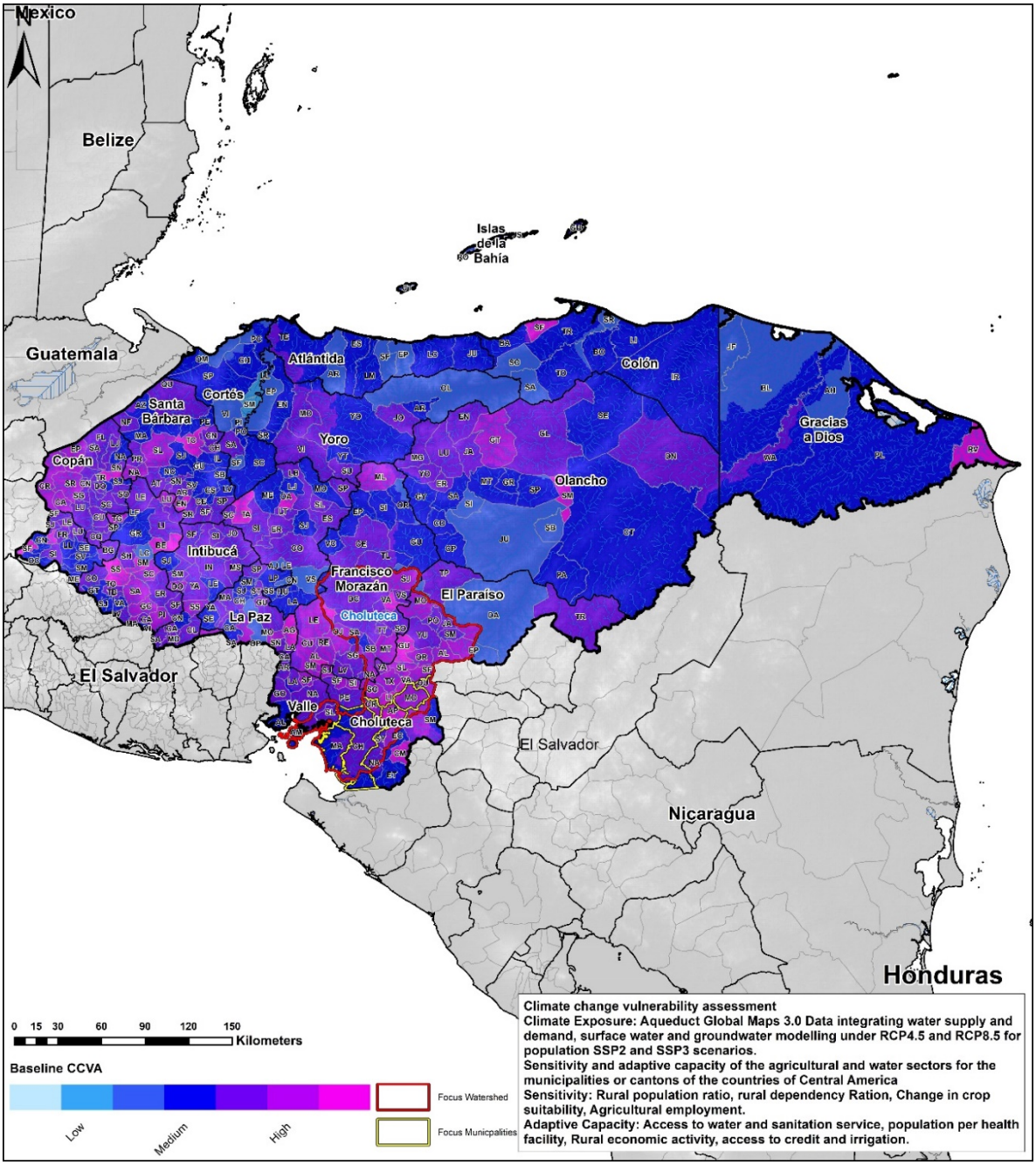


Figure 2. Climate change vulnerability assessment for four prioritized catchment areas in Honduras

3.3 Step 1.3 Workshops and consultations for final catchment selection

With the identification of the most vulnerable catchment area to be prioritized, 5 to 6 bordering municipalities were then selected by the ministries, considering the following criteria:

- Vulnerability to climate change (assessment from step 2).
- Non-duplication with similar projects.
- Potential to benefit underserved and most needed populations.
- National priorities.

For Honduras, based on the assessment results, the country prioritized the Choluteca catchment area and within it, 6 municipalities: Choluteca, Marcovia, Duyure, Morolica, Apacilagua and Orocuina, all located in Choluteca province.

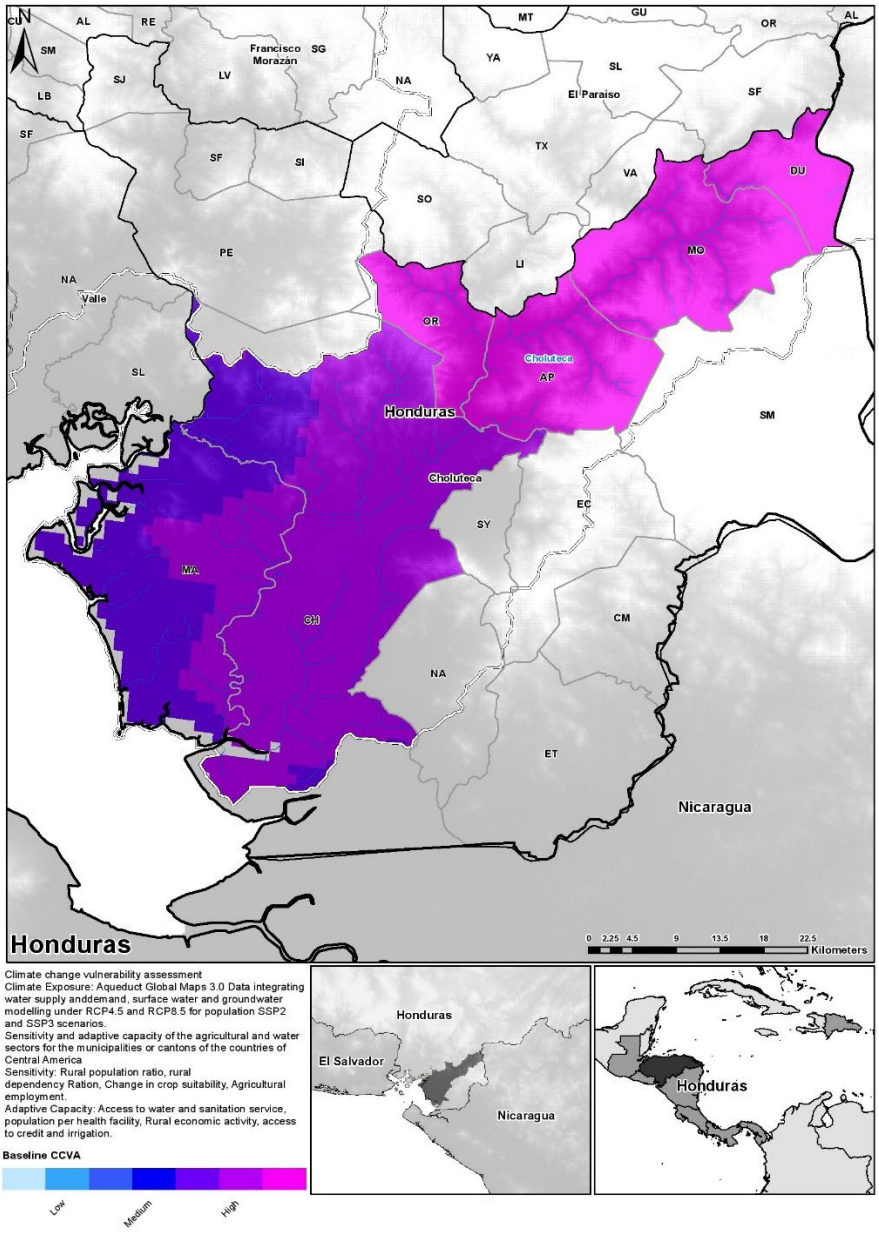


Figure 3. Municipalities selected within Choluteca catchment area

Through this vulnerability assessment, the Choluteca watershed, in southern Honduras was identified as one of the most vulnerable parts of the country to climate change (Figure 3). This part of Honduras has both high seasonal precipitation variability and relatively high levels of water stress, suggesting that it is particularly exposed to climate change, including the increasing frequency and duration of droughts and changing precipitation patterns. Apacilagua, Duyure, Morolica and Orocuina municipalities within the Choluteca watershed (Figure 4) have particularly high rural population ratios and high proportions of the workforce employed in agriculture, indicating the heightened sensitivity of these communities and workers to climate change. Rural economic activity and access to water and sanitation services varies across the watershed, while access to irrigation and credit are limited across all six of the mapped municipalities, indicating limited adaptive capacity should climate impacts render agriculture less sustainable in this part of the country.

4. Step 2. Local consultations to characterize climate risks and EbA opportunities

Local consultations were held in the selected catchment, for which gender considerations were mainstreamed in the consultation methodology. Results were used to validate and adjust the proposal and sub-activities for the grant component were agreed as part of the process.

The local consultation workshops were held in Choluteca, Choluteca October 14, 2019.

Important aspects to consider were:

1. The concerns participants had regarding water availability in the area, and their recognition of the role that forest protection can play for an improved watershed management.
2. Their request to keep local communities informed and actively involved to avoid creating false expectations, as sometimes projects tend to be unrealistic or not address their real needs, generating feelings of frustration among the population.
3. The need to address institutional conflicts/contradictions when providing permissions for forest exploitation despite its effects on watersheds.

Figure 4. Pictures of local consultations

4.1 Step 2.1 Assessment on territory and identification of key actors

Choluteca province's location and description

The Choluteca River is born in the municipality of Lepaterique, in the department of Francisco Morazán, and continues in an east and northeast direction until it passes through head of Choluteca and through the village of Marcovia, southwest of Honduras. It has a length of 250 km and its basin has an area of 7,570 km2. Choluteca Baja subbasin is located in the low part of Choluteca River basin.

All the selected municipalities enjoy a dry tropical climate. In summer the temperature ranges between 30 and 40 Celsius degrees, while in winter it can drop to 25ºC degrees. The municipality of

Choluteca according to Holdritch's classification has a sub humid tropical climate, determined by the mangrove wetlands that surround it.

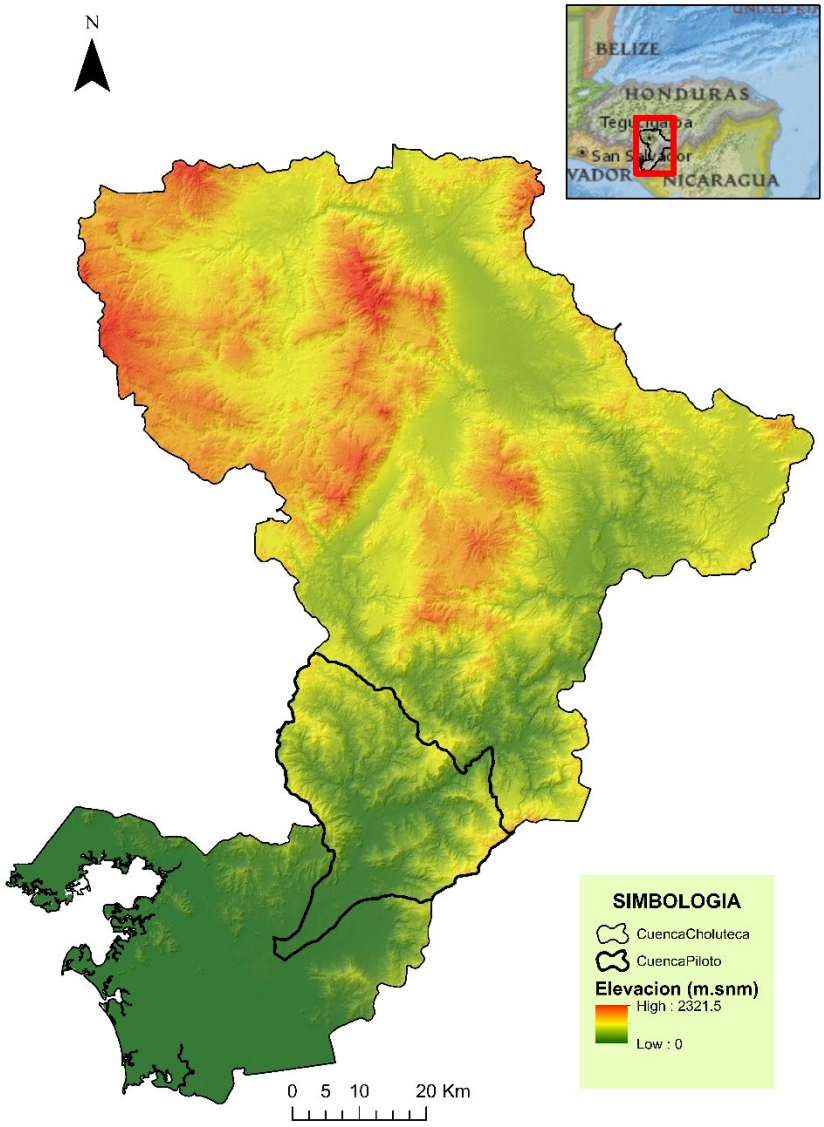


Figure 6. Prioritized municipalities within the targeted watershed

Land use

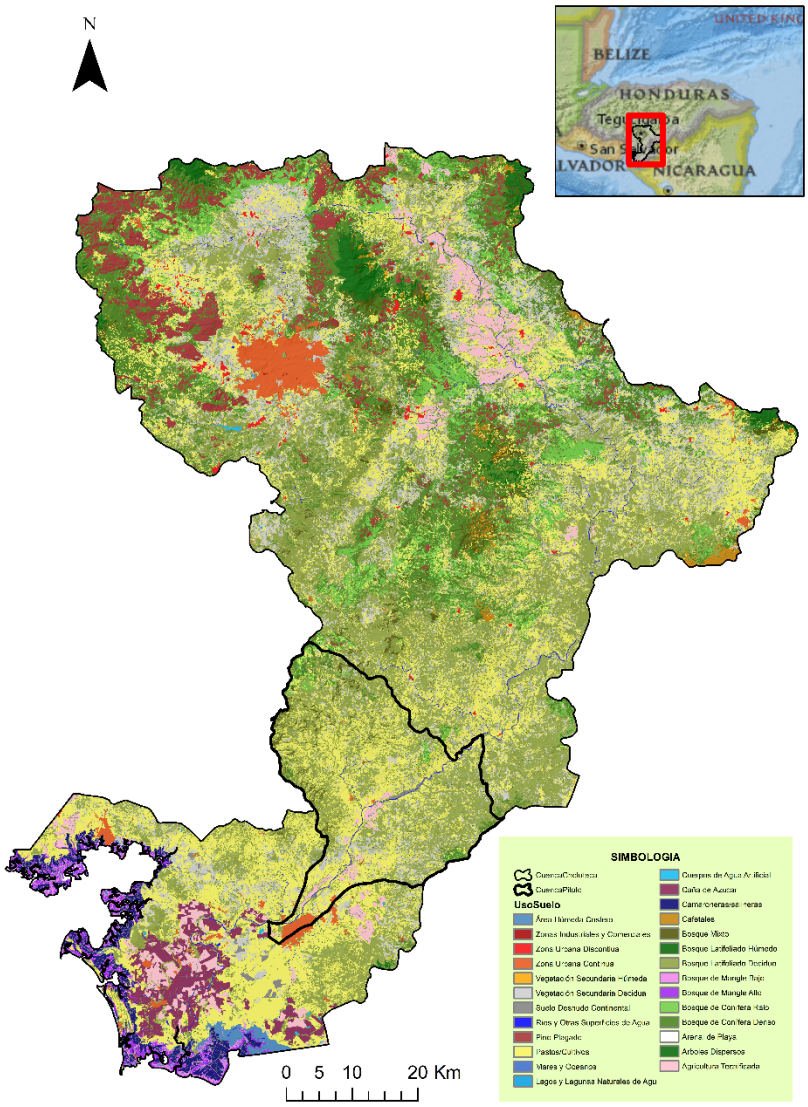


Figure 7. Land use in the Choluteca basin - Honduras

Table 1. Land use distribution in the Choluteca basin – Honduras

Land use	Choluteca basin	
	ha	% Area
Industrial and commercial zones	120.0	0.02
Artificial water bodies	542.1	0.07
Rivers and other water bodies	2677.3	0.35
Bare continental floor	6666.9	0.88

Scattered trees	6693.5	0.88
Mixed forest	10315.2	1.36
Sugar cane	13468.3	1.78
Continous urban zone	15205.8	2.01
Technified agriculture	22330.2	2.95
Pine	32678.4	4.31
Thinned coniferous forest	39591.0	5.23
Deciduous secondary vegetation	92229.1	12.17
Dense coniferous forest	101972.6	13.46
Pastures / crops	199372.3	26.32
Deciduous broadleaf forest	213701.4	28.21
Total	**757564.3**	**100.00**

Demographics

The largest urban centre in the territory is located in the municipality of Choluteca, which also has the most extensive area in the Choluteca province. The municipality of Marcovia is the second one with the largest urban population (the village of Monjarás specifically). It is also the second biggest municipality in the province, located in the lower part of the Choluteca river basin.

Table 2. Basic information for the selected municipalities

Country	Catchment	Province	Municipality	Total Population	Rural Population	Spatial extension (km^2)
Honduras	Choluteca	Choluteca	Choluteca	120791.00	45305.00	1069.10
			Apacilagua	8954.00	8954.00	213.10
			Marcovia	37824.00	31365.00	482.30
			Orocuina	15949.00	15949.00	124.60
			Morolica	5035.00	5035.00	281.30
			Duyure	2753.00	2753.00	105.50

Indigenous communities

Indigenous communities are not present in the area. Certain municipalities account for less than 1% of its population belonging to indigenous communities – namely the ethnic groups Apacilagua (0.6%), that belong to the Chorotega tribe.

Principal regulatory and legal framework

A compilation of the main legal frameworks that must be considered by this project was elaborated during the consultation process and subsequent investigation.

First, at the **regional level**, three main strategies must be taken into account:

- Framework Regional Environmental Strategy 2015–2020. The regional strategy integrates efforts from other Central American Integration System (SICA) subsystems and national efforts in order to facilitate and promote in each of the signatory countries — according to its social, environmental, institutional and economic particularity — the necessary actions to ensure the environmental sustainability of the ecosystems of the region.
- Strategy and Plan for the Integrated Management of Water Resources in Central America[1]
- Strategy for a sustainable agriculture adapted to climate change for the SICA region (2018-2030)[2]

At the **national level,** Honduras has made several advances in environmental policy:

- Decree 98 – 2007; Forest law, protected areas and wildlife, that establishes the legal regime for the administration of forest resources and protected areas and wildlife. It i) declares as national priority the sustainable use of forests, protected areas and wildlife, and the regulation of forestry lands;; ii) creates a fund for forestry reinvestment, replantation and management of protected areas and wildlife; iii) establishes a special management regime for areas of special hydrological importance; iv) creates incentives for reforestation, the protection of natural forests and water basins, the establishment of energetic and multiple use of forestry plantations and public and private forest management.
- Decree 181 - 2009 General Water Law, within which it: i) prioritises human water consumption above any other use; ii) declares water as being of public domain; iii) recognises the services provided by ecosystems and mentions the need to compensate them using the rates established by the Water Authority; iv) establishes that land use plans shall identify zones that are susceptible to disasters and shall implement limitation, prevention and mitigation actions; v) regulates the procedures to obtain permits for water usage; and viii) creates a national fund to finance programs of conservation, recovery, monitoring and investigation.
- Decree 234-2003 Law for the Financial Strengthening of Agricultural Producers, that creates a legal framework to financially support the agricultural sector by giving producers the opportunity to reduce their current debts and modify their payment conditions, therefore allowing them to obtain new credits.
- Climate Change Act, 2013, that establishes the principles and regulations to respond effectively to climate change effects by: i) creating the Interinstitutional Committee of

[1] http://www.siagua.org/sites/default/files/documentos/documentos/recursos_hidricos_centroamerica.pdf
[2] http://www.cac.int/sites/default/files/Estrategia%20ASAC%20-%20CAC.pdf

Climate Change, the Technical Interinstitutional Committee of Climate Change and the Unit for Economic and Financial Management to fund programs and projects; ii) promoting capacity building, awareness and education initiatives; iii) instructing public entities to develop strategic plans; and iv) including provisions for the development of adaptation plans for the agricultural sector.

- National Adaptation Plan (NAP) - currently implemented through the GCF readiness program. The main objective of this readiness and preparatory NAP support proposal is to build sustainable country capacity and strengthen stakeholder engagement to plan, finance, implement, monitor and report strategic national adaptation processes and communicate knowledge about climate change adaptation.

Additionally, local level policies and development strategies have been developed, mainly:

- Territorial planning instrument (Plan de ordenamiento territorial, TOP for its initials in Spanish) derived from the national project of risk mitigation: two of the selected municipalities have developed one, namely **Choluteca**[3] and **Marcovia**[4] which include a territorial characterization and planning model with a Territorial Zoning proposal. The plan defines the spatial representation of a Land Use Plan derived from the application of a technical procedure that includes the study of the vegetation cover, the capacity and conflicts over the use, the accessibility of the territory, areas under threat, protected areas and water-producing areas.
- Strategic municipal development plans (PEDM for its initials in Spanish) - All municipalities have one, but they're not all validated. For **Morolica** (2019 - 2024)[5] the strategic lines of development are (i) Social development, (ii) Productive development, (iii) Promotion of the protection of the Environment, (iv) Social Infrastructure. On another hand the **Choluteca** plan does not mention the development of communities or of natural resources.
- Integrated Watershed Management plans for the Choluteca Baja basin[6], that aims at contributing to reducing environmental degradation, natural resources, improving water resources in quality and quantity, and preventing disasters within the Lower Choluteca River Basin through strategic actions implemented through the Management Plan.

