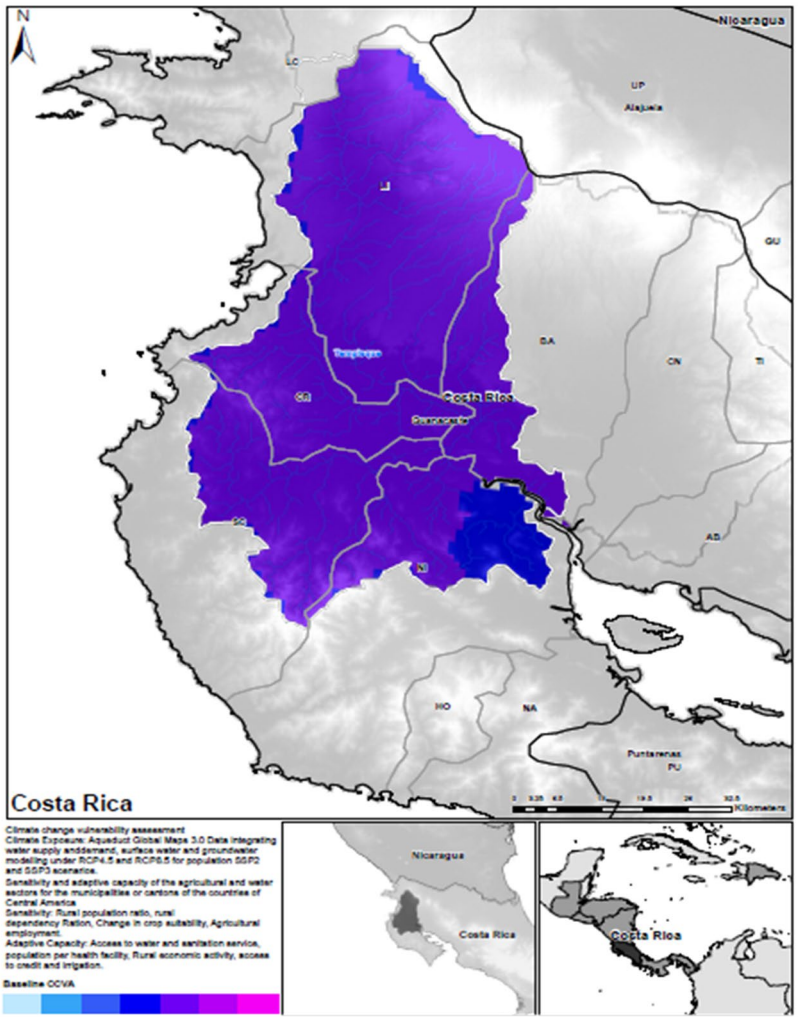


LOCAL EbA STRATEGY FOR THE TEMPISQUE BASIN

COSTA RICA

April 2021

Table of contents

Contents

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 focusing on designing site-specific intervention plans 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 a climate risk assessment framework to identify 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 Tempisque basin (selected basin in Costa Rica) 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.