Key actors - National level

Different public institutions must be involved in the process, especially those with a local office or representation in the target area. The main national actors are:

[3] http://www.desastres.hn/GROT/pdf/doch0169/pdf/doch0169-1.pdf
[4] http://www.desastres.hn/GROT/pdf/doch0173/pdf/doch0173-1.pdf
[5] https://portalunico.iaip.gob.hn/portal/ver_documento.php?uid=NzQwODAyODkzNDc2MzQ4NzEyNDYxOTg3MjM0Mg==
[6] https://www.sica.int/busqueda/busqueda_archivo.aspx?Archivo=odoc_32600_1_11022009.pdf

- **MiAmbiente**, the Secretariat of Environment and Natural Resources, with its different units (General Directorate of Water Resources (DGRH), National Climate Change Directorate (DNCC), etc.),
- the **SAG**, Secretariat of Agriculture and Livestock, and
- the **ICF**, the National Conservation Institute for Forest Development, Protected Areas and Wildlife, responsible for issuing exploitation permits (participants reported issues and conflicts with this delivery of permits).

The National Convergence Forum (**FONAC**), a civil society body for the verification and independent monitoring of compliance with the Country Vision and the National Plan is also an important actor to include in the planification activities. They work closely with the **Roundtable on Environment, Risk Management and Adaptation to Climate Change** promoted by the Technical Unit for Regional Planning of the Government of Honduras within the framework of the Country Vision Nation Plan, coordinated by **CODEFAGOL** (Committee for the Defence of the Flora and Fauna of the Gulf of Fonseca).

The **National Board of Advocacy for Risk Management**, a permanent civil society coordination body gathering around 32 bodies (NGOs, private companies, civil society organizations), is also a key player on risk management issues. They remain active and support the work of the Permanent Contingency Commission, **COPECO**.

Key actors - Local level

In terms of **governance**, several bodies must be included in the consultation process:

- The **Municipal Mayor's Office**, with its Municipal Environmental units (UMA for its Spanish acronym) and Municipal Emergency Committees
- The **Municipal offices for Women** (OMM), local level institutions that guarantee the fulfilment of women's rights.
- **Rural Boards**, local instances composed of representatives of communities or neighbourhoods as official representation before mayors or any other external instance.
- **Water Boards**, local bodies that are organized at the level of each community, with the purpose of ensuring the management of water, especially for human consumption in the communities.
- The Local level Emergency Committees (**CODEL**), with at least one located in Marcovia
- **Mancomunidades**: These instances converge the municipalities and integrate to work in an organized way. They manage projects, government transfers and are strengthened locally. In this territory: Duyure, Morolica, Orocuina and Apacilagua belong to the **MAMBOUCARE** (Mancomunidad del Cerro de la Botija and Guanacaure), while Choluteca and Marcovia belong to **NASMAR** (Community of Southern Municipalities).

The **civil society** is also to be consulted through its other representations, namely:

- NGOs working for water, forest protection and adaptation to climate change.
- Religious representations, either churches, evangelical or catholic, and Adventist.
- In Morolica, the Family of Educational Centers and Health Committees
- In Duyure, the PROSASUR Project, Alliance for the corridor.

As for the **productive sectors**, several key businesses were named during the workshops, mainly the Livestock Associations, Farmers associations and other microbusinesses. Aguas de Choluteca is also a key actor in terms of water management. As for agriculture, a sample list can be found in the following table:

Table 3. Main agricultural enterprises in the 6 targeted municipalities

Type of business	Choluteca	Marcovia	Morolica	Apacilagua	Orocuina	Duyure
Main national agricultural business	• Grupo Granjas Marinas (for agriculture, fisheries and livestock), • COEXMAR, • Cultivos Marinos (CUMAR), • Agropecuaria montelibano (melon production, members of the group *Agrolibano*), • Industrias caracol and Azucarera Choluteca (sugar cane agriculture),	La Grecia S.A. and Azucarera Choluteca (sugar cane agriculture),	Morolica lacteos and CRELL (Dairy micro-business)	Independent producers in small plots (vegetables)	Orocuina Producers Association (Aprooro, Okra)	A dairy processor and a processor of banana slices
International business	• Sinclair Import Group (Okra exporter)	Biolarva Aquaculture (marine products)			Sinclair Import Group (Okra exporter)	

Finally, in terms of **financial management**, three main entities are considered:

- **Boards of Trustees** also composed of civil society members.
- **Savings and credit unions**. Although there is no physical presence in all municipalities, Morolica, Apacilagua and Orocuina's inhabitants are registered in the offices of the municipality of Choluteca to benefit from these plans. In Duyure and Marcovia, there are physical cooperatives.
- **Rural cash institutions:** many rural communities have these bodies, supported by various institutions.

Main livelihoods

Agriculture, livestock, silviculture and fisheries is one of the main productive activities in the area. According to Population and Housing Census (2013), it represents 23% in Choluteca, 56% in Marcovia, 64% in Orocuina, 79% in Duyure, 81% in Morolica and 89% in Apacilagua.

Agriculture however is generally migratory, which is the case of the production of basic grains. Burning before planting is a common practice. In the highlands, many pine lands are deforested, burned and then subsistence agriculture is implemented, lasting about 3 years. Afterwards, the lands are used for livestock and farmers migrate to new land.

Maicillo or sorgo (*Creole sorgo*) is a crop that has lost relevance as a "security" crop. It has generally been sown with maize so that when there are losses of maize due to extreme droughts, sorgo can guarantee a livelihood for families, as it is more tolerant to intense summers. Data collected in interviews, however, indicate that in the early 1990s around one million quintals were produced in the Choluteca department. Currently the production does not exceed 50,000 quintals. This reduction in production is due to the concentration of pests in the few existing plantations.

Main available financial mechanisms

During the consultations, the participants indicated that rural cash institutions (financing mechanisms at community level) are very common in the territory. All municipalities have rural boxes. Moreover, there are also savings and credit cooperatives, which provide a higher ceiling and different mechanisms to provide credit to their partners. Finally, banks are options for medium and large producers who have mortgage guarantees.

Table 4. Main financial services in the 6 targeted municipalities

Country	Municipality	Banks	Cooperatives	Other	Products and services offered (summary)
Honduras	Apacilagua	0	1	10	Mainly credit products; some savings products; transfer services;
	Choluteca	9	4	8	Full range of financial products and services
	Duyure	0	1	4	Mainly credit
	Marcovia	2	1	0	Mainly credit
	Morolica	0	0	5	Mainly credit
	Orocuina	0	1	0	Mainly credit

4.2 Step 2.2 Analysis of main ecosystems, climate risks and perceived climate impacts

The following tables reflects the concerns of governmental employees from public institutions such as Municipalities, Water management projects, Water boards, Ministry of Environment (MiAmbiente) and Board of Trustees (from Duyure), civil society represented by various groups from the municipalities of the targeted municipalities that gathered during the consultation process to provide feedback and elements from a more territorial perspective.

To have a better understanding of the changes in climate that the communities in the prioritized sites perceived, men and women were separated during some activities of the consultation to have sex-disaggregated data.

Table 5. Perceived changes in the climate

Variables	Communities' perception
Changes in precipitation (intensity, frequency)	Participants indicate that rains have become intense and concentrated, so droughts have become more widespread, delaying the entry of the rainy season. They also testify of more storms and hurricanes, with increased climate variability, especially since 2001. In 2016 and 2018, the Choluteca river dried up.
Changes in temperature	Temperature has increased in recent years, there is a greater evapotranspiration. Currently it can reach up to 42 degrees Celsius, which didn't happen 10 years before. The increase in temperature is also related to forest loss, logging and forest burning.
How long have these changes been observed?	Participants indicate that these changes are perceived since 2001 and periods of dry years intensified since 2014.
Are climate events mentioned? Eg. El Niño	Yes, participants referred again to intense periods of drought such as 2001 and 2014.
Other climate changes mentioned	Changes in tides have been experienced, but since 1998 after Hurricane MITCH.

Table 6. Perceived impact of climate change in different activities, disaggregated by sex

Activities impacted	In men's lives	In women's lives
Impacts on household chores	n/a	Perception of lack of water for consumption, while a water wagon provides more supplies but has to cover longer distances, so it's not all reliable. There's a need to identify other means to meet water demand, such as well drilling. The need to look for water elsewhere and carry it home, implies less time to take care of the home. These changes have intensified in recent years.
Impacts on agricultural/labor work	Pest proliferation. Increased use of agrochemicals. Reduction in water supply for production.	More work for women in paid agricultural work (in okra production, for example).

Economic impacts	Reduced yields Migration in search of other opportunities to generate revenue. Increased diseases and soil contamination. Poverty is increasing. Unemployment and migration.	Decreased availability of nutritious food for the home. Increase in the price of dairy products, because it is more expensive and difficult to produce livestock derived products, which causes a low consumption. When high-value crops are affected, job supply is reduced. For women, the reduction in the production of basic grains forces them to work to generate additional income to men's. Today, both heads of households need to work away from home, to generate enough income.
Health impacts	In recent years, people have been referring to as "sunstroke" which is the feeling of higher temperature in the body, due to the increase in temperature, which has a strong impact on people. This is thought to cause dehydration and hypertension and skin diseases, so the population tries to avoid exposure to the sun at mid-day. There are also more vector diseases, such as "Zika".	Increased presence of vector illness (dengue or Zika): because they need to take care for sick children, other household chores are neglected.
Other impacts	Water conflicts: wars over water are feared if measures are not taken. The pollution in the river is also raised, as the "chocolate rivers" (named that way due to its color) then flows into the gulf and causes more pollution on the coast and increases sedimentation. Family disintegration due to all these problems is also mentioned, followed by forced displacement. For example, in the case of Duyure, some houses that were adjacent to the river were flooded with the passage of Hurricane Mitch in 1998, so people had to move and lost their community	Family disintegration. Major collapse, disasters and flooding from forest loss.

Table 7. Perceived uses of ecosystems and agro-ecosystems and perceived impacts

Ecosystem/agro-ecosystem identified	Perceived benefits and uses	Impact of climate changes
Forests (broadleaf, coniferous, mixed)	Water production, oxygen production, soil retention, wood production, flora, fauna, climate regulation, nutrient recycling. It also generates employment.	More diseases and pests (debarking weevil). Landslides and less infiltration. Biodiversity loss. Massive deforestation, and increased logging As an example it was mentioned that a change in the color of the oak leaves is being observed; in response to water stress it turns a deep red color, which was not observed before.
Basic grains, agriculture, corn and beans	Food security, nutrition, income generation. There is production of	Change in flowering periods. Proliferation of pests and diseases, which causes low production.

Ecosystem/agro-ecosystem identified	Perceived benefits and uses	Impact of climate changes
	basic subsistence grains. Improves quality of life.	Farmers no longer have access to the Creole seeds independently, they have to buy them from the agricultural business, so they depend on the outside. It wasn't like that before. Agricultural burnings for small cornfields, causes soil degradation. Dry season's extension. If there was good production, migration would not be necessary, and poverty could be tackled.
Livestock	Food security, income-generating nutrition	Decrease in pasture quality and decrease in quantity, with consequences of cattle dying. There is also increased diseases in livestock, increased stress and this reflects in poor yield of milk and meat.
High value crops: Melon, okra, lemon, mango, cane, pineapple.	Economic sustainability, through the generation of jobs and the generation of foreign exchange because these products are exported.	Reduction in water supply for production and thus decrease in yields. Increased presence of pests and diseases, and in response greater use of agrochemicals that come to pollute the environment. Summer extension. Less currency is generated, because there is less yield, less quality and less export.
Artisan fishing	To improve consumption or to generate income.	Reduction in the supply of fish in rivers. This activity has no regulation, there is no ban for fishing.
Shrimp, salt production	Economic sustainability, job creation and foreign exchange generation, because products are exported outside the country. In the case of shrimp, the people who work in the crop themselves are men, while in manufacturing women work (90% of the manufacture is made by women).	Increased salinity of seawater, which reduces shrimp growth.
Mangroves (wetlands)	Protection of storm surges, habitat for marine fauna, coverage, oxygen generation. Biodiversity of marine life (shrimps, curiles (mollusks), snakes). Provides CO^2 capture.	Tidal changes
Water source	Water is a vital resource for all activities.	A reduction in the flow of sources has been seen, causing loss of flora and fauna, loss of crops and also negatively impacts livestock.
General comments of the plenary		One point raised was that some animals felt invaded in their habitat, making them flee and even reach the populated centers (cities), looking for other new spaces to live.

4.3 Step 2.3 Participatory identification of adaptation options

During the consultation workshops, a series of adaptation measures were discussed with the participants, to identify their intakes and views of the different measures. A general input was that adaptation measures should be framed in territorial development strategies in soils, water, conservation and agricultural production. Below is a table summarizing their views of the justification and impact potential of the adaptation options.

Table 8. Summary of participants' view on proposed project's outputs

Component or activities	General appreciation of effectiveness/feasibility
Technical assistance to implement EbA	It is necessary, although aside from the lack of technical capacity, problems raise from conflict over land tenure and lack of territorial order, which hinders conservation. In addition, the boundaries over state property are also unclear and deforestation can occur even then.
Financial mechanisms	Necessary for the implementation of the project and ensure sustainability. Currently, financial mechanisms benefit agriculture rather than reforestation. There are no loans to plant trees, but there are loans for others that deforest.
EbA incorporation and knowledge management	Considered as very important, but governance issues (land ownership, agricultural incentives/deforestation) must be resolved for the project to be sustainable and continue over time.

4.4 Step 2.4 Perceived barriers and mitigation strategies during consultations

During the workshops, bullet points of main barriers and possible mitigation strategies for the main outputs of the project were discussed and are summarized in the table below.

Table 6. Perceived barriers and mitigation strategies for the project's activities.

Component or activities	Existing barriers or difficulties that could arise	Strategies for tackling barriers
Technical assistance to implement EbA	Bureaucracy to advise on credit lines No efficient use of financial resources High interest rates of loans and lack of incentives Collateral or mortgage guarantees Inequity in the use of funds Little understanding of EbA (e.g. forest protection as a key factor for the generation and conservation of water in the territory)	Process simplification Technical assistance Decentralization of administrative processes Management of the fund by rural boxes, municipalities Loan subsidies. Clear credit policies
Financial mechanisms	No technical assistance Limited sources of funding. Lack of interest or trained staff Time availability	Management of technical and financial resources Train technical staff Encourage the population with new and adapted proposals of interest.

EbA incorporation and knowledge management	Lack of political will and political gaps between mandates UMAs are small units, with little staff, limited operational capacity and large responsibilities in the municipality Lack of interinstitutional coordination Limited financing	Improving the political will to generate interinstitutional coordination spaces Resource management Promote community organizations Provide training and TA to UMAs, technically, logistically and financially. Conduct studies according to the needs of each situation. Revise strategic municipal development plans

Additionally, participants also raised specific issues they had been confronted with in previous years that should be taken into account during implementation, mainly:

- **Existing tensions** with the Institute of Forest Conservation (ICF) and the Municipal Environmental Units (UMA). The representatives of the UMAs have complaints regarding the delivery of forestry permits by the ICF in reloading areas (permission from Tegucigalpa, which leaves the UMAs powerless).
- **Consultative process**. When involving the local inhabitants in the process, goals must be clear and realistic, so as to avoid creating false expectations in the population.
- **Inter-institutional cooperation**. Watershed management and water production issues are also linked to political issues. Because the Choluteca river is so extended and passes by different regions (included the capital city), the watershed management must be coordinated. The advance of the agricultural border (in the reloading zones, the highest points), despite some of territories already having the status of "protected areas", has impacts on the lower basin. Participants would like to promote the recognition of the value of the land producing water, and eventually develop a system similar to payment for ecosystem services, paying the value of the water to their land owners.

4.5 Step 2.5 Alignment with demand analysis from microfinance institutions

Microfinance portfolio analysis in Honduras

According to MIFIndex (https://www.mifindex.org/perfilnacionalcartera.aspx?pais=HN), an analysis tool developed by REDACMIF (Regional Network for Microfinance institutions in Central America), there are around 65 microfinance institutions that operate in the Dry Corridor region in Honduras.

It is important to mention that not all microfinance institutions are part of REDCAMIF and therefore the microfinance market is even larger than the numbers discussed ahead. In the analysis summarized in Annex 30, 46 financial institutions were identified in the pilot site only (5 municipalities) in Honduras, displaying an adequate balance between nationally present and often regional or international banks and cooperatives and other types of smaller financial institutions.

In Honduras, at June 2020, a total agricultural loan portfolio of US$ 108 million to 75,176 clients has been reported – representing the second highest share of a total microfinance portfolio of US$467 million with 23% with commerce in the first position with US$189 million and 139,121 clients. The average ticket size is US$1,436. Individual lending methodologies are used for 96% of the portfolio, with 3% and 1% following group lending and community bank lending methodologies respectively for smaller loan amounts – probably in rural areas.

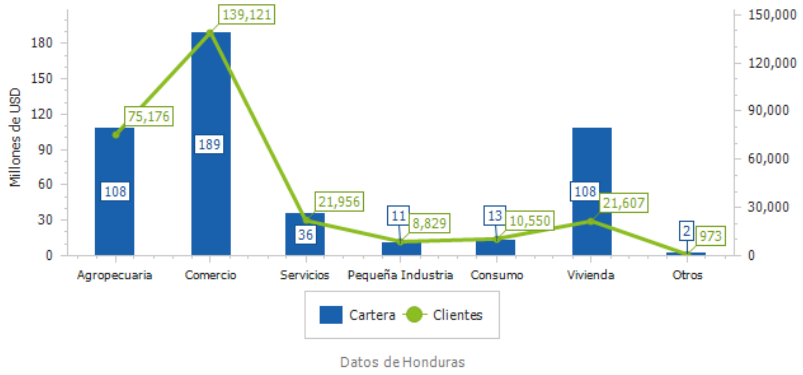


Figure 5. Microfinance portfolio distribution for Honduras June 2020. 108M USD in agriculture portfolio out of 467M USD total portfolio

As the proposed programme for the Dry Corridor focuses on agricultural finance, the above numbers would translate into the following situation for microfinance for the agricultural sector in Honduras:

1. Assuming linear disbursements and linear repayment, close to 37,000 loans are being disbursed in agricultural microfinance per year.
2. This translates into an estimated 3,000 loans per month
3. The average ticket size can be assumed to be double that of the outstanding loan portfolio, reaching amounts of US$ 2,800.

EbA finance survey analysis in Honduras

As part of the programme formulation process, a total of 14 financial entities were interviewed to understand the existing portfolios, credit demand and current financial support to EbA in the Dry Corridor in Honduras.

The main climate risks identified by these institutions in Honduras were aligned with those identified through the community consultations including rain pattern changes, extreme heatwaves and extreme rainfall events.
Additionally, the most representative impacts identified by respondents were productivity loss, harvest loss, need for extraordinary inputs and increased plagues.

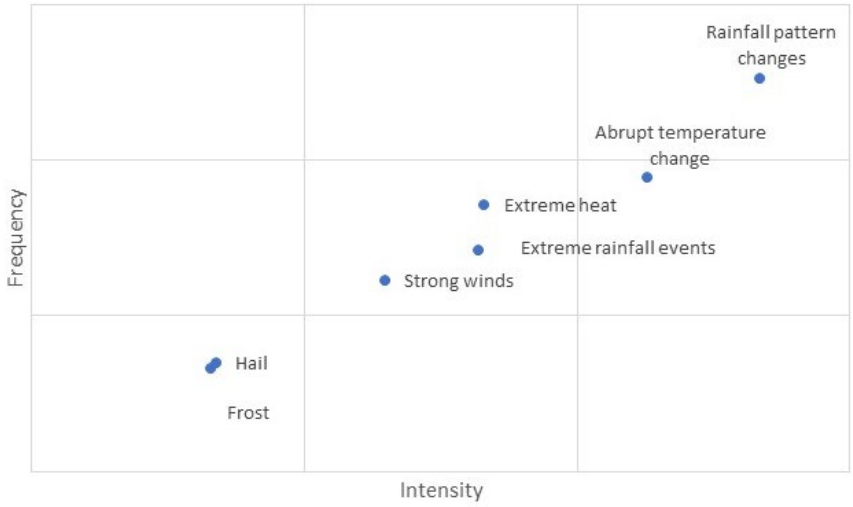


Figure 10. Main climate risks and impacts identified by MFIs in the Dry Corridor in Honduras

The surveys with these institutions requested about the EbA solutions used by small producers in Honduras. As shown in the graph below there is a wide range of solutions that can be categorized as EbA and it can be concluded that in their wide variety they are all known and implemented by local producers and communities. Although it can be emphasized that EbA solutions that respond to water needs are within the main identified ones, as well as those associated with improving productivity. 64% of respondents said drip irrigation is the most common technology used by their customers to adapt to the impacts generated by climate change. In the same way biodigestors, agricultural drainage, greenhouses and crop rotation present an interesting percentage of mentions. These figures reveal an initial idea of the EbA solutions on which entities could focus on, because farmers are already familiar with and making use of them.

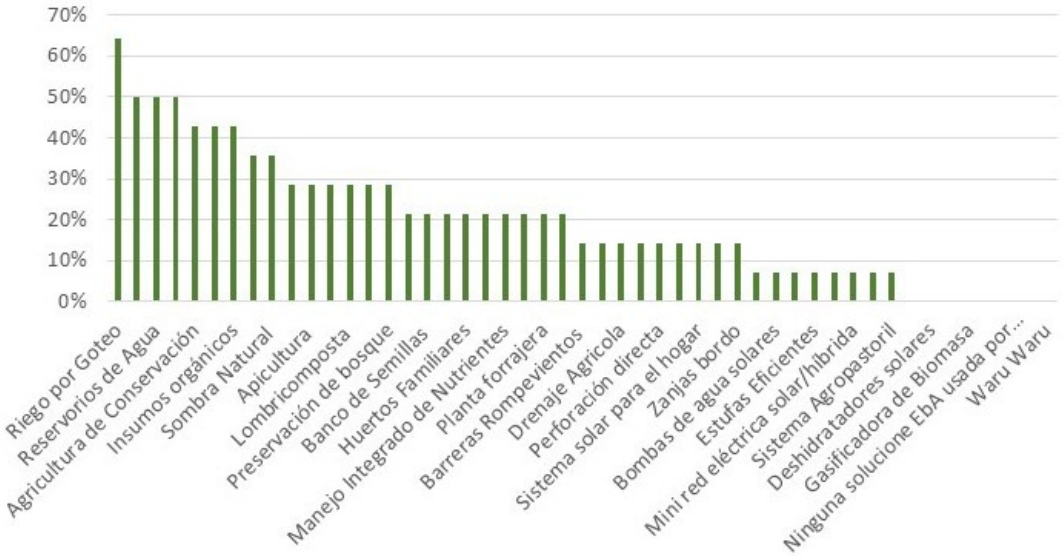


Figure 6. Observed frequency of EbA interventions already applied by local producers

All the financial institutions interviewed stated that they are providing credits to the agricultural sector and in around 30% of cases, they have developed or are developing a green credit line where these interventions are promoted. They also recognize that while they do not have labelled products as EbA, funding is made available through their traditional products.

By analysing information with the data produced by the survey, it is possible to conclude that local financial institutions are already financing EbA interventions. Although looking at the percentages of the graph below compared to the graph above, we can conclude that there is a gap between demand and supply, which materializes as an opportunity for financial institutions to expand their portfolios. For example, for organic agriculture, there is a gap of nearly a 30% which means that producers are implementing EbA solutions, although all financing is not through credits. Even in drip irrigation or organic supplies there is an interesting gap to be covered.

As seen in the graph below, there is an enormous gap in a number of EbA interventions that are already being applied by producers and not financed through loans that could become an interesting niche for microfinance institutions in the Dry Corridor in Honduras.

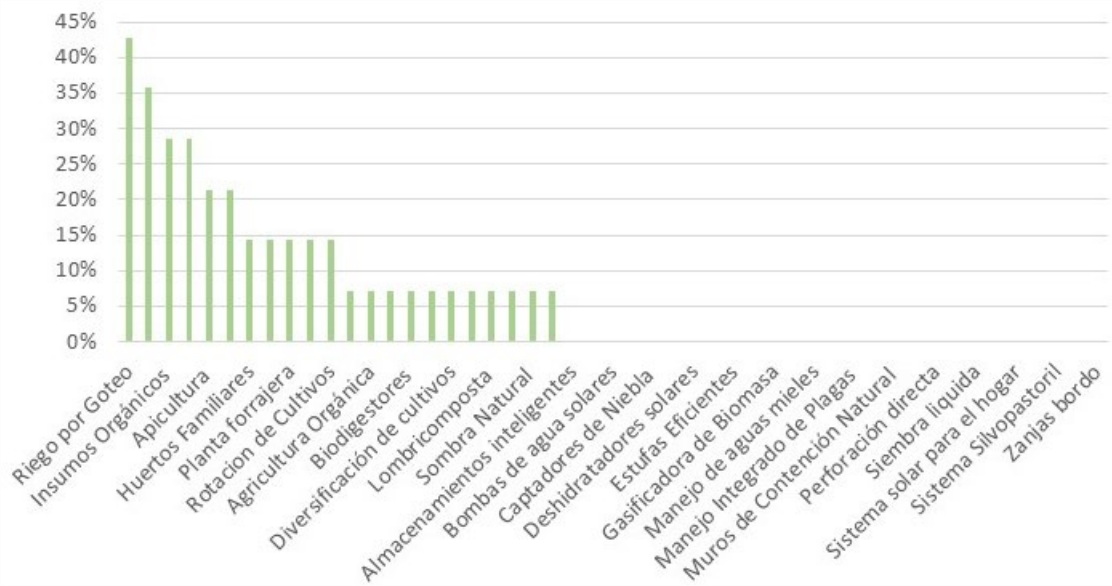


Figure 7. Frequency of financed EbA interventions by local financial institutions

Lending facility feasibility in Honduras

Honduras has the largest microfinance sector in the region and the following considerations for the potential of the lending facility of the programme can be drawn to establish a comparison with the microfinance portfolio described above:

1. In average each country could absorb (assuming equal distribution for purposes of discussion) around US$ 14.7M in funding form the lending facility (US$ 60M from GCF and US$ 42.8M from CABEI)
2. By rotating this capital at the MFI level, a total disbursement per country over the lifetime of the lending facility of US$ 51.5M via close to 9,800 loans could be reached.
3. This translates to an average disbursement of 980 loans per country, per year, or in average 82 loans per month (due to dynamics of building up the total facility, as well as winding her down, the peak is expected with roughly 1,780 loans in year 3, resulting in 148 loans per month).
4. Per country an expected 4 Partner Financial Institutions will gain access to the lending facility, disbursing around 20 loans in average (in peak: 37) per month.
-

It is expected that the lending facility will address the following barriers to EbA finance:

a) Already existing but not documented EbA finance will be made visible. As described above, institutions typically do not account for specific EbA investment.
b) Traditional agriculture investments will be replaced by EbA investments, and so will their financing, as a result of capacity building and technical assistance activities in component 1.
c) The market will be expanded, as concessional finance will be made available, that incentivizes PFIs to also invest in clients that are currently excluded from formal financial systems.

While more specific data is not available, the introduction of unified taxonomies is aligned with current financial sector transformation programmes that are being initiated in various countries of the proposed programme.

According to this analysis and considering the magnitude of the loan component of the proposal submitted to the GCF it is possible to conclude that there is sufficient capacity on the ground to absorb that amount and deploy it through micro credits to local producers ensuring an alignment with EbA eligibility criteria discussed and agreed with the participating financial institutions.

It is also important to mention that most of the interviewed financial institutions have or are currently developing green financing lines addressing climate change and environmental issues. This trend, combined with the already available training material from MEbA, and technical support provided through the programme lead to conclude that channelling the credit line of the programme through these on-the ground financial institutions is an efficient manner to accelerate climate action in the Dry Corridor.

Lending facility justification in Honduras

The underlying theory of change is that by

1. Building awareness and capacity to identify, implement and finance EbA investments,
2. Providing adequate and attractive funding and
3. Implementing adequate and comprehensive MRV systems,

financial institutions in the areas of operations of the project will initially receive and later autonomously develop commercial incentives to finance EbA investments.

Building awareness, and capacity for EbA with end beneficiaries as well as financial institution is crucial and includes the creation of provisioning service ecosystems that allow for allocation of critical input factors, including know-how.

The provision of attractive and adequate funding is intended to kick-start commercial EbA finance, while the underlying economics (see below) are not yet proven via solid MRV systems in place.

Via comprehensive MRV systems the financial sector will acquire sufficient know-how and capacities to not only serve vulnerable populations in the project areas in the dry corridor but also provide a live and documented example for efficient EbA finance beyond the areas of the project.

In consequence the funding structure as well as operational management of the presented mechanisms will focus on financial solutions and management systems that help to prove the stated hypothesis and promote the targeted change.

Ecosystem-based adaptation (EbA) to climate change is geared towards the alignment of ecosystems with productive systems, especially in agriculture and animal husbandry, facing adverse impacts of climate change. Ecosystem deterioration, and in consequence of their services, and climate change pose real threats (in financial terms: “risks”) to agricultural production. EbA is hence a risk mitigation strategy. Depending on the actual sophistication of the financial system, lower risk customers become more attractive for the financial system and shall be able to expect lower interest rates.

While the provision below market refinancing options incentivizes the engagement of the financial sector in EbA finance in an initial state of the project, the introduction of comprehensive MRV systems will allow to document and in consequence prove the attractiveness of EbA investments in terms of risk-adjusted returns resulting in enhanced economics via lower defaults, lower loan loss provisions and increased purchasing power as well as investment and payment capacity of end beneficiaries.

It is hence expected that resulting “hard data” will support the introduction of commercial EbA finance, driven by increased risk returns.

5. Step 3. Climate impact modelling

5.1 Step 3.1 Selection of the Choluteca basin for the modelling purpose in Honduras

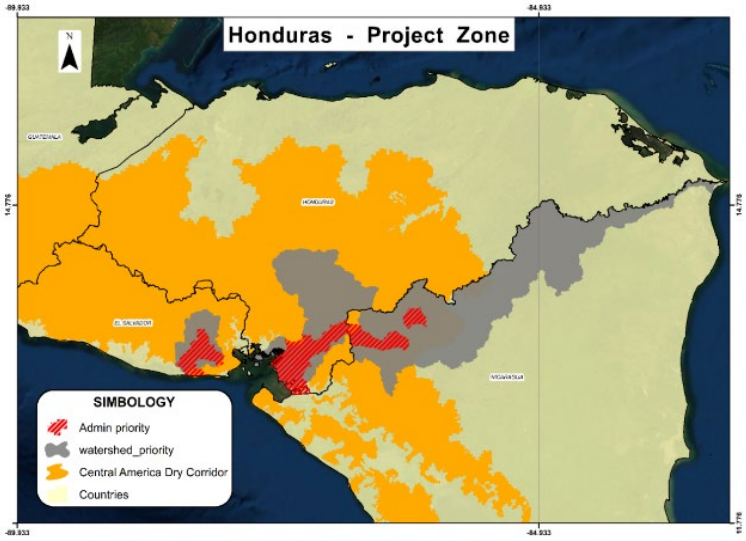


Figure 8. Project zone map for Honduras

The basin identification and prioritized towns were considered to select the Choluteca Baja subbasin as a pilot basin. This basin covers the majority of prioritized towns in comparison to the other subbasins (Figure 5).

The Choluteca Baja subbasin locates in the low part of the Choluteca River basin between 13°.70' y 13°29' N latitude and - 87°32' y -86°92' W longitude in the southern part of Honduras. The subbasin area is 830.8 Km2, and the main channel length is 45.9 Km, with maximum elevation at 1398.4 AMSL and minimum elevation at 30.6 AMSL. There is a bimodal precipitation distribution in the sub-basin, a dry season from November to April and a rainy season from May to October. The mean annual precipitation is 1800 mm, and the mean temperature is 26.55°C.

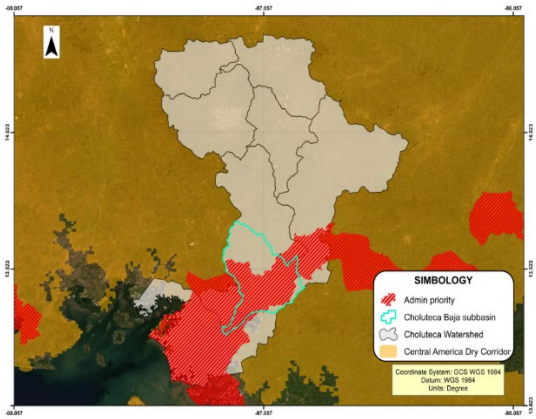


Figure 9. Honduras pilot basin: Choluteca Baja subbasin, Choluteca watershed, Honduras

As can be seen in Choluteca Baja subbasin presents a considerable variation in the altitude gradient.

The plot basin topography includes estuaries, mountainous areas, and volcanoes, describing a considerable variation in altitude gradient as can be seen in Figure 7 and Figure 8. To meet the altitudinal gradient criteria, the basin was divided into three altitudinal categories: i) low altitude, zones with flat slope, close to sea level (0 AMSL), ii) Intermediate altitude, zones with intermediate slope and iii) high altitude, zones with steep gradient slope and volcanoes in the upper part of the basin.

Figure 10. Longitudinal profile of Choluteca Baja subbasin, Honduras

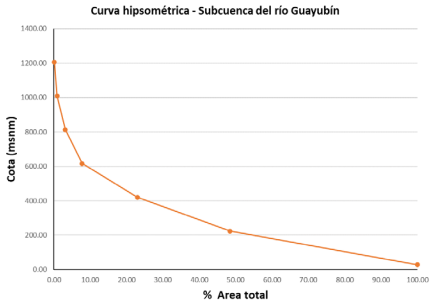


Figure 11. Hypsometric curve Choluteca Baja subbasin, Honduras

Data availability: Input data (DEM, hydroclimatic data, land use, soil cover) [7] for hydrological modelling was provided by government and education institutions.

[7] Available data (geospatial and tables) was checked to assess quality and reliability.

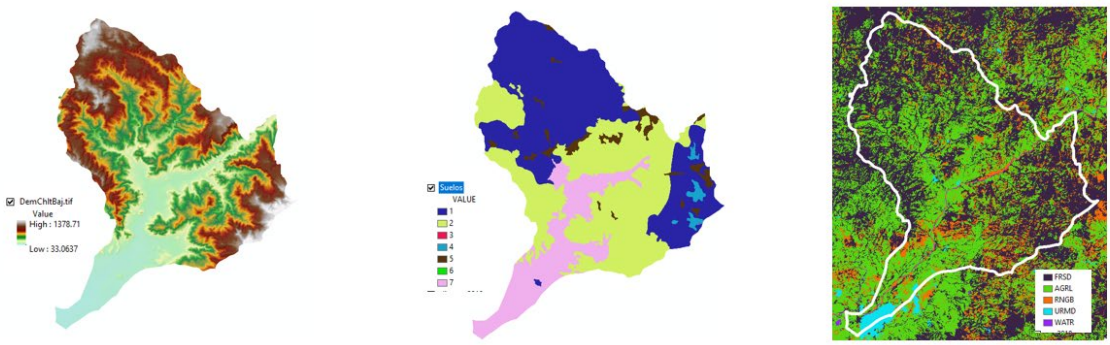


Figure 12. Input data Choluteca Basin, Honduras (Digital elevation model, land use and soil type)

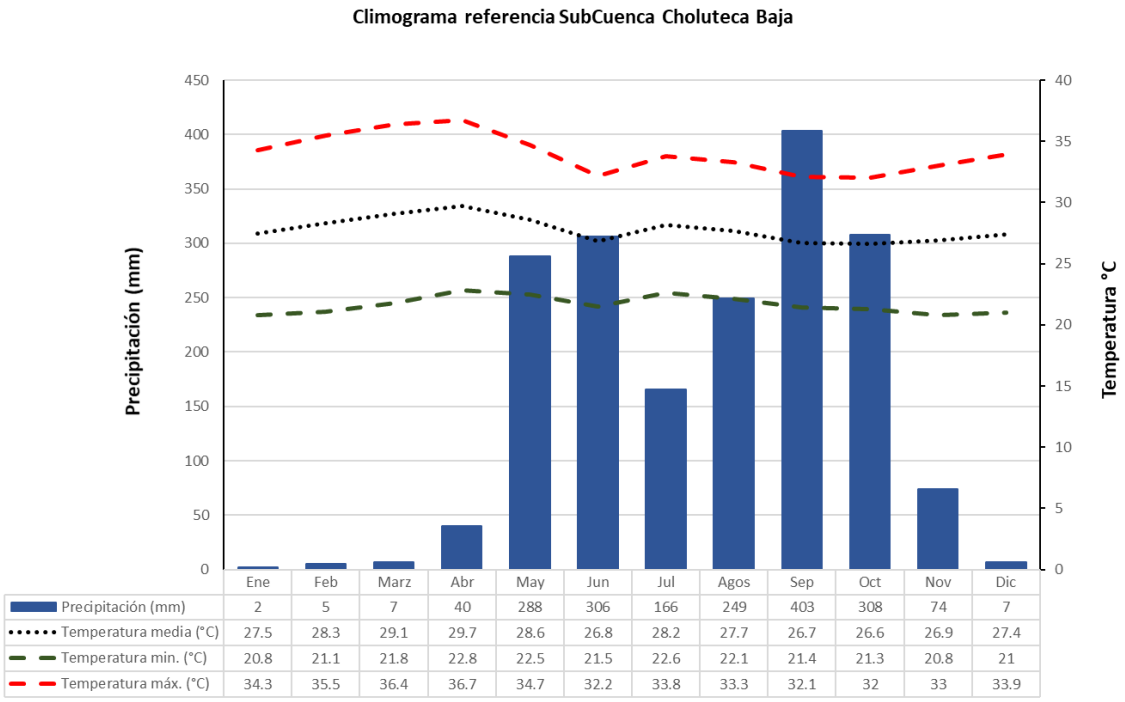
Land use diversity: The Choluteca Baja subbasin has diverse land uses mainly oriented to agriculture. Considering this, the implementation of adaptation measures is feasible.

5.2 Step 3.2 Identification of the main climate risks

Climate of reference

Choluteca's basin climate is sub-humid. Mean annual precipitation and temperature are 1855 mm and 27.8 °C, respectively. The driest month is January (2mm), and the wettest month is September (403 mm). April is the month with the highest value of temperature (29.7 °C). October is the coldest month of the year (26.6 °C).

Based on the time series (1982 – 2012), the difference between precipitation of the wettest and the driest month is 401 mm. Mean temperature varies 3.1°C.



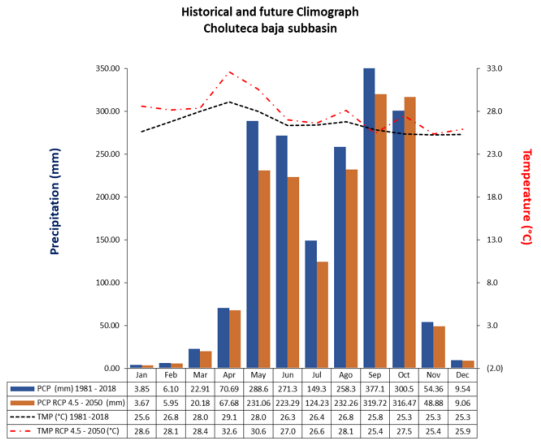
	Ene	Feb	Marz	Abr	May	Jun	Jul	Agos	Sep	Oct	Nov	Dic
Precipitación (mm)	2	5	7	40	288	306	166	249	403	308	74	7
Temperatura media (°C)	27.5	28.3	29.1	29.7	28.6	26.8	28.2	27.7	26.7	26.6	26.9	27.4
Temperatura min. (°C)	20.8	21.1	21.8	22.8	22.5	21.5	22.6	22.1	21.4	21.3	20.8	21
Temperatura máx. (°C)	34.3	35.5	36.4	36.7	34.7	32.2	33.8	33.3	32.1	32	33	33.9

Figure 13. Climograph of Choluteca Baja subbasin, Choluteca watershed, Honduras

Climate change scenarios

This study considers a 11.8% precipitation decrease and temperature increase of 1.0 °C, according to RCP 4.5 climate change scenario projected for 2050 and a decrease of 16.9% for RCP 8.5 for 2050[8]. Figure 11 below present current and future trends in Piedras and San Jeronimo subbasin and the projected monthly anomalies.

[8] Based on: https://gisclimatechange.ucar.edu/ and ensemble of models results.



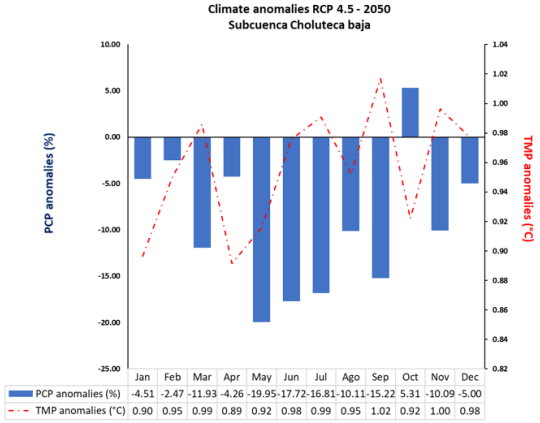
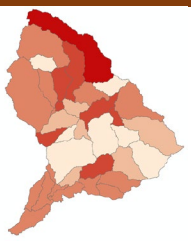
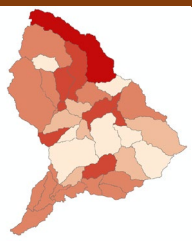
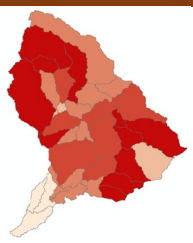
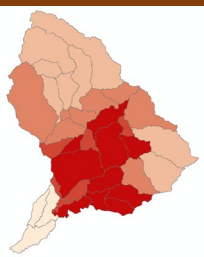
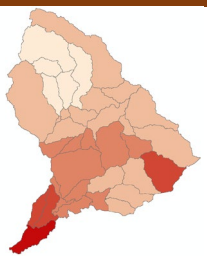
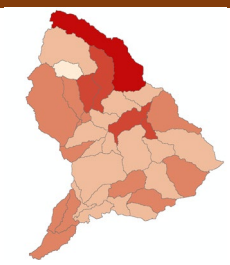
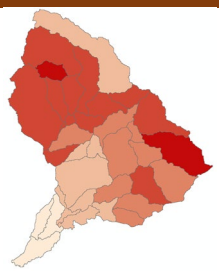
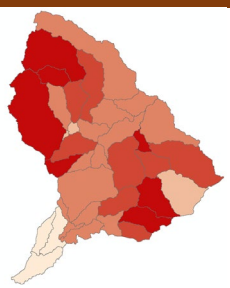
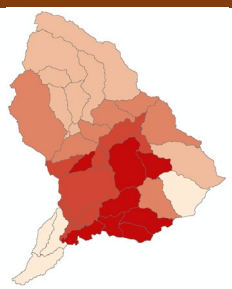
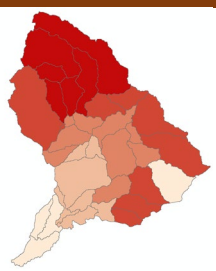
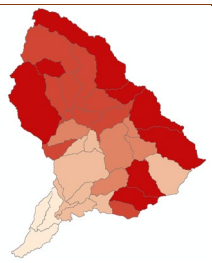
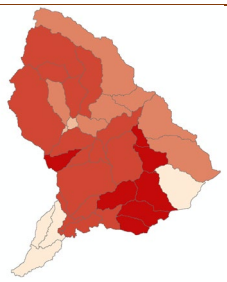
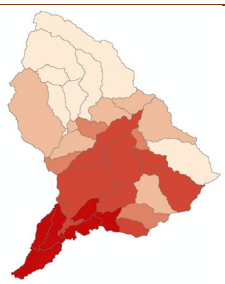
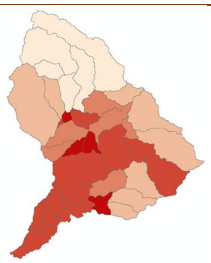
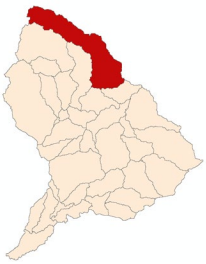
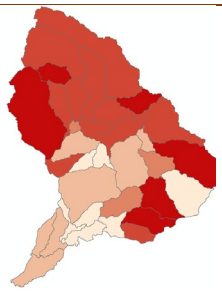
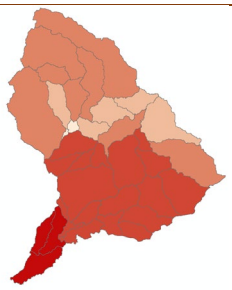
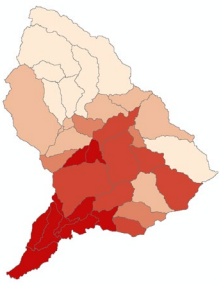
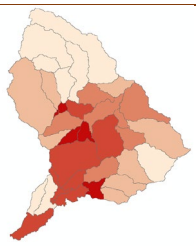


Figure 14. Climate anomalies projected for 2050 under RCP 4.5 scenario in Choluteca Baja subbasin, Choluteca watershed, Honduras

These changes in precipitation and temperature have direct impacts over hydrological variables in the catchment. Table 7 summarizes the main impacts over hydrological variables for scenarios RCP 4.5 and 8.5 for the 2050 and 2100 horizon. As described in the table, changes in precipitation and temperature are projected to derive into a general decrease of soil water availability, essential for crop production, and a severe decrease in percolation and percolation (between 17.8% and 26.4% in 2050) with consequent decrease in groundwater recharge.