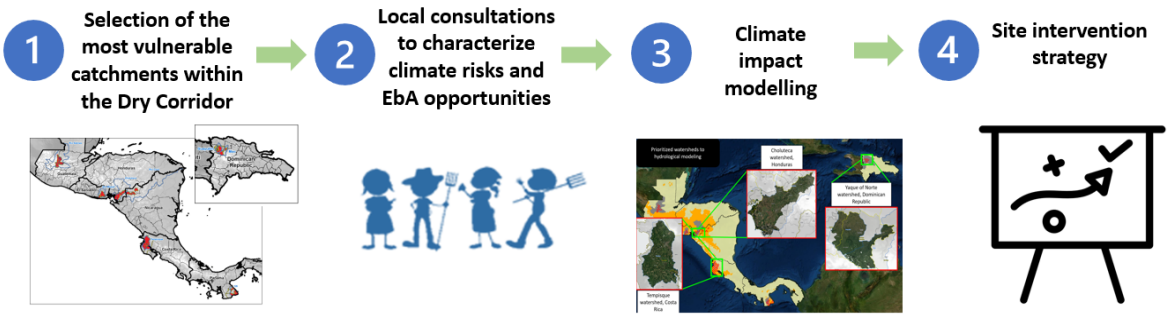


Figure 1. Steps for the elaboration of site-specific intervention plan

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 Costa Rica: 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 Tempisque 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 Tempisque 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 site context and needs (institutional, information, cultural, social, technical) and to ensure proper engagement 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 Costa Rica, its ministry of Environment and Energy prioritized four catchment areas of interest in the Dry Corridor region: Tempisque, Bebedero, Abangares and Peninsular, in its Pacific coast.

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

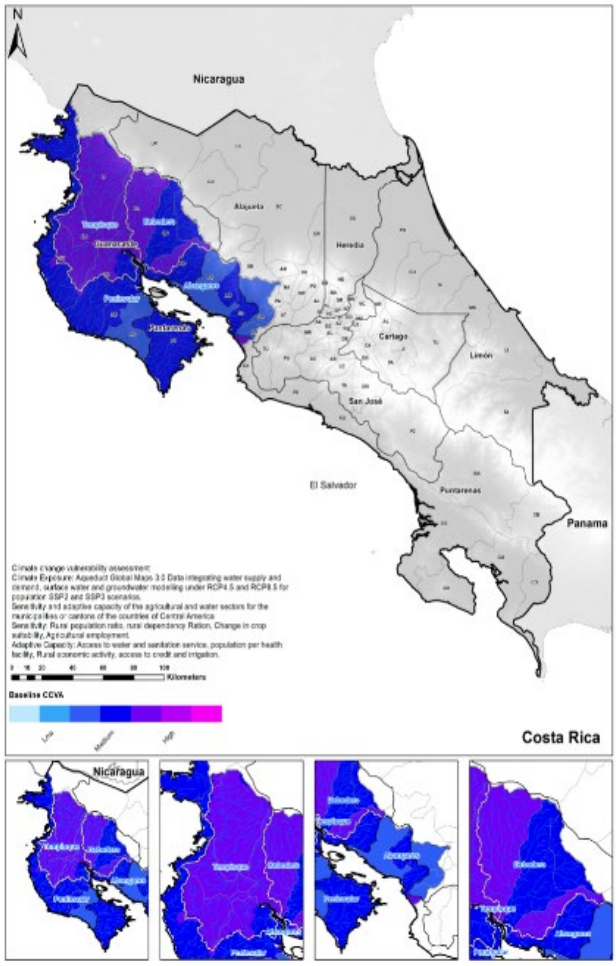


Figure 2. Climate change vulnerability assessment for four prioritized catchment areas in Costa Rica

.

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 Costa Rica, based on the assessment results, the country prioritized the Tempisque catchment area and within it, five *cantones*[1]: Liberia, Nicoya, Santa Cruz, Bagaces and Carrillo, all located in Guanacaste province.