Table 7. Main impacts in Choluteca Baja subbasin over hydrological variables for scenarios RCP 4.5 and 8.5 for the 2050 and 2100 horizon

Choluteca Baja Subbasin HONDURAS	**PRECIPITATION**	**SOIL WATER**	**PERCOLATION**	**WATER YIELD**	**EROSION**
Climate Change RCP 4.5 - 2050					
Change (%) for RCP 4.5 - 2050	**Decrease 11.8%**	**Decrease 4.1%**	**Decrease 17.8%**	**Decrease 18.4%**	**Increase 11.1%**

Choluteca Baja Subbasin HONDURAS	PRECIPITATION	SOIL WATER	PERCOLATION	WATER YIELD	EROSION
Climate Change RCP 8.5 - 2050					
Change (%) for RCP 8.5 - 2050	Decrease 16.9%	Decrease 5.7%	Decrease 25.4%	Decease 26.4%	Decrease 25.7%
Climate Change RCP 4.5 - 2100					
Change (%) for RCP 4.5 - 2100	Decrease -78.2%	Decrease -68.3%	Decrease -97.2%	Decrease -94.1%	Decrease -96.2%
Climate Change RCP 8.5 - 2100					
Change (%) for RCP 8.5 - 2100	Decrease -82.0%	Decrease -77.2%	Decrease -98.6%	Decrease -95.8%	Decrease -98.1%

The results of the hydrological modelling confirm some of the perceived risks by community members and summarised above including the perceived changes in rain patterns with a general decrease of precipitation and agricultural productivity and the increased rates of soil loss due to increased erosion processes also aggravated by land use change patterns.

The substantial decrease in soil water content has a direct consequence on the loss of productivity of grain crops with shallow root systems and therefore has a direct impact over the key source of food and income of the local communities.

The decrease in water yield and percolation is foreseen to impact additionally vegetation cover with deeper root systems like forests or tree plantations. The decreases in percolation also produces a decrease in the recharge rate for aquifers that translates in even lower availability of water during the dry season when aquifers are the main source of water for irrigation, soil humidity and drinking water.

In the case of erosion, erosion rates show substantive decrease for the longer term and more severe climate scenarios, which is directly related in the hydrological model to precipitation rates. This is directly correlated with the high level of precipitation decrease. It is important to highlight though that extremely dry soils are highly sensitive to soil loss, even landslides during extreme rainfall events.

The projections for 2100 both for RCP 4.5 and RCP 8.5 show a drastic decrease in average precipitation that imply proportionate consequences over hydrological variables. The change in soil water content is projected to decrease between 70 to nearly 80%, while percolation and water yield are projected to decrease nearly 100%. Also, in this case, the projected decrease in erosion is proportionate to the decrease in precipitation which is the main driver of erosion. This result should not be considered positive though, as extremely dry soils are highly sensitive to rapid erosion processes during extreme rainfall events.

5.3 Step 3.3 Impact modelling for main EbA interventions

Considered EbA interventions

For the hydrological modelling exercise, some of the community prioritized EbA interventions were selected. The selection was based on those EbA interventions that have direct impacts over the modelled hydrological variables.

Four measures were considered to assess their adaptation potential to climate change. A combination of scenarios was designed to analyse the potential impact of these interventions when applied at different intensity levels, from low levels of intervention to hight levels of interventions.

Additionally, EbA interventions were modelled independently and in combination to ensure a more realistic vision of the potential implementation of EbA in a populated basin considering the different land uses.

The modelled EbA interventions include:

- *Measure 1: Conservation and restoration of forest.*

- *Measure 2: Establishment of agroforestry systems.*
- *Measure 3: Implementation of efficient irrigation systems.*
- *Measure 4: Vegetative barriers.*
- *Measure 5: Combination.*

The table below summarizes the scenarios that were developed for the modelling of these interventions from low to high levels of interventions and from individual to combined interventions.

Table 8. Adaptation scenarios in the Choluteca baja basin, Honduras

Adaptation measures (SbN)		Intervention levels		
		Low	Intermediate	High
Measure 1: Forest conservation and restoration	a. Forest conservation	Conservation 5% of the existing forest cover	Conservation of 15% of the existing forest cover	Conservation of 30% of the existing forest cover
	b. Forest restoration	Restoration of 5% of basin forest cover	Restoration of 15% of the existing forest cover	Restoration of 30% of the existing forest cover
Measure 2: Agroforestry	Agroforestry increase	Conversion of 2% conventional agriculture to agroforestry	Conversion of 15 % conventional agriculture to agroforestry	Conversion of 40% conventional agriculture to agroforestry
Measure 3: Efficient irrigation systems	Efficient irrigation systems	Implementation of efficient irrigation systems in 2% of agriculture areas with slope less than 15%	Implementation of efficient irrigation systems in 15% of agriculture areas with slope less than 15%	Implementation of efficient irrigation systems in 40% of agriculture areas with slope less than 15%,
Measure 4: Living fences	Living fences in livestock farming areas	Implementation of living fences in livestock farming areas with a slope above 45%	Implementation of living fences in livestock farming areas with a slope above 35%	Implementation of living fences in livestock farming areas with a slope above 25%
Combined scenarios	Measures 1, 2, 3 and 4 combination	Conservation and restoration of 5% of the existing forest cover, conversion of 2% of pasture by agroforestry, implementation of efficient irrigation systems in 2% of agriculture areas with a slope less than 15%, and implementation of living fences in livestock farming areas with a slope above 45%.	Conservation and restoration of 15% of the existing forest cover, conversion of 15 % of pasture by agroforestry, implementation of efficient irrigation systems in 15% of agriculture areas with a slope less than 15%, implementation of living fences in livestock farming areas with a slope above 35%.	Conservation and restoration of 30% of the existing forest cover, conversion of 40% of pasture by agroforestry, implementation of efficient irrigation systems in 40% of agriculture areas with a slope less than 15%, implementation of living fences in livestock farming areas with a slope above 25%.

5.4 Step 3.4 Conclusions of the climate impact modelling

Under RCP 4.5 climate change scenario projected for 2050 precipitation will decrease by 11.9 % and temperature will increase by 1.00°C. Projected climatic conditions will reduce soil water by 3.8 %, percolation by 15.6%, and water yield by 12.3% and erosion by 11.1%.

As observed in the following tables and maps, even if forest conservation seems to show the most positive impacts over all hydrological variables, the implementation of mixed EbA measures produce also positive hydrological impacts at local and basin scale for all the analysed variables. Impact magnitude depends on the type and the scale of the intervention. Intermediate and high levels of intervention produce the most positive hydrological responses compared to the BAU scenario.

Table 9 presents the hydrological variables response to the different scenarios and levels of intervention.

Table 9. Variation between climate change scenario without adaptation measures and climate change scenario with adaptation measures in the Choluteca watershed, Honduras

SCENARIOS				Scenarios name	Watershed level				COMMENTS
Adaptation measures			Level		SWmm	PERCmm	WYLDmm	EROSION	
NO				Climate Change	-3.83	-15.55	-12.34	-11.10	Change compared to baseline(%)
Adaptation measure 1: Conservation and restoration forest	1a	ForestConservation	low	ForestConservationlow	7.47	31.45	24.65	-8.92	Change compared to Climate Climate change scenario
		ForestConservation	middle	ForestConservationmiddle	6.94	32.68	24.54	-7.74	
		ForestConservation	hight	ForestConservationhight	6.22	34.27	24.41	-5.40	
	1b	ForesRestoration	low	ForesRestorationlow	-0.21	0.61	-0.03	-12.44	
		ForesRestoration	middle	ForesRestorationmiddle	-0.63	1.81	-0.10	-11.54	
		ForesRestoration	hight	ForesRestorationhight	-1.24	3.63	-0.20	-10.35	
Adaptation measure 2: Establishment of agroforestry systems		SAF_Increase	low	SAF_Increaselow	-0.04	0.12	-0.01	-12.80	
		SAF_Increase	middle	SAF_Increasemiddle	-0.25	0.78	-0.03	-10.82	
		SAF_Increase	hight	SAF_Increasehight	-0.66	1.94	-0.11	-11.40	
Adaptation measure 3: Implementation of efficient irrigation systems		Agriculture with irrigation	low	Agriculture with irrigationlow	-0.01	0.05	0.00	-1.61	
		Agriculture with irrigation	middle	Agriculture with irrigationmiddle	-0.07	0.31	-0.02	-3.38	
		Agriculture with irrigation	hight	Agriculture with irrigationhight	-0.19	0.82	-0.04	-6.47	
Adaptation measure 4: Vegetative barriers		LivingBarriers	low	LivingBarrierslow	0.04	0.69	-0.01	-11.46	
		LivingBarriers	middle	LivingBarriersmiddle	0.05	2.48	-0.02	-25.30	
		LivingBarriers	hight	LivingBarriershight	0.03	2.92	-0.01	-33.89	
Combined scenarios		Mix1	low	Mix1low	-0.43	1.98	-0.08	-15.38	
		Mix1	middle	Mix1middle	-1.53	6.21	-0.27	-31.85	
		Mix1	hight	Mix1hight	-3.32	10.60	-0.56	-37.87	

Results

- Projected climate anomalies (RCP 4.5 2050) will have a negative impact on water dynamics of the basin, a worrying situation as this is a territory with "natural" water deficit conditions. A reduction in soil water content is expected by up to 3.8%, percolation (15.6%) and water production (12.3%); limiting water availability processes for plants, water recharge in the basin and decreased flows in rivers and raves that put their permanence at risk. In addition, erosive processes decrease as they are linked to decreasing rainfall patterns.

- Under RCP 4.5 2050 climate conditions, forest conservation and restoration measures have the potential to neutralize the impacts of climate change on water dynamics in the basin. This measure may increase water moisture in soil (3.15%), percolation (17.4%) and water production (12.2%). Between these two measures, forest conservation promotes soil water conservation (6.9%),

percolation (32.8%) and water production (24.5%); while restoration processes affect soil water content, but show better benefits related to reducing erosion.

- Establishment of agroforestry systems is an efficient measure to address climate anomalies in production systems in the basin. Although the incorporation of trees may affect the water content in the soil (-0.32%), it is lower compared to a non-intervention or permanence of productive systems under conventional use (-3.8%). In agricultural production areas this measure can promote percolation processes and reduce erosion by up to 11.7%.

- Under RCP 4.5 2050 climate conditions, establishing efficient irrigation systems helps to mitigate water deficits in production systems, mainly basic grains. In areas where this measure is established, mainly under a high level of intervention, benefits are evident in up to 20 times more water conservation in soil, percolation and water production versus a non-intervention scenario; contributing to climate resilience in productive areas of vital importance to communities. Benefits in decreased erosion are also evident.

- The establishment of living barriers, under RCP 4.5 2050 climate conditions, has similar benefits to forest restoration processes. Soil moisture conservation, promoting percolation processes and decreasing erosion are of paramount importance in areas of the Dry Corridor.

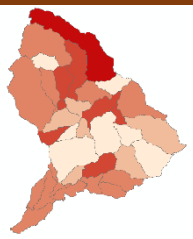
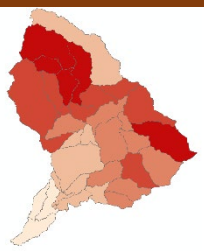
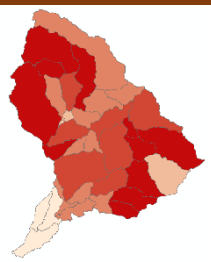
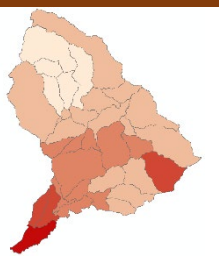
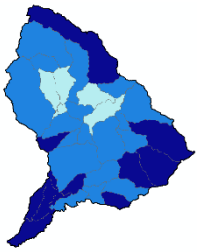
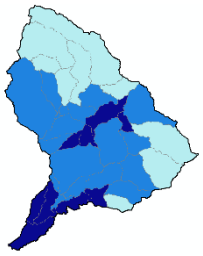
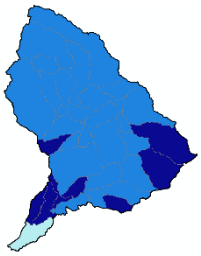
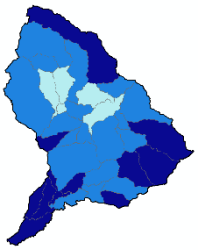
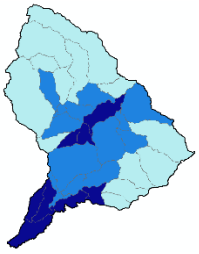
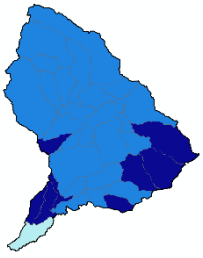
- Different levels of implementation of adaptation measures contribute to face situations of decreased rainfall and temperature increase in natural and productive systems in the basin. While the incorporation of new elements into the basin, such as trees or shrubs through processes of restoration and establishment of agroforestry systems and living barriers can affect the soil water content and water production in the basin when observed at average values

In general terms, the implementation of any intervention increases water availability and groundwater compared to climate change scenario without interventions.

The following table summarizes the projected climate change impacts for 2050 under RCP 4.5 and the changes in hydrological variables compared to two different scenarios introducing combined EbA interventions at medium and high intensities.

The maps show the total net benefits of introducing these interventions as they are able to reverse completely the impacts of climate change over the hydrological variables and therefore on water availability. The largest positive impacts are observed over erosion rates and groundwater recharge which is the most important factor to decrease water stress during dry periods.

Table 10. Summary of results for different adaptation interventions' scenarios on 2050, RCP 4.5

Choluteca Baja Subbasin Honduras	PRECIPITATION	SOIL WATER	PERCOLATION	EROSION
Climate Change RCP 4.5 – 2050 No adaptation interventions				
Change (%)	Decrease -11.9%	Decrease -3.8%	Decrease -15.5%	Increase 11.1%
Climate Change RCP 4.5 – 2050 Adaptation interventions (middle combined interventions)				
Change (%)		Decrease -1.5%	Increase 6.2%	Decrease -31.8%
Climate Change RCP 4.5 – 2050 Adaptation interventions (high combined interventions)				
Change (%)		Decrease -3.3%	Increase 10.6%	Decrease -37.9%

It is clear that adaptation measures, at different levels of intervention, provide hydrological benefits in the basin, which would increase climate resilience for crops and production systems. While the adaptation measures considered increase soil moisture, aquifer recharge, water in springs and maintaining water recharge zones, maintaining water production levels in the basin and mitigating impacts of decreased rainfall; reforestation processes and inclusion of trees or shrubs should appropriately consider the species to be used to avoid further impacts on soil moisture values.

Due to the diversified land use in the basin, it is more appropriate to think about combined adaptation interventions rather than focusing all efforts only on one option. This integrated approach will gain from advantages of the individual benefits of each intervention measure across the basin. The analysis carried out clearly shows that the combined implementation of the measures achieves up to twice as much water content, 5 times more percolation, 30 times the production of water and twice as much erosion decrease in the low basin when compared to a non-intervention scenario.

In summary:

- Adaptation measures (Nature Based Solutions) produce hydrological impacts at local and sub-basin scale. Impact magnitude depends on the type and the scale of the intervention.
- All levels of interventions, including low level interventions, produce positive hydrological response compared to the do-nothing scenario.
- Combined adaptation measures mainly at low and intermediate level produce holistic benefits at local and sub-basin scale.

Combined measures at intermediate level showed the best hydrological response, it includes: Conservation and restoration of 15% of the existing forest cover, conversion of 15 % conventional agriculture by agroforestry, implementation of efficient irrigation systems in 15% of agriculture areas with a slope less than 15%, implementation of living fences in livestock farming areas with a slope between 25 and 45%. This level of intervention has the potential to mitigate water stress, consequence of climate change.

6. Step 4. Site intervention strategy

The objective of this intervention strategy is to describe how the main vulnerabilities identified both through extensive consultations as well as through technical evaluation of climate change projected impacts will be addressed through this programme.

6.1 Definition of the problem statement

Climate change is projected to cause significant decrease in water availability, groundwater recharge and erosion rates for the Choluteca basin. This region shows high levels of poverty — concentrated in rural areas — when compared with the rest of the country. In addition, most rural communities in the Choluteca basin are dependent on agriculture and forestry for their livelihoods, both of which are extremely sensitive to climate impacts — specifically those impacts that result in changes in water availability. These communities also have limited knowledge of climate change adaptation measures, coupled with an inability to access funds to finance adaptation. As a result, rural communities in this region are extremely vulnerable to the impacts of climate change. This vulnerability is exacerbated by widespread environmental degradation and an associated loss of ecosystem services such as water production. Future climate projections indicate that the region will continue to become warmer and drier, with increasingly variable rainfall and an associated increased risk of severe drought. Past and ongoing adaptation efforts in the region have not been implemented at a sufficient scale to prevent rural communities experiencing severe negative impacts of climate change, which will likely only increase in the future.

6.2 Intervention objective

The preferred adaptation solution to the above-described problem is to improve the climate resilience of rural communities in the Choluteca basin by: i) implementing integrated catchment management and restoring catchments; ii) improving hydrological flow and infiltration of rainwater into groundwater reserves through forest and ecosystem restoration; and iii) reducing demand for scarce water resources by implementing water-efficient technologies at farm- and household-level. Specifically, under the preferred adaptation solution, commercial farmers and entrepreneurs in rural communities would have access to the financial resources and technical skills required for the widespread implementation of adaptation measures — including EbA, and water- and biomass-efficient techniques that decrease pressure over ecosystems that sustain the hydrological cycle at the basin level. This access to financial and technical resources would strengthen the adaptive capacity of rural communities to withstand increasingly frequent and intense droughts, which result in water shortages, and subsequent reductions in economic activity, productivity and food security. In addition, the mainstreaming of adaptation considerations into policy and planning by government, and the generation of knowledge and awareness of adaptation options should be strengthened. Mainstreaming in this way would enable the uptake of large-scale EbA and other adaptation measures. The overall approach under the preferred adaptation solution would ensure access to adaptation measures for all impacted communities, building their climate resilience in the long-term.

6.3 Intervention structure

The high vulnerability of the Central American Dry Corridor requires a multi-dimensional response involving three main actors:

- communities and producers as their main source of income is the main land use change driver and also the most directly impacted by climate change
- local, national and regional institutions in their capacity to modify land use and adaptation planning instruments
- financial institutions in their capacity to leverage and deploy financial resources to upscale climate action to a sufficiently large scale to ensure a transformational change in climate resilience

The objective will be achieved through two project components:

i) Component 1. Strengthened technical capacity of local government, farmers and rural communities to implement EbA and other adaptation measures; and
ii) Component 2. Financing and implementation of EbA as well as water- and resource-efficient technologies across selected catchments

Under component 1, three interrelated outputs will facilitate the widespread implementation of adaptation measures across the region. This will include: i) providing technical assistance to local government, farmers and rural communities to implement adaptation measures; ii) implementing on-the-ground EbA and water/biomass-efficient technologies; and iii) mainstreaming adaptation measures and incentives into policy and planning as well as disseminating information on climate change and adaptation across the Dry Corridor and Arid Zones. In addition, increased knowledge regarding EbA and water-efficient technologies and newly-available financial mechanisms will facilitate access for those previously unable to fund these adaptation measures, as well as creating an enabling environment for the establishment of economic incentives for investment in EbA.

The demonstration, capacity building and mainstreaming activities under this component are expected to increase the capacity of MFIs in the region to structure appropriate financial products and the demand for this type of products by agricultural producers and agri-business.

The objective of component 2 is to establish and operationalize financial mechanisms to facilitate investment in EbA practices, as well as the adoption of water- and resource-efficient technologies. The EbA Lending facility will have a revolving character: while it will be established for a period of 10 years, loans to be disbursed to PFIs are expected to have a tenor of 2 - 5 years maximum (as a function of the expected EbA finance portfolio to be created with end beneficiaries, i.e. focusing more on working capital or investment capital, and in accordance with market standards).

The loan facility will be deployed following a phased approach that allows for the generation of evidence on the impacts of the EbA financed interventions and the promotion of the financial mechanism.

6.4 Implementation strategy

The programme will be implemented following a sequence that allows for continuous feedback of results and observed impacts of the interventions into the enabling activities to strengthen capacity building, mainstreaming of EbA into relevant policies and into the regional communication platform. The described sequence below is divided into 5 main phases, with a summarized description of main activities implemented in each of them.