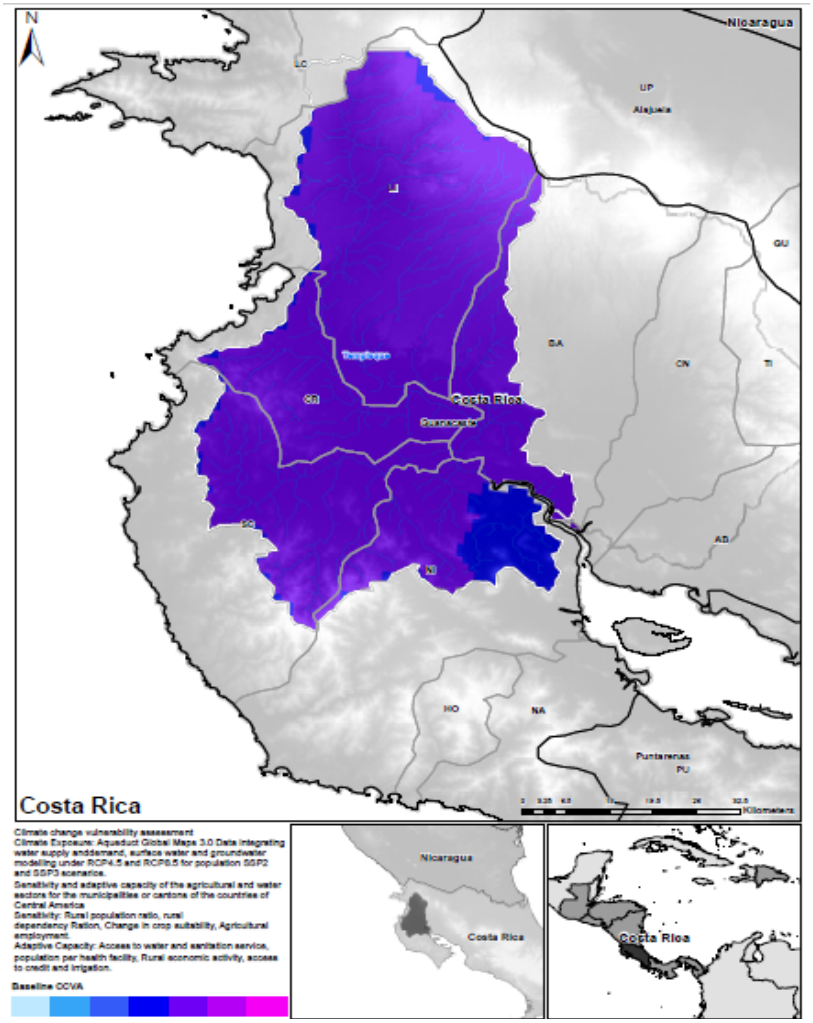


Figure 3. Municipalities selected within Tempisque basin

The result of the climate change vulnerability assessment showed the Tempisque watershed was one of the most vulnerable areas to climate change in Costa Rica. The watershed is particularly exposed to climate change due to a high seasonal variability in precipitation. It is also one of the regions with the highest level of water stress in the country, of which the populations of Nicoya and Santa Cruz suffer the most within that catchment. Nicoya, Bagaces and Carrillo municipalities also have relatively little rural economic activity, limiting their adaptive capacity. Compared to the rest of the region, communities in the Tempisque watershed are particularly exposed to climate change but have relatively low sensitivity and high adaptive capacity.

[1] Second level subnational entities, after the provincial level, in Costa Rican administrative territorial organization.

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 Nicoya, Guanacaste, in October 2019.

Important aspects to consider were:

1. the concerns participants had regarding relatively successful project experiences in the area;
2. historical land-use transitions mainly with extensive livestock and its impact on deforestation, riverbed sedimentation, wetland damage among others;
3. the effects of annual melon and watermelon monocultures among others, in addition to cane production that have direct impacts on ecosystems.

The workshop drew on the experience, knowledge and local vision of many people committed to adaptation efforts in a part of Costa Rica's dry corridor and at the same time comes to determine that coordination interinstitutional and other similar projects are essential to avoid repeated actions in a relatively small region but with diverse ecosystems and needs.

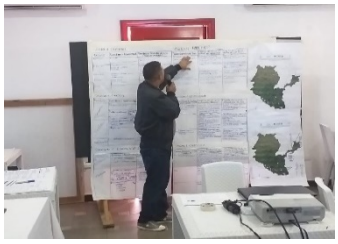




Figure 4. Pictures of local consultations

4.1 Step 2.1 Assessment on territory and identification of key actors

Guanacaste province's location and description

The Tempisque catchment is located in the north-western Guanacaste province of Costa Rica, close to the border to Nicaragua. It covers around 5,405km^2 encompassing tropical ecosystems of great diversity. The catchment is part of the Central American dry corridor and is highly vulnerable to droughts. It's one of the biggest catchments, covering a tenth of the Costa Rican territory[2].

[2] Monge-Najera, J; Gómez Figueroa, P. 2007. Tempisque: Una cuenca de alta diversidad ecológica en el noroeste de Costa Rica. Revista Biocenosis Vol 20(1-2).

Land use

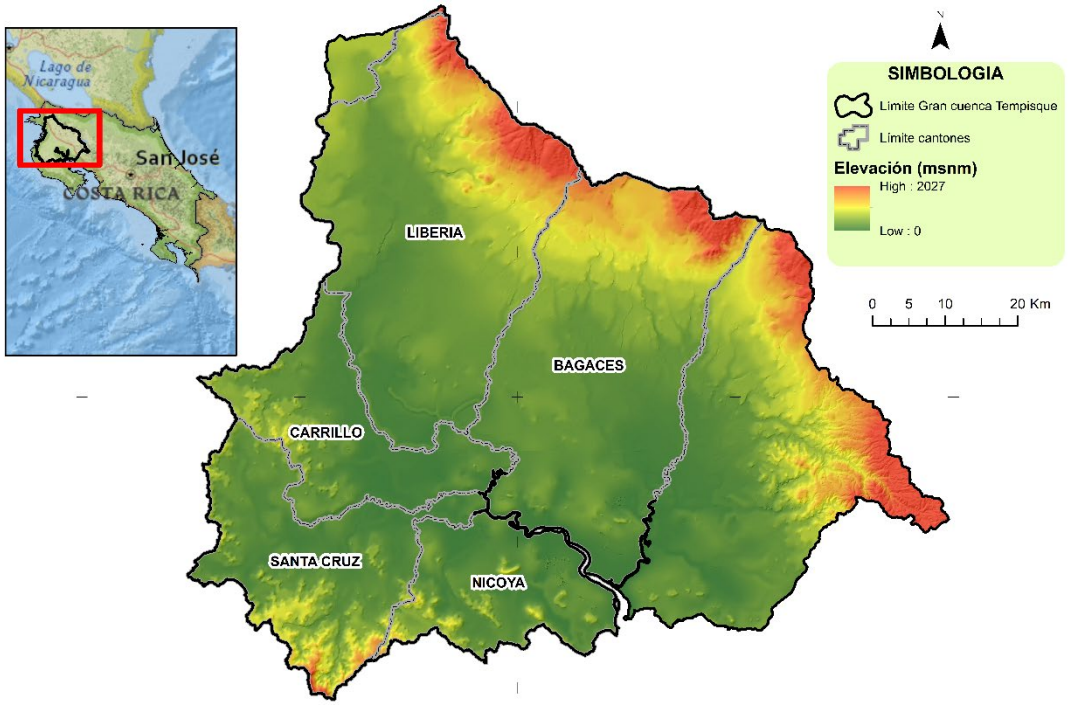


Figure 5. Prioritized cantones within the targeted watershed

As reflected in the map below, the agricultural and pasture cover in the basin make up to 50% of the land cover in the basin, the other 50% are different types of forests including primary forest, secondary forest, deciduous forest and forest plantations (Table 1, Figure 7)

This composition provides an indication into the economic activities in the basin and the range of stakeholders the programme will need to work with to ensure transformational change in land use planning and land use transformation processes. While forest conservation and restauration are appropriate EbA interventions, other economic activities are important to this basin and need to be considered in the range of adaptation strategies adopted considering their impact in the use of water and transformation of land use