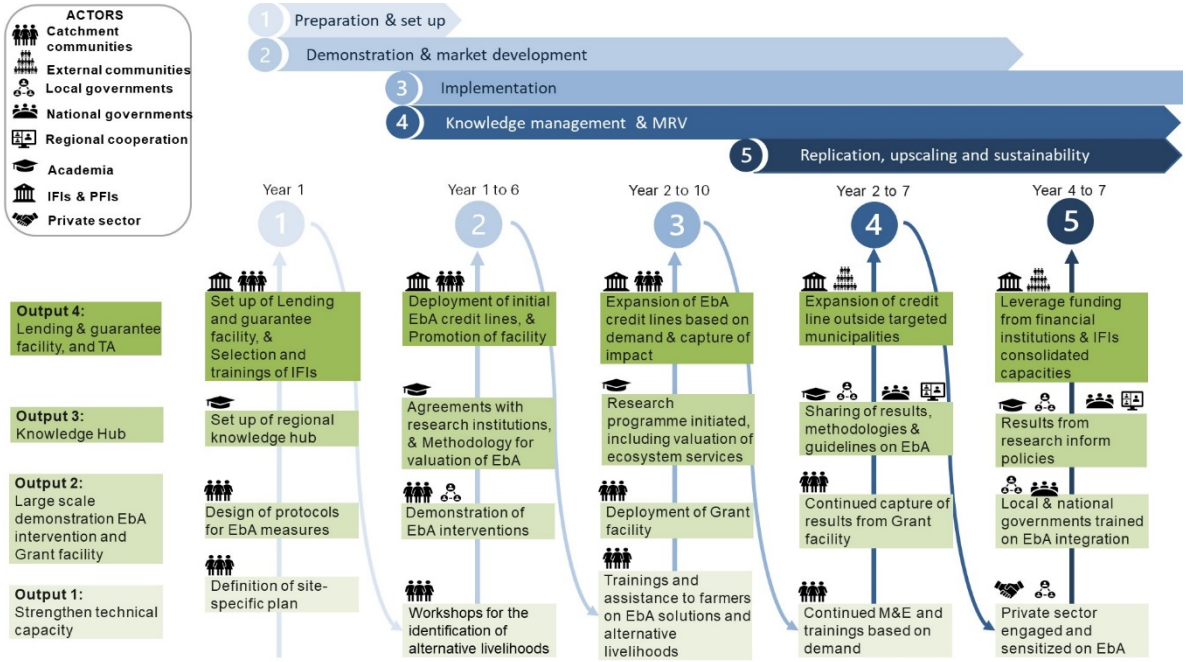


Figure 15. Graphic representation of implementation strategy

1/ Set up and preparedness

During this first stage of the project, the site-specific implementation plans based on vulnerability and hydrological models will be strengthened and finalized in consultation with communities and key actors including detailed climate risk assessments.

This stage is critical for the engagement of actors and the Monitoring and Evaluation committees will be established within the participating communities. Technical protocols will be designed for the implementation of the large-scale EbA interventions that will serve as capacity building, demonstration and promotion sites.

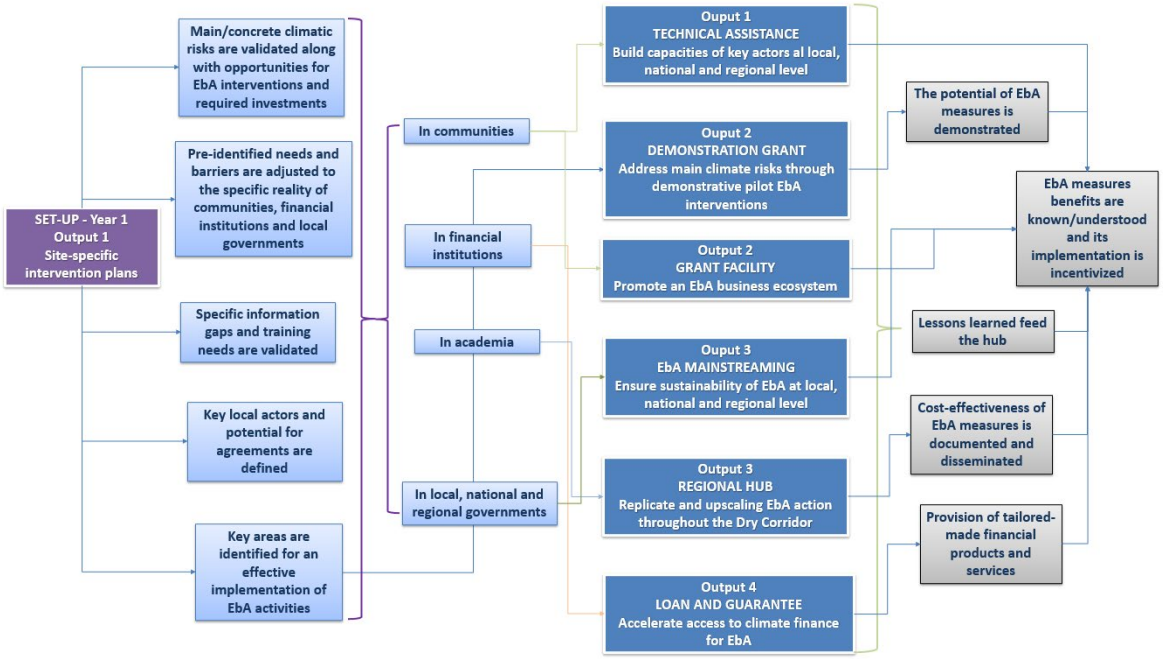
In the process for the finalization of the site-specific EbA implementation plans, a selection process will be undertaken to select and engage the adequate financial institutions at the local level. Legal agreements will be established including the definition of specific eligibility criteria and investment

criteria of financial mechanisms and trainings on adaptation finance will be undertaken. The lending and guarantee facilities will be set-up.

Table 11. Implementation strategy 1 - Preparedness and set up

Stage 1/ Preparedness and set up	Related activities	Year 1				Year 2	
		Q1	Q2	Q3	Q4	Q5	Q6
Definition of site-specific implementation plans based on vulnerability and hydrological models	1.1						
Climate risk livelihood assessments	1.3						
Community engagement activities	1.1, 1.2, 1.3						
Design of technical protocols for EbA measures implementation	1.2, 3.3						
Establishment of M&E committees at community level	1.1						
Set up of the regional knowledge hub	3.1						
Definition of eligibility criteria and investment criteria of financial mechanisms	4.1						
Selection of PFIs and establishment of legal agreements with IFIs, PFIs	4.1						
Set up of the lending and guarantee facilities	4.2						
Initial trainings with IFIs and PFIs	4.3						

Additionally, the following graph shows the linkages of the programme components to the specific catchment plan:



2/ Demonstration and demand generation

At this stage and after launching the programme and building on the engagement with local actors, pilot interventions defined by communities and included in component 1 will be implemented.

Agreements will be established with research institutions to generate knowledge from project interventions on EbA solutions in the Dry Corridor and further climate risk assessments will be undertaken to identify potential alternative livelihoods and opportunities for initial funding through the financial mechanism based on vulnerability assessments, hydrological modelling and to reinforce site specific plans.

A grant facility will be set up to strengthen the EbA business ecosystem in the region including training of commercial and subsistence farmers on EbA financial products available. The eligibility criteria for the grant facility will be based on specific site priorities.

At this initial stage, the selected MFIs will focus on promoting the blended EbA lending facility with potential network institutions and non-network institutions. MRV systems will be established and formalized with IFIs and PFIs.

The loan and guarantee facilities will make their initial disbursements at this stage.

Table 12. Implementation strategy 2. Demonstration and demand generation

Stage 2/ Demonstration and demand generation	Related activities	Y1	Year 2				Year 3			
		Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Demonstration of EbA interventions and benefits through pilot interventions pre-defined by communities from the grant component	2.1, 2.2									
Training of commercial and subsistence farmers on EbA financial products available	2.3, 4.3									
Identification of potential alternative livelihoods and opportunities with the communities for initial funding through the Grant facility	1.3, 2.3									
Set up of the grant facility, definition of eligibility criteria based on specific site priorities	2.3									
Adjustment of training materials to be disseminated through knowledge hub based on baseline built in year 1	1.2, 2.3, 3.1									
Establish agreements with research institutions to generate knowledge from project interventions on EbA solutions in the Dry Corridor	3.2, 3.3									
Define methodology for the valuation of ecosystem services in the Dry Corridor	3.3									
Definition of MRV systems with IFIs and PFIs	4.3									
Promote the blended EbA lending facility with potential network institutions and non-network institutions	4.3									

Deployment of initial EbA credit lines	4.2, 4.3		
Continued Technical Assistance to IFIs and PFIs and ToT program	4.4		

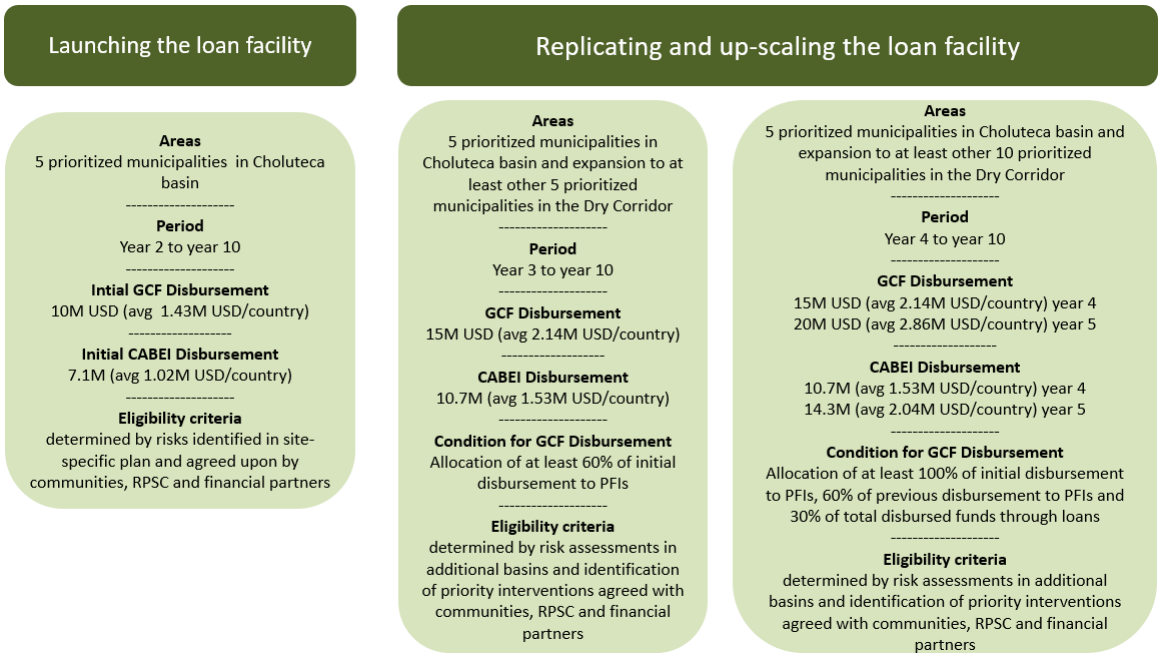
3/ Implementation

This stage will focus on full implementation of the grant financed activities making emphasis on awareness raising and capacity building of vulnerable communities through demonstration of EbA interventions and benefits through pilot interventions.

The grant facility will also be in full implementation at this stage and results from investments will serve as input for research programmes and shared through the knowledge Hub. These results will also be shared with national governments at the regional level to inform National Adaptation Plans and Regional strategies**.**

The deployment of the loan facility will follow a phased approach along the project to ensure cohesive and substantive impact of the financed activities as well as proper vulnerability assessments and identification of priorities for other vulnerable regions within the Dry Corridor where the intervention could be scaled up. This phased approach will also allow for more time to strengthen capacities of the financial institutions and to promote the financial mechanism with communities and producers.

The three implementation phases of the loan facility are described below:



- Launching the loan facility

The loan facility will be initially deployed through local MFIs to attend priorities and requests from producers and communities within the 6 prioritized municipalities in the Choluteca basin. The specific eligibility criteria for the type of interventions to be included in the loan facility will be detailed during the first year of the programme through consultations with communities, experts and financial institutions. An MRV system will also be structured to gather information about the deployment of the loan and guarantee facilities and the impacts of the EbA interventions financed. Additionally, the technical team will initiate a climate risk assessment and prioritization of other municipalities within the Dry Corridor.

- Replicating the loan facility

As a result of the initial phase, the technical team and MFIs will count on information about the deployment rate of the loan facility and initial results from the impacts of the financed interventions. The larger climate risk assessments will have also provided information about climate risks and adaptation potential for additional basins within the Dry Corridor. In this second phase, the possibility to disburse loans within the 5 initially prioritized municipalities and other surrounding basins that have been prioritized and characterized through complete climate risk assessments.

- Scale up of the loan facility

Finally, and after gathering more detailed information about the results of the deployment of the loan facility, the beneficial impacts of EbA interventions and undertaking substantive capacity building both with community members and MFIs in the 5 prioritized municipalities and other vulnerable ones within the Dry Corridor, the loan facility will be expended geographically to cover for additional municipalities and always within the limits of the Dry Corridor to ensure substantive action to build resilience.

Table 13. Implementation strategy 3 - Demonstration and demand generation

Stage 3/ Demonstration and demand generation	Related activities	Year 2		Year 3						Year 4			
		Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16		
Awareness raising and capacity building of vulnerable communities through demonstration of EbA interventions	2.3, 3.2												
Initial deployment of grant facility with target communities focused on ideas generated by communities from the complete list of EbA potential interventions	2.3												
Implementation of identified innovative EbA interventions through the grant facility and lending facility	2.3, 4.3												
Implementation of identified alternative livelihood opportunities through the grant facility and lending facility	2.3, 4.3												
Monitoring and capture of results from grant facility	2.3												

Research programmes initiated and delivering initial results to be disseminated through Knowledge Hub	3.2, 3.3										
Results shared with national governments at the regional level to inform National Adaptation Plans and Regional strategies	3.2, 3.3										
Climate change adaptation valuations for ecosystem services undertaken	3.3.										
Capture of impacts through IFIs and PFIs MRV systems and community M&E committees	4.3										
Expansion of EbA credit lines based on demand increase through trainings, technical assistance and demonstration pilots	4.3										
Continued promotion of the blended EbA lending facility with potential network institutions and non-network institutions	1.3, 4.3										
Continued Technical Assistance to IFIs and PFIs and ToT program	4.3										

4/ Knowledge generation – MRV

At this stage, the programme will have already produced a substantive amount of results that will serve as input to develop knowledge products to be disseminated through the knowledge hub, including resilient landscape management standards and procedures, opportunities for access to financing and women economic empowerment as well as technical assistance, business opportunities, technical guidelines for the assessment of ecosystem services and their contribution to human well-being. The produced results, tools and methodologies will be shared through the Regional knowledge Hub with government institutions across the region.

The capture of impacts through IFIs and PFIs MRV systems and community M&E committees will contribute to sharing results, tools and methodologies through Regional knowledge Hub with financial institutions across the region and this will facilitate the expansion of EbA credit lines based on demand increase through trainings, technical assistance and demonstration pilots to other regions in the Dry Corridor.

Table 14. Implementation strategy 4 - knowledge generation - MRV

Stage 4/ Knowledge generation MRV	Related activities	Year 5				Year 6				
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
Develop knowledge products to be disseminated through the knowledge hub (1)	3.2, 3.3									
Sharing of results, tools and methodologies through Regional knowledge Hub with government institutions across the region	3.3									
Methodology and results from ecosystem services for adaptation shared across the region and used to inform national and regional adaptation strategies	3.3									

Guidelines on EbA for local communities developed and shared across the region including protocols for EbA interventions	1.2	
Continued monitoring and capture of results from grant facility	2.3	
Capture of impacts and results from lending facility implementation	4.3	
Evidence of demand and local ability to manage loans generated and shared	4.3	
Continue deployment of lending facility with target communities	4.3	
Expansion of EbA credit lines outside of targeted municipalities, based on demand increase through trainings, technical assistance and demonstration pilots	4.3	
Capture of impacts through IFIs and PFIs MRV systems and community M&E committees	4.3	

5/ Replication upscaling and sustainability

The last stage of the project will be key to ensure proper consolidation of technical capacities and sustainability of the implemented activities. The results gathered from research and through the Regional knowledge hub will be shared with government institutions and used to inform national and local policies and decision-making processes. Main actors from local and national governments will receive training on how to use that information and integrate EbA into policy frameworks.

Results, tools and methodologies developed by the Regional knowledge Hub will also be shared with financial institutions across the region, thus consolidating their capacity on EbA financial products. The private sector will be further engaged and sensitized to potential benefits of EbA interventions through technical assistance to demonstrate benefit to implement EbA for businesses with economic inputs from valuation of ecosystem services. This will contribute to leverage funding from financial institutions for the expansion of EbA financial products.

Stage 5/ Replication upscaling and sustainability	Related activities	Year 6 Q21	Q22	Q23	Q24	Year 7 Q25	Q26	Q27	Q28
Results from research used to inform national and local policies and decision making processes	3.2, 3.3								
Continued expansion of EbA credit lines outside of targeted municipalities	1.3, 3.3								
Local and national governments trained on EbA integration into policy frameworks	1.2, 3.3								
Private sector's engaged and sensitized to potential benefits of EbA interventions technical assistance to demonstrate benefit to implement EbA for businesses with economic inputs from valuation of ecosystem services	4.3								
Consolidation of technical capacities in financial institutions on EbA financial products	3.3								

Sharing of results, tools and methodologies through Regional knowledge Hub with government institutions across the region	4.3
Leverage funding from financial institutions for the expansion of EbA financial products	3.2, 3.3

6.5 Grant-financed EbA interventions to address prioritised climate risks in the Choluteca basin (Output 2.1)

Support will be targeted at the most vulnerable communities in the basin that lack the capacity to access financing and equipment to implement adaptation interventions without external assistance.

The hydrological modelling undertaken for the project area (described in Section 5) has demonstrated that a combination of adaptation interventions, such as forest conservation, reforestation, transition to agroforestry systems, introduction of irrigation systems and vegetative barriers results in substantial improvements for all key hydrological variables in the catchment areas. As a result, a combination of adaptation measures will be implemented to maximise the benefits conveyed and the reduction of climate change impacts, specifically on hydrological parameters.

The grant-supported interventions also serve as demonstration and capacity building sites that will provide practical examples to surrounding communities on how to identify and implement resilient land management practices.

Grant financed EbA interventions for the Choluteca basin

Responding to the main climate risks and adaptation options identified through the community consultations and the hydrological modelling, the main climate risks identified in the basin include:

- Changing rain patterns with decreased trend in precipitation
- Decreased soil humidity
- Decreased water availability
- Increased forest fires
- Increased soil loss (erosion)

The following interventions that have been prioritized through expert and community consultation will be implemented through the grant component of the project:

Climate risk	Intervention	Cost per Unit	Units	Total cost	Location	Beneficiary	Expected result
Decreased groundwater	1.1 Forest protection	$5.45	600	$3,270	Communal land	community	Increased water infiltration

recharge and increased erosion	1.2. Forest protection and restoration of Water recharge areas an riparian areas	$1,057.25	270	$285,459	Communal land	Community	Erosion control
	1.3. Forest restoration	$330.72	600	$198,432	Communal land	Community	
	2.1 Plantations for timber and firewood	$330.72	270	$89,294	Communal land	Community	
Decreased soil water availability Increased erosion Decreased agricultural production	3.1. Implementation of Agroforestry system - diversified living fence arrangements in basic grains crops	$1,181.53	840	$992,481	Grain crop farms	Grain crop farmers	Diversification of agricultural activity Increased productivity Increased soil humidity Erosion control
	3.2. Implementation of Agroforestry systems - natural shade in cofee plantations	$1,722.94	180	$310,129	Coffee farms	Coffee farmers	
	3.3 SilvopastorII system - diversified living fence arrangements	$576.05	180	$103,689	Pastural land	Pastural l and owners	
	3.4. SilvopastorII systems - individual trees	$1,722.94	168	$289,454	Pastural land	Pastural l and owners	
Increased forest fire risk	4.1 Implementation of Firebreaks for forests and plantations	$505.92	168	$84,994	Communal forest; Forest plantations	Community; Forest plantation owners	Decreased impacts by forest fires
	5.1. Mixed forest nurseries (wood, firewood and fruit trees)	$3,937.80	24	$94,507	Communal land	community	Increased recovery after forest fires
Increased erosion	6.1 Construction of living barriers (1000 m)	$6,310.99	6	$37,866	Farms on vulnerable slopes	Farmers located in vulnerable slopes	Increased soil retention Increased soil humidity Decreased erosion
Increased flooding	6.2. Drainage superficial construction	$119.41	16	$1,911	Farms on floodplains	Farmers located on floodplains	Increased drainage in floodplains

Decreased water availability	Rainwater harvesting systems on public or community building using the roof of houses and plastic or geomembrane deposits for storage. (25 mt3)	$2,975.24	16	$47,604	Community buildings	Community members	Increased water availability
	Community-level rainwater reservoirs (500 m3)	$2,050.00	41	$84,050	Communal land	Community	Increased water availability
TOTAL COST				**$2.801.639**			

Priority areas for intervention

The specific location of the foreseen interventions under this component will be identified during the first year of the project through community consultations and attending to the following principles described in the Term Sheet of the programme.

Eligibility criteria for the EbA landscape interventions

- Areas located in the 5 selected municipalities in the Choluteca basin
- Include participatory mechanisms to ensure the knowledge, needs and individual and collective rights of male and female youth and adult women in their design, implementation, monitoring and evaluation are taken into account
- Local organisations in each municipality to implement on-the-ground EbA interventions that provide multiple ecosystem goods and services to vulnerable communities
- Farmers and communities that lack the capacity to access financing and equipment to implement adaptation interventions without external assistance.
- Farmers and communities interested in landscape restoration with sustainable silvo-pastures, and/or agroforestry; and/or forest restoration and conservation systems, initiatives and sub-projects in their community
- Contribute to intercultural gender equality and women's economic empowerment through both access to financing and other resources and generation of tangible and measurable benefits
- Ensure the active participation of women producers and women's organizations in the programme's decision-making processes, as well as in water committees
- Include participatory mechanisms to ensure the knowledge, needs and individual and collective rights of male and female youth and adult women in their design, implementation, monitoring and evaluation are taken into account
- Contribute to intercultural gender equality and women's economic empowerment through both access to financing and other resources and generation of tangible and measurable benefits.

- Participation of the local community in control and oversight schemes to grant transparency and accountability.

The potential locations for the prioritized EbA interventions have been identified in the Choluteca basin and will need to be validated with key actors during the initial stage of the programme.

The map below shows the recommended areas for the prioritized interventions.

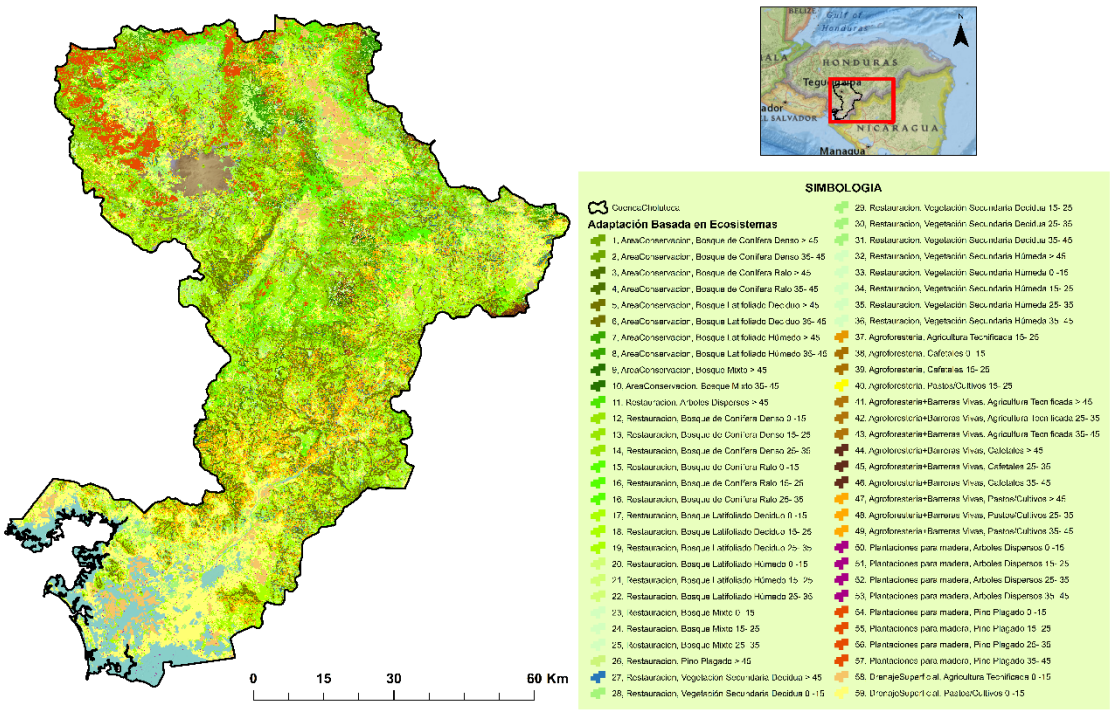


Figure 16. Potential areas for EbA interventions in the Choluteca basin

FOREST CONSERVATION interventions will be established in the mature forest patches in the higher and northern areas of the basin indicated in the map in dark green colours. Mature forests are located mainly at altitudes between 500 and 1750m and ranging slopes between 0 and 30 degrees, as can be seen in the example of dense coniferous forest below (Figure 18). The areas with higher altitude and slope gradient will be prioritized for this intervention as they show the highest potential for soil retention and water infiltration.

- TOTAL AREA MATURE FOREST. 214,765 ha[9]

[9] Estimation considering the following national land use categories for the basin: dense coniferous forest and 50% of deciduous broadleaf forest and wet broadleaf forest.

- TOTAL AREA OF INTERVENTION. 870 ha (0.41% of total area)

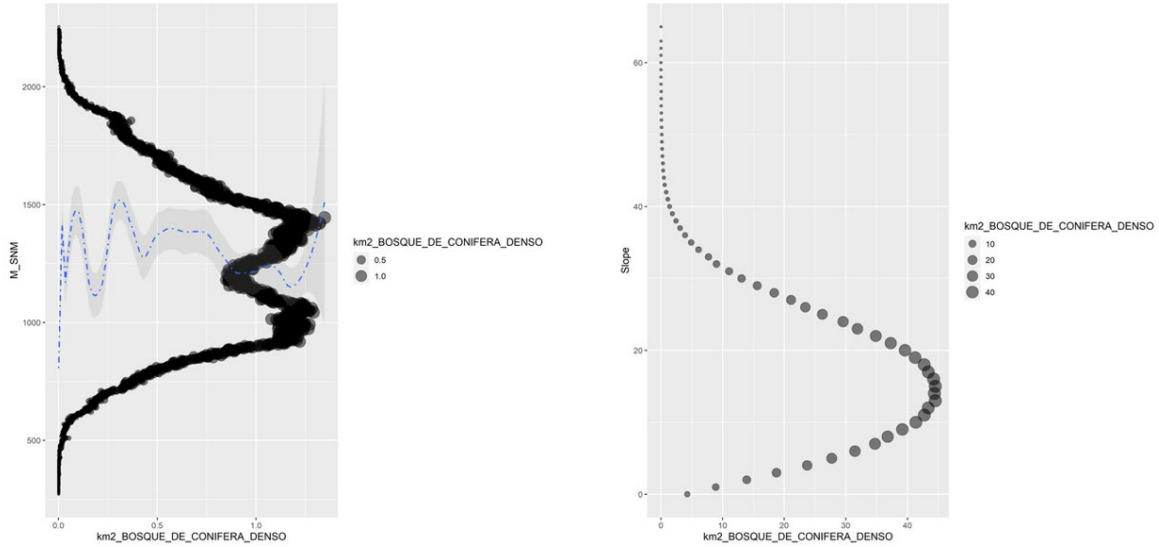


Figure 17. Total area of dense coniferous forest per altitude and slope in the Choluteca Basin

FOREST RESTORATION interventions will be undertaken mainly over secondary forest patches located in the northern central areas of the basin indicated in the map in light green colours. Secondary forests are located mainly at altitudes between 500 and 1500m and ranging slopes between 0 and 20 degrees, as can be seen in the example of sparse coniferous forest below (Figure 15). The areas with higher altitude and slope gradient and those close to water flows will be prioritized for this intervention as they show the highest potential for soil retention and water infiltration.

- TOTAL AREA SECONDARY FOREST. 294,696 ha[10]
- TOTAL AREA OF INTERVENTION. 870 ha (0.30% of total area)

[10] Estimation considering the following national land use categories for the basin: scattered trees, mixed forest, plagued pine, sparse coniferous forest, secondary deciduous vegetation, secondary humid vegetation and 50% of deciduous broadleaf forest and wet broadleaf forest.

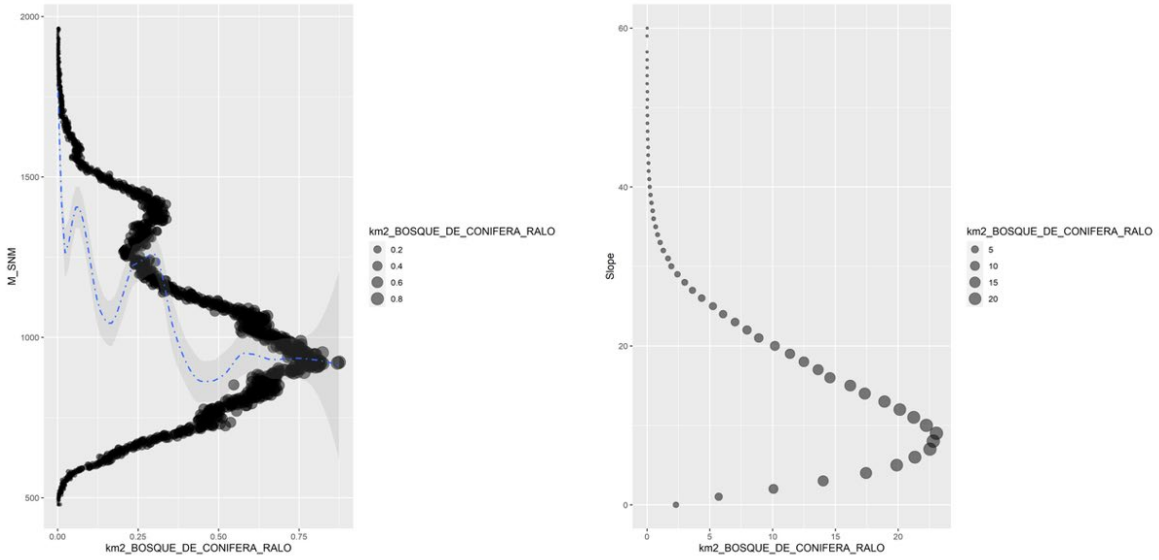


Figure 18. Total area of sparce coniferous forest per altitude and slope in the Choluteca Basin

AGROFORESTRY SYSTEMS/LIVING FENCES IN AGRICULTURAL SYSTEMS interventions will be undertaken mainly over agricultural land located in the central part of the basin indicated in the map in light brown colours. Agricultural land is located mainly at altitudes between 0 and 1750 meters and ranging slopes between 0 and 20 degrees, as can be seen in the example of coffee plantation below (Figure 16). The agroforestry systems will improve water recharge and crop productivity and the living fences, located in those areas with higher slope, will increase erosion control.

- TOTAL AREA AGRICULTURE. 17,853 ha[11]
- TOTAL AREA OF INTERVENTION. ~302 ha (1.69% of total area)

[11] Estimation considering the following national land use categories in the basin: sugar cane and coffee plantations.

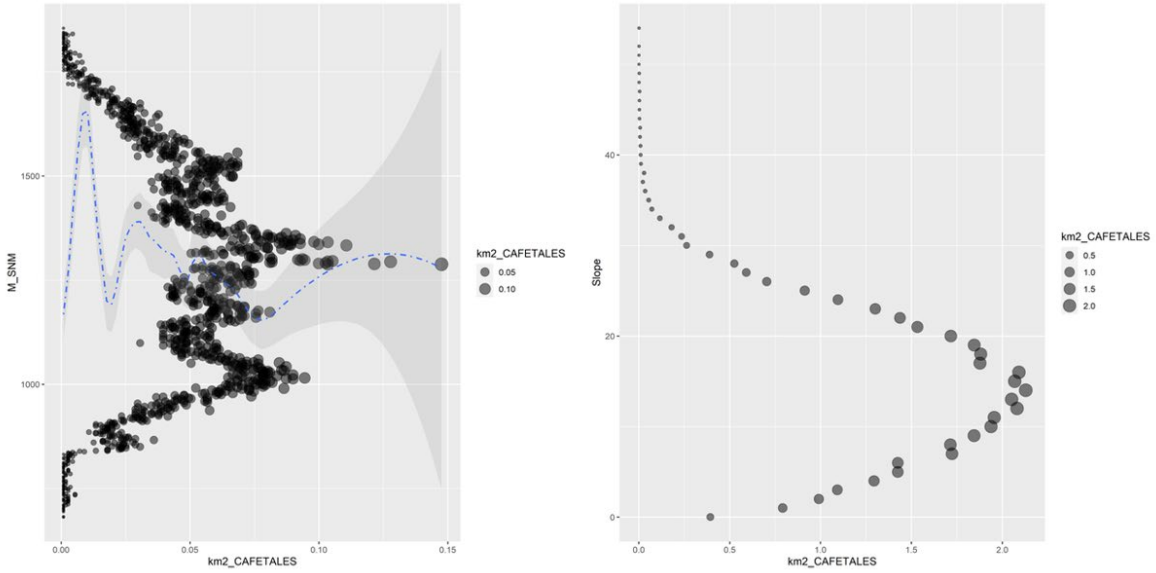


Figure 19. Total area of coffee plantations per altitude and slope in the Choluteca Basin

SILVOPASTORIL SYSTEMS/LIVING FENCES interventions will be undertaken mainly over pasture that expands widely throughout the basin indicated in the map in yellow colours. Pastureland is distributed in a wide range of altitudes from 0 to 100 meters, but mainly concentrated below 100 meters and ranging slopes between 0 and 20 degrees, as can be seen in the example of pasture and land below (Figure 17). The silvopastoril systems and living fences will be implemented mainly on the higher and steeper areas to improve water recharge and control erosion.

- TOTAL AREA PASTURE. 199,372 ha[12]
- TOTAL AREA OF INTERVENTION. ~268 ha (0.13% of total area)

[12] Estimation considering the following national land use category in the basin: pasture/crops.

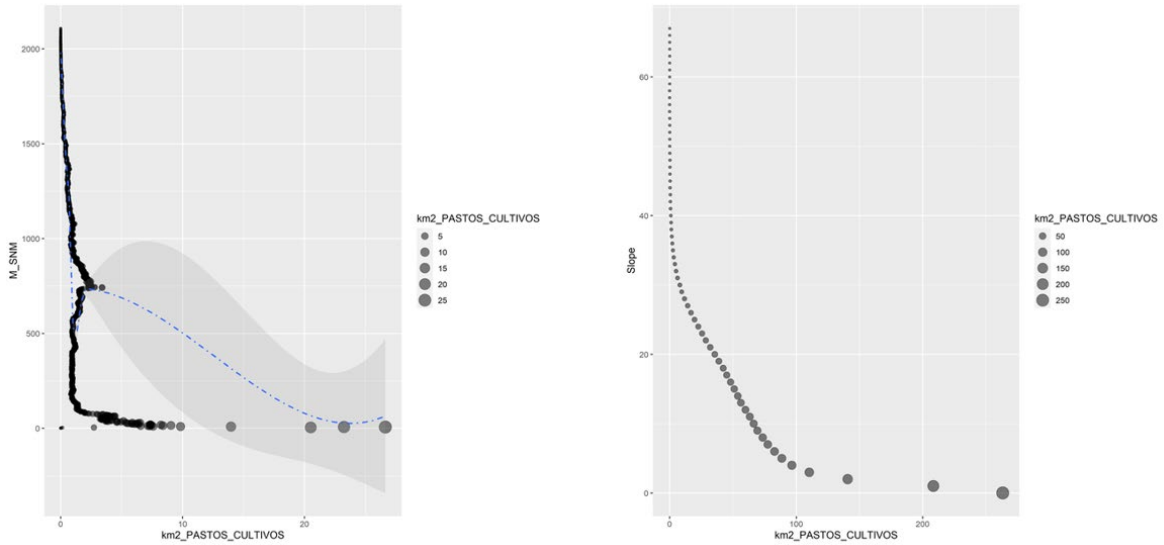


Figure 20. Total area of pasture and crops per altitude and slope in the Choluteca Basin

SOIL CONSERVATION / SUPERFICIAL DRAINAGE SYSTEMS interventions will be undertaken mainly over agricultural land located in the central part of the basin indicated in the map in yellow colours. Agricultural land is located mainly at altitudes between 0 and 600 meters, but mainly concentrated below 100m, and ranging slopes between 0 and 5 degrees, as can be seen in the technified agriculture example below (Figure 18). The superficial drainage systems will be implemented on agricultural land at the floodplains and with lower slopes to decrease flooding of crops and increase water recharge.

- TOTAL AREA AGRICULTURE. 22,330 ha[13]

- TOTAL AREA OF INTERVENTION. ~10 ha (0.05% of total area)

[13] Estimation considering the following national land use category in the basin: technified agriculture.

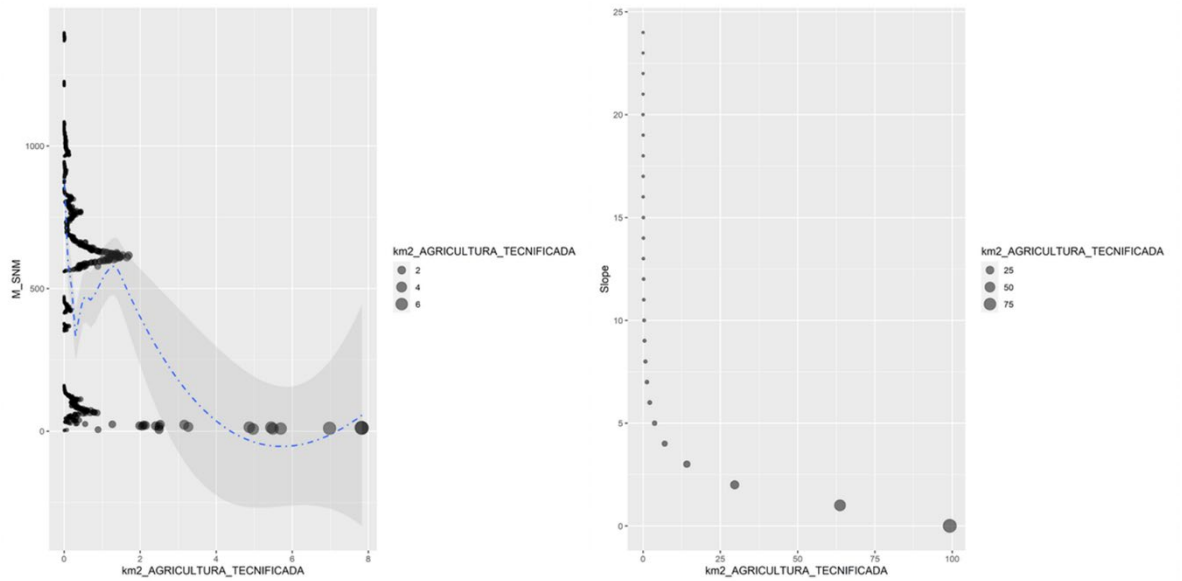


Figure 21. Total area of technified agriculture per altitude and slope in the Choluteca Basin

Beneficiaries of the grant component

The interventions selected for this component are mainly focused at landscape interventions that provide benefits at the watershed scale and are implemented in communal land as well as some critical interventions that can be applied at the farm level that will also serve as demonstration and promotion elements for the financial mechanism.

For those interventions addressing **individual farmers**, access to grants through this component will be limited to one-time access, one single option and prioritized according to:

- the location of farms on high priority hotspots as identified in the site-specific implementation plan for the catchment
- farmers identified within priority vulnerable groups as defined in the site-specific implementation plan for the catchment
- their confirmed willingness and capacity to participate as demonstration farm sites in capacity building activities for the communities and other interested stakeholders
- the confirmed willingness and capacity to provide reference data for economic analysis and success monitoring, including the autonomous fill-in of reporting templates (preferred: digital)
- the confirmed willingness and capacity to participate in awareness raising activities on EbA implementation,
- willingness to support the creation of visual materials (e.g. by being displayed on photos or in videos) for further knowledge dissemination.

Co-financing of the Grant-financed EbA intervention

Honduras has committed a total of USD 7,000,000 in co-financing for the duration of the project (see annex 13). This co-financing has been certified through its co-financing letter (see Annex 13-G), and close to 80% will be focused on the EbA interventions under output 2.

Honduras will identify the funds each year and will report to CCAD on their corresponding contributions, identifying additional investment sources from their national budgets to increase the interventions of this output. The CCAD, whose highest authority is the Council of Ministers, composed of representatives of the environmental authorities of each Member State, will be responsible for ensuring such commitments are fulfilled.

6.6 Grant facility established to promote an EbA business ecosystem (Output 2.3)

As identified in the community consultations and in the analysis of previous projects in the region, the implementation of sustainable practices and adaptation measures also depends on the availability of technology and supplies at the local level at affordable prices.

The Grant Facility will disburse a total of USD 28,000,000 for the seven countries from year 2 to year 5, representing an average of 1 Million USD for Honduras per year for 4 years, assuming equal distribution. More information on the establishment and deployment of this facility can be found in annex 23 (Operational Guidelines).

Communities in the Choluteca basin will have access to a Grant facility to identify and support innovative business and distribution models for EbA solutions, as well as biomass and water-efficient technologies, following a competitive bottom-up approach. As a working principle, potential projects are to be identified at the community level. A competitive evaluation and selection process will be established from the local level through the Project Execution Units to the Regional Steering Committee level twice a year for 4 years as described in the following diagram.

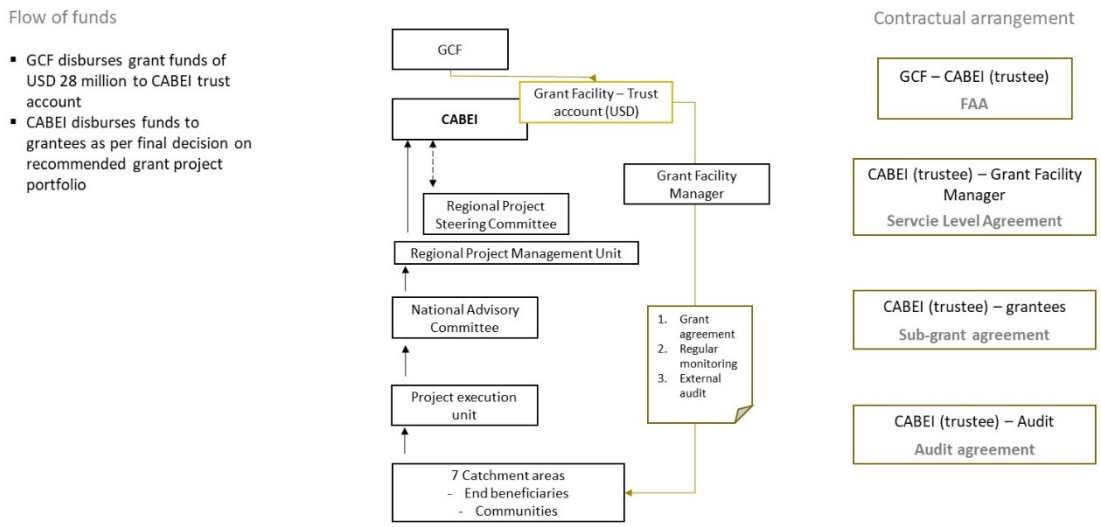


Figure 22. Grant facility mechanism

Eligible projects will include community-level investments, the establishment of water funds, seed funding for payment for ecosystem services (PES) and support for the adoption of selected EbA practices and/or water- and resource-efficient technologies, innovations in new solutions and distribution models, among others. Additional criteria, such as the prioritization of vulnerable groups like women-headed households, for the access to grants, will be considered in the first set of eligibility criteria.

Access to grants through this component will be limited to one-time access and conditioned to:

- Comply with all basic requirements and management principles established for the grant facility
- Proven capacity to execute the proposed project or initiative
- Participation in capacity building activities, where applicable
- Participation in awareness raising activities on solutions, where applicable
- Be situated or attending the project areas of operations in the defined catchment areas.
- Having a clear vision or plan on how to scale EbA solution or water technology provision.
- Provide clear and measurable result metrics that can be verified and audited.

The success of EbA activities financed by the Grant component is also expected to leverage demand for EbA loans, e.g. via supporting the introduction of (locally) unknown or new solutions, fomenting distribution and capacity building mechanisms as well as the strengthening of institutional and community coordination mechanisms.

The Grant Facility is provided to undertake three core areas of activities. In principle, any grant is subject to co-financing by the beneficiary, the percentage is determined by the specificity of the grant subject (typically 10% - 20%). Grants can be destined to working capital, investment capital or

technical assistance activities to support selected projects. The three Grant Facility innovation categories are as follows:

- Business linkage innovation: This category of funding is foreseen to take the largest share in the grant facility budget. The beneficiary will be asked to contribute at least 10% in cash or in kind with additional commitment to contribute by sharing concepts, models, skills and knowledge to other interested stakeholders. Examples of activities in this funding category are the support of the establishment of sustainable business linkages for the promotion of EbA solutions and water technologies, "import" successful EbA solutions form other regions and support EbA and water technology group or associative formation.
- Service and input innovation: this category of innovation funding can be used to test innovations in input supply, service provision, collection services, and any other innovative model in service provision which has potential for sustainable up-scaling. Applicants will be supported up to 90% of their projects and are obliged to share their monitoring and evaluation results and lessons learned of the whole process. This typically consists of publishing learning briefs, providing on-site training or making presentations at group gatherings.
- Sector organizations and institutions strengthening: This category is meant to develop the capacity of sector organizations, such as the establishment of water funds. The lead organization needs to contribute a minimum of 10% for the support requested in kind or cash. The organizations are expected to pay back by offering relevant services during the project period, and this must already be indicated in the grant application.

Eligibility criteria for the grant facility proposals

- Promote an approach of bottom-up identification of adaptation interventions and de-risked top-down financing for adaptation.
- Individuals or legal entities with proven track record in implementing or providing EbA solutions or water technologies.
- Be situated or attending the project areas of operations in the defined catchment areas.
- Having a clear vision or plan on how to scale EbA solution or water technology provision.
- Provide clear and measurable result metrics that can be verified and audited.
- Adhere to the established grant management principles.
- Establish a quota for women's access as one of the defining eligibility criteria of the Steering Committee guidelines
- Participation of the local community in control and oversight schemes to grant transparency and accountability.
- Make a contribution to strengthen the capacities and entrepreneurship within the community, private sector co-finance and participation will be positively valued for sub-project evaluation
- Grants awarded in compliance with:
    a) Reducing pressure on ecosystems and the services they provide

b) Enhancing the social or economic resilience or human populations vulnerable to climate change,
c) Reducing risks associated with climate events in production areas,
d) In their implementation, protecting, restoring or using biodiversity and ecosystems in a sustainable manner,
e) Having a positive impact on individuals' economy in the short term

6.7 Loan and guarantee facility to accelerate access to finance for other relevant EbA interventions for the Choluteca basin (Output 4.2)

Finally, previous activities are expected to provide populations in the Choluteca basin not only with the awareness that EbA solutions and resource- and water-efficient technologies can provide positive returns but also with the capacity to implement them via the grant financing of intervention at different levels: while direct grants target to introduce community-level landscape interventions that foster the awareness of the value of ecosystem services, the Grant facility and its competitive selection processes focus on building the required structures and mechanisms to make EbA solutions and biomass- and water-efficient technologies widely available.

Only then a mainstreaming of EbA finance can be possible, as concrete investments to be financed can be identified, planned and properly supplied – i.e. establishing market building mechanism often not considered in reference projects.

The Lending and guarantee facility are in consequence filling a gap that is often defined as barrier to EbA finance: by providing concessional finance the lending facility will incentivize Partner Financial Institutions to build internal capacities to promote more complex financial products as well as comply with increased Monitoring, Reporting and Verifications (MRV) requirements. By de-risking rural and especially most vulnerable clients and simultaneously providing data from MRV administrative records, the ground is being provided to apply the Guarantee facility in order to leverage additional capital for EbA finance and expand the barrier towards more vulnerable populations.

Objective

The **objective** of the Lending Facility is to enable financing of proven EbA solutions and biomass- and water-efficient technologies, when responding to locally identified and perceived adverse climate threats and impacts and proven to provide positive economic returns. By definition, only locally available EbA solutions and resource- and water-efficient technologies will be financed by the concessional Lending facility's funds or backed by the Guarantee facility's coverage.

Further, by providing concessional finance and a free-of-charge guarantee coverage, Partner Financial Institutions will be incentivized to apply mandatory and more rigid MRV systems which will

not only ensure aligned deployment of funds but help to build the database for performance monitoring of EbA strategies under different local realities and in differing climate scenarios.

This database will be crucial in the definition of the financial and economic rate of return of specific EbA interventions for different economic activities and fuel further purely commercial funds at markets rates, if the expected de-risking function of EbA investments can be proven.

Partner financial institution eligibility criteria

The selection of partner financial institutions will be based on a number of eligibility criteria:

Eligibility criteria for the selection of PFIs

- Promote an approach of bottom-up identification of adaptation interventions and de-risked top-down financing for adaptation.
- IFIs complying with CABEI current policies and criteria
- PFIs must be duly licensed in the respective countries and have at least three years of operation.
- The PFIs must be and remain in compliance with applicable laws and regulations issued by the local authorities as certified by independent external auditors on an annual basis and by quarterly returns provided by PFIs to the local regulatory authorities
- In case the initial eligibility of the PFIs falls to such a date that their year-end audits have been already completed and do not cover this requirement, then the PFIs would be required to submit a management letter in an acceptable format confirming their compliance with applicable laws and regulations issued by the authorities.
- PFI's board of directors and managers must be considered "fit and proper" by IFI trust structure. It must have qualified and experienced management, adequate organization and institutional capacity for its specific risk profile.
- The PFI must have well defined policies and written procedures for management of all types of financial risks (i.e. credit, operational, liquidity and market risks).
- Operational self-sufficiency: The operational self-sufficiency of the PFI must be over 100% for the preceding financial year.
- The PFI must have adequate liquidity (based on the acceptable prudential ratios dictated by the national financial regulatory body of each country).
- The PFI must have positive profitability and acceptable risk profile (based on the acceptable prudential ratios dictated by the national financial regulatory body of each country).
- The PFI must classify its assets and off-balance-sheet credit risk exposures (at least four times per year) and make adequate provisions.
- The PFI must have adequate portfolio quality, with PAR>=90 of at most 5% of total gross loans.
- The PFI must have adequate internal audits and controls for its specific risk profile.
- The PFI must have adequate management information systems, allowing it to separately and individually track all loans made with the EbA facility funds.

- The PFI must agree to engage in financing commercial farms, households, agroindustry and other enterprises.
- The PFI must agree to undergo intensive mandatory technical assistance.
- Promote a specific grant programme within the fund for women, which facilitates access to credit for women producers and womens' cooperatives (example: The Women Entrepreneurs Finance Initiative (We-Fi) https://we-fi.org, Programa Regional de Financiamiento Empresarial para Mujeres – FEM (CABEI)) sustainable supply of financial services to low-income households for combating poverty and especially women who, in these areas, are mostly heads of families

EbA interventions eligibility criteria

The specific EbA related eligibility criteria to be emitted by the Regional Project Steering Committee (RPSC) will be elaborated during the first phase of the proposal. These will be aligned with national and municipal adaptation policies, plans and initiatives.

Even if specific selection criteria are to be defined during the inception phase of the project by the RPSC, they shall be aligned to the following minimum criteria based on the framework of the MEbA project:

- Reducing pressure on ecosystems and the services they provide,
- Enhancing the social or economic resilience of human populations vulnerable to climate change,
- Reducing risks associated with climate events in production activities
- In their implementation protecting, restoring or using biodiversity and ecosystems in a sustainable manner, and
- Having a positive impact on individuals' economy in the short term.

These criteria have been the base and foundation of a first definition of a set of EbA solutions that can cater to the adaptation needs of the most vulnerable populations. Methodologies have been developed in the same project to identify, analyze, define and include additional EbA solutions as well as systemize their economic analysis (IRR + NPV).

Eligibility criteria will be defined following a **top-down approach** and their fulfilment will be constantly monitored via the incorporation of modern Information and Communication Technology (ICT) solutions for PFIs as well as by digitized lending and operational processes of PFIs, including the incorporation of GPS data on EbA implementation sites – enabling periodic, randomly selected external audits. PFIs eligibility further is depending in the IFIs eligibility criteria according to the contractual set-up to be chosen.

Beneficiaries eligibility criteria

Access to loans through this component will be conditioned to:

- End beneficiaries need to be credit-worthy, i.e. showing overall household/business payment capacity and willingness
- Providing documented proof that EbA financing is in fact destined to eligible EbA investments; eligibility criteria will be defined during project's first phase for all intervention sites.
- Comply with minimum reporting and monitoring activities as established by the Lending facility.
- Dispose of capacity to implement the targeted EbA investment, where applicable as part of the investment plan to be financed (e.g. via training participation, provided TA or other capacity building activities).

Possible EbA solutions according to climate risks

The figure below represents a summary of the proposed EbA interventions for the loan facility according to the climate impacts and main related threats they address. This list was compiled following the resources and examples from the MEbA project, and more detailed information of each measure and their cost can be found in Annex 2.

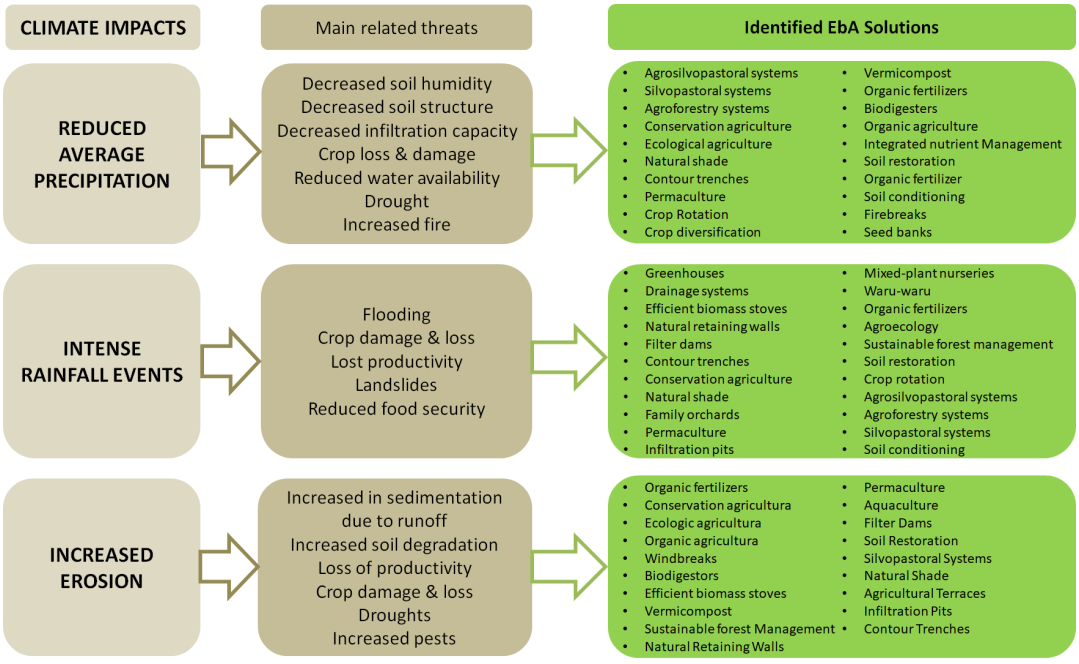


Figure 23. Identification of EbA measures according to climate risks

It's important to note that this is an indicative list and not the only EbA options: for example, coastal management or resilient livestock management interventions aren't included, although they would be highly relevant for certain communities in the target catchments. There is a much larger number of alternatives that could be more suited to specific environmental, social and cultural context of each community and each MFI would have certain flexibility of studying and proposing EbA interventions based on demand and the above listed criteria.

Phased approach for the replication and scale up of the loan component

The loan component will ensure the generation of evidence of demand and impacts of the investments undertaken through the loan component – always vis-à-vis adverse climate threats and impacts. With the aim to introduce the identification, measurement and management of climate-related financial risks, the necessary MRV systems for Partner Financial Institutions will include not only tools to verify the adequate use of funds but also geolocalized linkages of concrete EbA investment to climate data sets.

The deployment of the loan facility will follow a phased approach along the project to ensure cohesive and substantive impact of the financed activities as well as proper vulnerability assessments and identification of priorities for other vulnerable regions within the Dry Corridor where the intervention could be scaled up. This phased approach will also allow for more time to strengthen capacities of the financial institutions and to promote the financial mechanism with communities and producers.

The three implementation phases of the loan facility are described in the implementation strategy above.

Guarantee facility coverage

The guarantee facility will be linked to the EbA lending facility to secure IFI's on-lending of CABEI's co-financing funds and mobilise additional lending from IFIs' own and additional public and private investors' resources by mitigating against credit risks associated with commercial EbA Finance to end beneficiaries.

CABEI will manage the guarantee facility as a window in its recently established Guarantee Fund (managed in-house), guaranteeing the collateral to senior loans from IFIs to PFIs which is usually provided in form of end beneficiary loan portfolio. Such loans are usually – especially for subsistence farmers – not fully covered by real guarantees such as real estate or other moveable assets pledges, hence making such constructs prohibitively expensive.

As digital EbA lending facility MRV systems will be integrated, CABEI will be in position to automate its extension of guarantee certificates over end beneficiary loans in line with current guarantee fund

stipulations – IFI will have partial coverage by CABEI's guarantee fund, which will lower collateral requirements by PFIs and enhance access to the lending facility and leveraged finance for end beneficiaries.

Initially, the guarantee facility will only cover funds originating from CABEI's co-financing. The guarantee facility will issue a capped partial credit risk guarantees to IFIs for their on lending to PFIs. If successful, the guarantee facility will hence be able to provide guarantee coverage to additional funds.

Once operational and with increased EbA Finance experience at hand in the programme areas, its coverage will be expanded, following established risk management principles and depending on the guarantee's performance (in terms of claims and outreach). In the same way, in case of claims exceeding expected levels, the emission of additional guarantee obligations will be limited.

The guarantee is foreseen to cover 25–75% of end beneficiary loan portfolios to eligible PFIs and hence leverage additional EbA finance with a ratio of 1:4.33 (see 6-1, section 5 in Annex 3).

6.8 Building capacities of key actors

Capacity Building of the key actors throughout the Dry Corridor is key component of the project to ensure the sustainability of the interventions, as showed in step 2.1. The programme will be focusing on providing technical assistance and capacity building for key actors throughout its 4 outputs, with an identified budget of around USD 940,000 for Honduras, assuming equal distribution among countries.

Communities' capacity building needs identified during the consultations

Technical assistance and capacity building at the catchment levels will mainly be carried out throughout output 1, following the identified needs raised during the consultations. The trainings will be adapted to the necessities of each communities, but for the Choluteca basin, participants had already raised some important elements:

- The programme will be providing technical assistance to farmers and rural communities on the implementation of on-the-ground EbA practices, including silvopasture, agroforestry and sustainable land management including commercial farmers, smallholder subsistence farmers, local communities and individual households.
- Implementation protocols will be developed for: i) the implementation of sustainable EbA practices; ii) the adoption of water-efficient technologies; and iii) the adoption of resource-efficient technologies that reduce fuelwood demand.
- Training will be provided to communities on the development of small, locally appropriate livelihoods. This will include training for natural resource-based businesses (NRBs) that: i) will support the implementation and maintenance of EbA interventions — such as tree nurseries and the manufacturing, distribution, or repair of water-

efficient technologies; and ii) rely on non-destructive use of ecosystem goods and services provided through EbA — such as businesses developed around the ecotourism industry, or non-timber forest products (NTFPs).

- Strengthening the technical capacity of local governments, producers, and communities to implement EbA and other adaptation measures: participants indicated it was necessary to strengthen the environmental units of the municipalities and train the technical staff. This requires adapting to the levels of understanding of the concepts of climate change in each municipality, as well as focusing on the organizational level and not restraining training to individuals.

Technical assistance for financial institutions

Capacity building activities will also target the small, medium and large financial institutions involved in the project, to support the integration of external data management solutions to enhance EbA-oriented MRV systems with existing IT infrastructure such as core banking systems, focusing on information and data management, risk management, financial product development and marketing.

A comprehensive Training-of-Trainers or online course mechanism for financial institutions will also be carried out to strengthen: i) the awareness of climate change, ecosystem degradation and water scarcity; ii) the identification and promotion of solutions to overcome these threats; iii) the application of methodologies, technologies and tools to foster EbA finance and manage climate and ecosystem risks via tailor-made financial products and services, non-financial services such as information services or training; and iv) the monitoring, reporting and verification systems in place to support learning on successful EbA and EWT strategies.

Trainings linked to the knowledge hub's results

It is important to highlight that capacity building will go beyond local communities. Key actors at the national level will be trained specifically under Output 3 for the knowledge hub, covering a wide range of representatives from relevant institutions. For Honduras, for example, main national institutions include universities, research centers, the private sector, the Ministry of Environment (MiAmbiente), the Secretariat of Agriculture and Livestock, the National Conservation Institute for Forest Development, Protected Areas and Wildlife, the Committee for the Defence of the Flora and Fauna of the Gulf of Fonseca, the National Board of Advocacy for Risk Management, the Permanent Contingency Commission, among others.

6.9 Mainstreaming EbA into key policy and planning frameworks

The capacity of governments and institutions to make policy changes that include these kinds of incentives will be strengthened, including the use of protocols and criteria for the adoption of EbA

and implementation of economic incentives for sustainable land management. This output will also support the integration of EbA into national sectoral policies by providing inputs into the currently under development National Adaptation Plan (NAP). Additionally, the technical assistance under this component will support the integration of EbA into the four relevant regional strategies convened by the Central American Integration System (SICA) including the environmental, climate change, water resources and agricultural regional strategies.

Local level policies and development strategies:

- Territorial planning instrument (Plan de ordenamiento territorial, in Spanish)
- Strategic municipal development plans (PEDM for its initials in Spanish)
- Integrated Watershed Management plans for the Choluteca Baja basin.

National policies:

- Decree 181 - 2009 General Water Law.
- Decree 234-2003 Law for the Financial Strengthening of Agricultural Producers.
- Climate Change Act, 2013.
- National Adaptation Plan (NAP)

Regional policies:

- Regional Environmental Framework Strategy, 2015-2020, CCAD[14]
- Strategy and Plan for the Integrated Management of Water Resources in Central America[15]
- Strategy for a sustainable agriculture adapted to climate change for the SICA region (2018-2030)[16]

6.10 Monitoring and evaluation framework

Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
Component 1: Mainstreaming of EbA, water-efficient technologies and natural resource-based businesses into selected catchments						
Output 1. Strengthened technical	• Technical capacity of local government	Capacity scorecard[17]	Baseline to be determined	3 local institutions with at least	6 local institutions with at least	Local monitoring systems provide sufficient detail to

[14] https://www.sica.int/documentos/estrategia-regional-ambiental-marco-eram-2015-2020_1_94463.html

[15] http://www.siagua.org/sites/default/files/documentos/documentos/recursos_hidricos_centroamerica.pdf

[16] http://www.cac.int/sites/default/files/Estrategia%20ASAC%20-%20CAC.pdf

[17] The indicator scale is based on four-step criteria of capacity assessment for each stakeholders group:

i) Are the stakeholders aware of the current and expected impacts of climate change and the availability of climate-resilient practices available to adapt to these impacts?

capacity of local government, farmers and rural communities to implement EbA and other adaptation measures.	institutions to plan for and implement EbA and other adaptation measures, as measured by the capacity scorecard. Number of males and females with knowledge of how to implement EbA, water/resource-efficient technologies, and/or climate-resilient livelihood options.	Household surveys Local level monitoring reports (as established through Activity 1.1.1)	at inception phase	Level 3 Capacity 14,800 males 7,000 females	Level 7 Capacity 32,500 males 17,500 females	guide effective planning. The training of trainers programme, supported by training workshops and farmer-to-farmer knowledge exchanges are sufficient to enable community members to adopt climate-resilient practices.
Output 2. Demonstration adaptation interventions implemented in rural communities across seven target catchments in the Dry Corridor and Arid Zones.	• Ha of forest protection zones. • Ha of natural forest in major recharge areas and riparian zones.	Site surveys Remote sensing data Implementation reports	0 ha of new forest protection zones 0 ha of new natural forest	300 ha of forest protection zones. 130 ha of natural forest in major recharge areas and riparian zones	600 ha of forest protection zones 270 ha of natural forest in major recharge areas and riparian zones	Introducing SLM practices will enhance the provision of ecosystem services. Communities will continue to use the introduced technologies and will not revert to old practices.
	• Ha of restored forested areas • Ha of restored pine forests. • Km of living fence agroforestry systems.		0 ha of restored forested areas 0 ha of restored pine forests 0 km of living fence agroforestry systems 0 ha of new agroforestry	300 ha of restored forested areas across 130 ha of restored pine forests 90 km of living fence agroforestry systems 90 ha of agroforestry	600 ha of restored forested areas 270 ha of restored pine forests 180 km of living fence agroforestry systems 180 ha of agroforestry	Communities will continue to use the introduced technologies and will not revert to old practices

ii) Do local institutions have access to the EbA and water/energy-efficient technology protocols?
iii) Do local institutions have the capacity to monitor and evaluate the state of ecosystems and the effectiveness of EbA interventions at the landscape level?
iv) Do local institutions have the capacity to train farmers on the adoption of EbA and water/energy-efficient technologies?

Each question is scored from 0—2, with: 0 = not at all, 1 = partially; and 2 = to a large extent/completely. An overall score is calculated, with a maximum score of 8 given four criteria. These four criteria will be elaborated, reviewed and validated at inception phase of the project.

	• Ha of agroforestry systems for natural shade in coffee plantations.		systems for natural shade	systems for natural shade in coffee plantations	systems for natural shade in coffee plantations	
	• Km of diversified living fence silvopasture systems.		0 km of diversified living fence silvopasture	80 km of diversified living fence silvopasture systems	168 km of diversified living fence silvopasture systems	
	• Ha of silvopasture systems using individual trees		0 ha of new silvopasture systems	80 ha of silvopasture systems using individual trees	168 ha of silvopasture systems using individual trees	
	• Tons of fuelwood produced through plantations to reduce impacts of fuelwood collection on natural forests		0 tons of fuelwood being produced through plantations[18]	2,000 tons of fuelwood produced	33,600 tons of fuelwood produced	
	• Rainwater harvesting capacity		0 m^3 rainwater harvesting capacity	470 m^3 rainwater harvesting capacity	1025 m^3 rainwater harvesting capacity	
	• Rainwater storage capacity		0 m^3 rainwater storage capacity	4,700 m^3 rainwater storage capacity	10,500 m^3 rainwater storage capacity	
Output 3. Information on climate change adaptation and its financing disseminated across the region and mainstreamed into local and national policies.	• Level of integration of climate change adaptation in municipal-level political and technical decision-making for climate resilience, such as the Territorial Rural Development Plans, the Comprehensive Water Supply Plan for Guanacaste, the Management plans in Protected Wild Areas	Policy uptake scorecard[19]	Limited integration of CCA in municipal-level political and technical decision-making for climate resilience	3 municipalities with at least Level 1 policy uptake	All 6 municipalities with at least Level 2 policy uptake	Lessons learned from project activities are sufficient to support the mainstreaming of CCA into local and national policies.

[18] Baseline to be determined through activity 2.1 "Develop site-specific intervention plans for the 7 target catchments to integrate EbA measures through a participatory process with municipal authorities, local communities and other stakeholders".

[19] This policy uptake scorecard will have four levels and will measure the extent of CCA mainstreaming in relevant local government policies and plans. Level 0: CCA not integrated meaningfully into municipal policy; Level 1: Evidence-base in place to guide policy adjustments in local municipalities; Level 2: CCA narrative woven through the draft municipal policy; Level 3: Policies updated to fully account for climate change adaptation.

	and the Local Management Plan					
Component 2: Financing and implementation of EbA as well as water- and resource-efficient technologies across selected catchments						
Output 4. Financial products and services to finance EbA investments are offered by Partner Financial Institutions (PFI), including PFI access to EbA on-lending funds and support mechanisms. .	• # of financial or support mechanisms in place to provide EbA on-lending funds to PFIs • # of specific financial or non-financial products and services offered by PFIs geared towards EbA investment • Institutional capacity of financial institutions to channel funds for small- and large-scale EbA investments strengthened	Statutes of created financial or support mechanisms Management reports of financial or support mechanisms Internal product information PFI communication material & press releases Digital management reports Audit reports (general + programme-specific) Institutional capacity scorecard[20]	0 (Financial Mechanisms not yet operational) Baseline to be determined at inception phase Baseline to be determined at inception phase	2 (Financial Mechanisms operational) 2 (specific financial or non-financial products and services) 2 institutions with at least Level 3 (out of 5) capacity	2 (Financial Mechanisms operational) 4 (specific financial or non-financial products and services) 4 institutions with at least Level 4 (out of 5) capacity	PFIs need specific EbA financing and support (e.g. risk transfer) mechanisms to fully take advantage of last-mile solutions End beneficiaries will adhere to specific EbA finance products and non-financial services to invest into EbA capacity once available

A community-level monitoring and evaluation committee will be established during the initial stage of the programme, which will promote country ownership and sustainability of project interventions. The technical capacity of these committees will be strengthened to enable the

[20] Within the MEbA II project an institutional capacity scorecard has been developed that assesses the capacity of a given institution in five main dimensions and expresses findings over 100 points in total, implemented with 13 institutions in Latin America and Sub-Sahara Africa:

i) EbA solutions: does the institution have a basic understanding of concrete EbA and efficient water management solutions and is it able to distinguish and verify the application of these solutions by target end beneficiaries (survey-based)?
ii) Information management: is internal information management structured in a way that enables the assessment of loan applications based on EbA and water/energy-efficient technology protocols (e.g. via MEbA II EbA capacity and EbA verification indicators) and spur ongoing learning to enable autonomous and effective EbA by target end beneficiaries?
iii) Risk management: is the institution in a position to integrate climate and ecosystem risk management (identification, measurement, monitoring and mitigation of these risks) into daily operations, including incorporating business continuity and contingency plans?
iv) Products & services: is the portfolio of financial and non-financial products sufficiently sophisticated to integrate EbA and water-efficient technology-focused products and services relevant to PFI's areas of operations?
v) Marketing: is the marketing management incorporating all aspects needed to raise awareness of target end beneficiaries regarding the importance and potential impact of climate change, ecosystem services and water scarcity

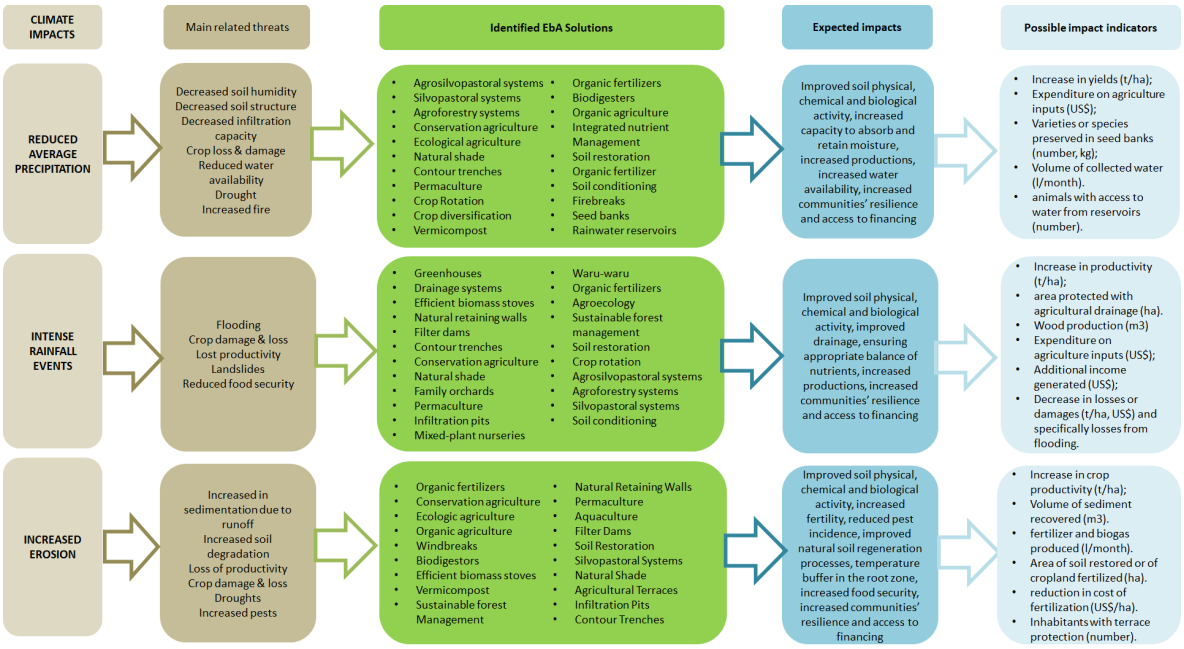
Questions are scored between 1 and 10 points with different weights applied; 20% percentiles define 5 segments of development status of an institution. [we do not have it as that – we use it to steer TA and close gaps] Each question is scored from 0—2, with: 0 = not at all, 1 = partially; and 2 = to a large extent/completely. An overall score is calculated, with a maximum score of 8. These four criteria will be elaborated, reviewed and validated at inception phase of the project.

monitoring of biophysical, social and economic conditions in their local catchment areas, as well as to assess the level of climate vulnerability, risks and opportunities. Using the findings of these committees to ensure stakeholder buy-in, site-specific intervention plans will be developed which will account for current and future climate change risks and will integrate EbA measures.

The role of this committee supported by the national and regional technical project teams will be crucial for the evaluation of EbA positive impacts, the use of that information for the capacity building, awareness raising activities with community members and for the generation of information on the valuation of ecosystem services.

The table above summarizes some of the indicators that will be used to measure implementation and impact of the project in the 5 municipalities of the Choluteca basin. Specific baselines and targets will be defined during the first year of the project in consultation with local communities and the technical support team.

Moreover, the figure below illustrates the link between the climate rationale and the EbA potential. Considering the proposed EbA interventions and their expected impacts, a sample list of potential indicators is also provided to gauge the impact of each intervention. These indicators are only indicative and can variate, as they will be presented to the M&E committees in each municipality (established in sub-activity 1.1.1) for their review, further revision and final approval.



Annexes

1. Lists of participants of local consultations

Local consultation held on October 2019

Name	Institution	E-mail address
Luis Adalberto Mendoza	Municipality of Apacilagua	luismendoza1920@yahoo.es
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Ronal Arquímides Hernández	Municipality of Apacilagua Water Board of Apacilagua	
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2. EbA measure identified by MEbA programme according to main climate risks

	EbA intervention's characteristics

Up to 3 main climate risks addressed*	EbA measures		Climate change threats and impact addressed	Scale*	Average costs (1ha land)**	Timeframe for viewing results (years)***
Changes In Rainfall Patterns Extreme Heats	10	Fog catchers	Reduced water availability, drought	Collective	$875	1
Changes In Rainfall Patterns Extreme Heats	16	Firebreaks	Fire	Collective	$3,615	1
Changes In Rainfall Patterns Extreme Heats	30	Drip irrigation	drought, loss of productivity, reduced water availability	Individual	$3,730	1
Changes In Rainfall Patterns Extreme Heats Sudden Temperature Changes	7	Seed banks	drought, phenological changes, loss of productivity, reduced food security, increased pests	Collective	$1,177	3
Changes In Rainfall Patterns Extreme Heats Sudden Temperature Changes	12	Crop diversification	loss of productivity, need for greater inputs, increased pests, phenological changes, reduced food security, drought	Individual	$3,936	1
Extreme Heats Sudden Temperature Changes	5	Organic agriculture	loss of productivity, need for greater inputs, increased pests, phenological changes, erosion, drought	Individual	$3,383	3
Frost Intense Rainfall Hail	19	Greenhouses	crop damage, lost productivity, crop loss	Individual	$6,411	1
Frost Strong Wind Extreme Heats	8	Windbreaks	crop damage, erosion	Individual	$1,961	5
Frost Sudden Temperature Changes	36	Agricultural terraces	drought, landslides, erosion, flooding, crop loss	Collective	$1,902	1
Intense Rainfall	13	Drainage systems	crop damage, flooding	Individual and collective	$2,670	1
Intense Rainfall	15	Efficient biomass stoves	Need for greater inputs, droughts	Individual	$680	1

Intense Rainfall	24	Natural retaining walls	landslides, erosion, flooding.	Collective	$5,845	1
Intense Rainfall	27	Filter dams	slides, Erosion, Less water availability.	Collective	$3,830	1
Intense Rainfall Changes In Rainfall Patterns	40	Contour trenches	flooding, erosion, crop damage, drought	Individual	$2,460	1
Intense Rainfall Changes In Rainfall Patterns Extreme Heats	3	Conservation agriculture	increased pests, need for greater inputs, erosion, phenological changes, loss of productivity, droughts	Individual	$4,835	2
Intense Rainfall Changes In Rainfall Patterns Extreme Heats Hail	35	Natural shade	drought, loss of productivity, erosion, crop damage	Individual or collective	$2,730	3
Intense Rainfall Changes In Rainfall Patterns Extreme Heats Sudden Temperature Changes	18	Family orchards	Food safety, loss of productivity	Individual	$1,490	1
Intense Rainfall Changes In Rainfall Patterns Extreme Heats Sudden Temperature Changes	25	Permaculture	reduced food continuity, phenological changes, need for greater inputs, erosion, lower productivity, reduced water availability, drought,	Individual	$2,550	3
Intense Rainfall Changes In Rainfall Patterns Extreme Heats Sudden Temperature Changes	37	Infiltration pits	loss of productivity, reduced water availability, crop damage.	Individual and collective	$4,305	2
Intense Rainfall Changes In Rainfall Patterns Extreme Heats Sudden Temperature Changes	38	Mixed-plant nurseries	crop damage, lower productivity, crop loss, reduced food security, drought	Individual	$8,618	1
Intense Rainfall Changes In Rainfall Patterns Extreme Heats	39	Waru-waru	drought, crop damage, flooding, lost productivity, reduced food security, need	Collective	$17,513	1

Sudden Temperature Changes			for greater inputs, reduced water availability			
Intense Rainfall Changes In Rainfall Patterns Sudden Temperature Changes	1	Organic fertilizers	Loss of productivity, need for greater inputs, increased pests, erosion, drought	Individual and collective	$523	1
Intense Rainfall Changes In Rainfall Patterns Sudden Temperature Changes	4	Agroecology	need for greater inputs, erosion, phenological changes, loss of productivity, drought	Individual	$859	3
Intense Rainfall Sudden Temperature Changes	21	Sustainable forest management	Drought, increased pests, phenological changes, landslides, erosion, reduced water availability	Collective	$7,860	5
Intense Rainfall Sudden Temperature Changes	29	Soil restoration	erosion, landslides, drought, reduced water availability	Collective	$4,321	5
Intense Rainfall Sudden Temperature Changes	31	Crop rotation	loss of productivity, need for greater inputs, increased pests, droughts	Individual	$718	1
Strong Wind Intense Rainfall Changes In Rainfall Patterns Extreme Heats	32	Agrosilvopastoral systems	Loss of productivity, drought, need for greater inputs, less food security	Individual	$2,504	3
Strong Wind Intense Rainfall Changes In Rainfall Patterns Extreme Heats	33	Agroforestry systems	Loss of productivity, drought, need for greater inputs, less food security, erosion	Individual	$5,570	3
Strong Wind Intense Rainfall Changes In Rainfall Patterns Extreme Heats	34	Silvopastoral systems	Loss of productivity, drought, need for greater inputs, less food security	Individual	$983	3
Sudden Temperature Changes	20	Vermicompost	need for greater inputs, Loss of Productiveness, Increased Pests, Drought	Collective	$2,874	1

Sudden Temperature Changes Hail	17	Solar hydroponics	Reduced food security, Drought, Reduced water availability, loss of productivity	Individual	$2,261	1
Intense Rainfall Changes In Rainfall Patterns	2	Soil conditioning	Loss of productivity, need for greater inputs	Individual	$1,289	1
Changes In Rainfall Patterns Extreme Heats	11	Solar dehydrators	loss of productivity, phenological changes, less food security	Individual	$857	1
Changes In Rainfall Patterns Extreme Heats	23	Integrated pest management	Increased pests	Individual	$4,112	1
Decreased water availability	28	Rainwater reservoirs	Drought, reduced water availability, crop loss	Individual and collective	$5,058	1

* Suitable scale of implementation

** these are estimated prices based on MEbA analysis and the programme will validate during inception

*** estimated timelines based on MEbA experience

3. Compilation of adaptation solutions for each municipality and ecosystem

Information regarding ecosystems and main agroecosystems in targeted Honduran municipalities, as well as selected adaptation solutions to address threats to these systems

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
Choluteca	Mangroves	Fishing / Shrimp Industry	Water regulation, coast protection	Burning / fire / logging, shrimp industry	Drought, non-sustainable extractive industry	• Restoration of coverage in aquifer areas • Ecotourism services • Sustainable management in the shrimp industry
	Shrimp farming (small producers)	Shrimp industry	Water regulation, coast protection	Burning / fire / logging, shrimp industry	Drought, non-sustainable extractive industry	• Restoration of coverage in aquifer areas • Ecotourism services • Sustainable management in the shrimp industry
	Salt production (small producers)	Salt Industry	Water regulation, coast protection	Burning / fire / logging, shrimp industry	Drought, non-sustainable extractive industry	• Restoration of coverage in aquifer areas • Ecotourism services • Sustainable management in the salt industry
	Production of basic grains for self-consumption corn and beans	Self-consumption, mainly	Water regulation, erosion regulation, protection of Creole seeds (biodiversity)	Burns / fires, forest losses, landslides, crop losses	Drought, advance of the agricultural frontier, sowing on hillsides, unsustainable soil management	• Water reservoirs • Rainwater collection and storage • Soil amendments • Live barriers • Seed banks • Drip irrigation • Trees in basic grain systems
		Meat production	Preparation of dairy products to diversify the diet	Desertification	Soil degradation, drought	• Rotation of pastures • Water reservoirs • Rainwater collection

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Cane cultivation	Sugar production	Source of income, Generation of income	Desertification, fires, pollution	Drought, burning during the harvest, competition for well water to population consumption	• Adoption of sustainable practices for cane production • Water reservoirs • Rainwater harvesting
	High value crops	Okra production for export	Source of income, Generation of income			
	Broadleaved forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Coniferous forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
						for the sustainable production of forest and non-timber products
	Mixed forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Shrimp farming (small producers)	Shrimp industry	Water regulation, coast protection	Burning / fire / logging, shrimp industry	Drought, non-sustainable extractive industry	• Restoration of coverage in aquifer areas • Ecotourism services • Sustainable management in the shrimp industry
	Salt production (small producers)	Salt Industry	Water regulation, coast protection	Burning / fire / logging, shrimp industry	Drought, non-sustainable extractive industry	• Restoration of coverage in aquifer areas • Ecotourism services • Sustainable management in the shrimp industry
Apacilagua	Production of basic grains for self-consumptio	Self-consumption, mainly	Water regulation, erosion regulation, protection	Burns / fires, forest losses, landslides,	Drought, advance of the agricultural frontier, sowing on	• Water reservoirs • Rainwater collection and storage • Soil amendments • Live barriers • Seed banks

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	n corn and beans		of Creole seeds (biodiversity)	crop losses	hillsides, unsustainable soil management	• Drip irrigation • Trees in basic grain systems
	Cattle raising	Milk production	High biological value protein	Lack of grasses	Overgrazing	• Agrosilvopastoral systems
		Meat production	Preparation of dairy products to diversify the diet	Desertification	Soil degradation, drought	• Rotation of pastures • Water reservoirs • Rainwater collection
	High value crops	Vegetable cultivation (onion, sweet pepper, tomato)	Generation of jobs vacancies and income	Soil erosion, pollution	Drought, excessive use of agrochemicals, which pollutes water and affects people's health	• Proper management of agrochemicals • Water reservoirs • Rainwater collection.
	Dry tropical forest (mixed conifers and broadleaved)	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Broadleaved forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Coniferous forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
Marcovia	Production of basic grains for self-consumption corn and beans	Self-consumption, mainly	Water regulation, erosion regulation, protection of Creole seeds (biodiversity)	Burns / fires, forest losses, landslides, crop losses	Drought, advance of the agricultural frontier, sowing on hillsides, unsustainable soil management	• Water reservoirs • Rainwater collection and storage • Soil amendments • Live barriers • Seed banks • Drip irrigation • Trees in basic grain systems

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Mangroves	Fishing / Shrimp Industry	Water regulation, coast protection	Burns / fires, shrimp industry	Drought, non-sustainable extractive industry	• Restoration of coverage in aquifer areas • Ecotourism services • Sustainable management in the shrimp industry
	Cattle raising	Milk production	High biological value protein	Lack of grasses	Overgrazing	• Agrosilvopastoral systems
		Meat production	Preparation of dairy products to diversify the diet	Desertification	Soil degradation, drought	• Rotation of pastures • Water reservoirs • Rainwater harvesting
	Coniferous forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Broadleaved forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
						• Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Mixed forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
Orocuina	Production of basic grains for self-consumption corn and beans	Self-consumption, mainly	Water regulation, erosion regulation, protection of Creole seeds (biodiversity)	Burns / fires, forest losses, landslides, crop losses	Drought, advance of the agricultural frontier, sowing on hillsides, unsustainable soil management	• Water reservoirs • Rainwater collection and storage • Soil amendments • Live barriers • Seed banks • Drip irrigation • Trees in basic grain systems
	Monocultures of high commercial value	Crops such as okra, watermelon, melon and lemon for export	income generation	Monocultures, competition for water, water pollution for human consumption, loss of biodiversity, loss of	Drought, excessive use of agrochemicals, which pollutes water, affects people's health, cutting down	• Proper management of agrochemicals, • Water reservoirs • Rainwater harvesting.

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
				forest cover, soil erosion	forests to expand the crop.	
	Cattle raising	Milk production	High biological value protein	Lack of grasses	Overgrazing	• Agrosilvopastoral systems
		Meat production	Preparation of dairy products to diversify the diet	Desertification	Soil degradation, drought	• Rotation of pastures • Water reservoirs • Rainwater collection
	Coniferous forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Broadleaved forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
						• Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Mixed forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
Morolica	Production of basic grains for self-consumption corn and beans	Self-consumption, mainly	Water regulation, erosion regulation, protection of Creole seeds (biodiversity)	Burns / fires, forest losses, landslides, crop losses	Drought, advance of the agricultural frontier, sowing on hillsides, unsustainable soil management	• Water reservoirs • Rainwater collection and storage • Soil amendments • Live barriers • Seed banks • Drip irrigation • Trees in basic grain systems • Environmental education
	Cattle raising	Milk production	High biological value protein	Lack of grasses	Overgrazing	• Agrosilvopastoral systems
		Meat production	Preparation of dairy products to	Desertification	Soil degradation, drought	• Rotation of pastures • Water reservoirs • Rainwater collection

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
			diversify the diet			
	Coniferous forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest product • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Broadleaved forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Mixed forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
						harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
Duyure	Production of basic grains for self-consumption corn and beans	Self-consumption, mainly	Water regulation, erosion regulation, protection of Creole seeds (biodiversity)	Burns / fires, forest losses, landslides, crop losses	Drought, advance of the agricultural frontier, sowing on hillsides, unsustainable soil management	• Water reservoirs • Rainwater collection and storage • Soil amendments • Live barriers • Seed banks • Drip irrigation • Trees in basic grain systems • Environmental education
	Cattle raising	Milk production	High biological value protein	Lack of grasses	Overgrazing	• Agrosilvopastoral systems
		Meat production	Preparation of dairy products to diversify the diet	Desertification	Soil degradation, drought	• Rotation of pastures • Water reservoirs • Rainwater collection
	Coniferous forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products

Municipality	Ecosystems and main agroecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Broadleaved forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products
	Mixed forest	Firewood, housing construction, fence posts	Water and erosion regulation, Biodiversity	Deforestation and forest degradation, loss of biodiversity	On exploitation, demand for firewood, burning, expansion of basic grain crops or high value crops	• Restoration of forest cover • Restoration of forests through enrichment • Management of forest fires • Establishment of plantations of species that provide firewood • Establishment of forest plantations for sustainable harvest and non-timber forest products • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products