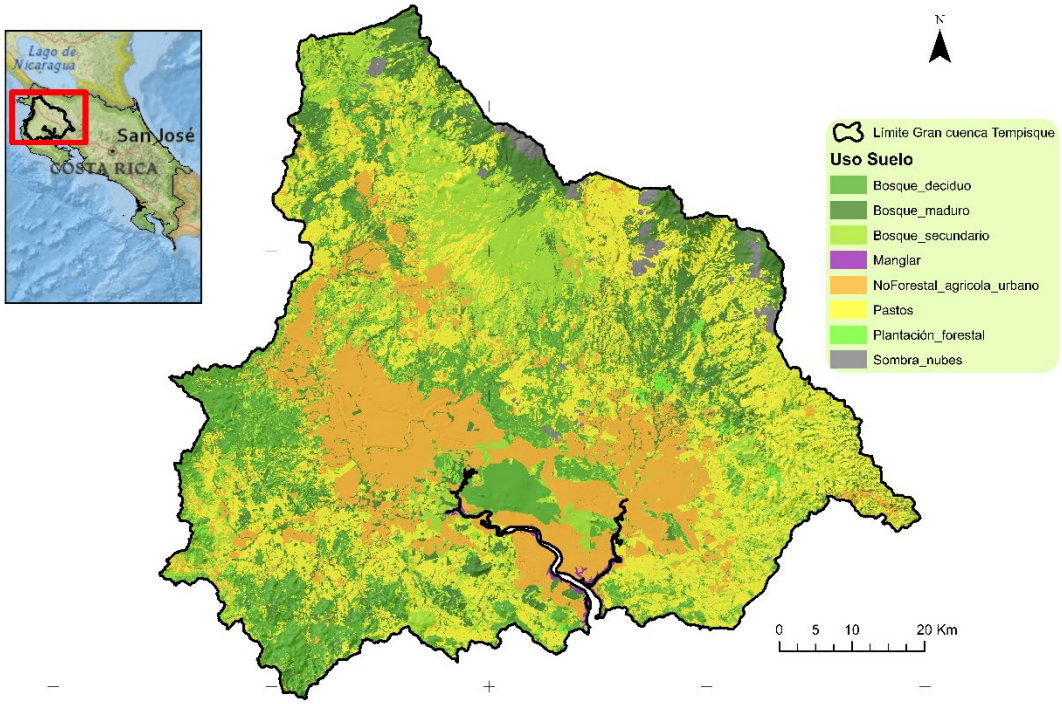


Figure 6. Land use in the Rio Tempisque basin - Costa Rica

Land use Tempisque	Area (ha)	% Area
Pastures	162062,76	29,80
Agriculture	108169,36	19,89
Mature Forest	77974,62	14,34
Deciduous forest	83726,77	15,39
Secondary forest	99334,15	18,26
Mangrove	1710,61	0,31
Forest Plantation	2876,03	0,53
TOTAL AREA	**543903,00**	**98,52**

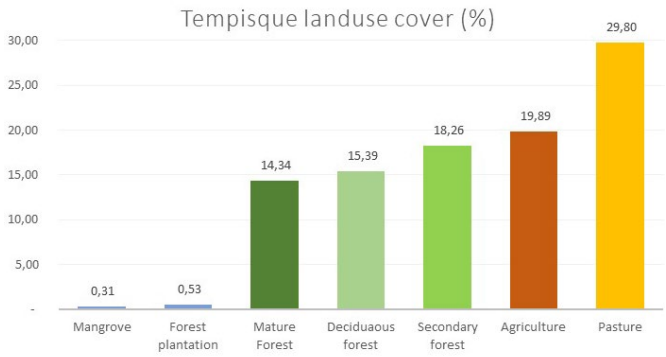


Table 1. Land use distribution in the Rio Tempisque basin - Costa Rica
Note: shade and cloud areas not included

Demographics

The main population centers are concentrated in the cities within Santa Cruz, Nicoya and Liberia's *cantones.* The 3 municipalities of Santa Cruz, Nicoya and Liberia represent almost 78% of the total population of the 5 municipalities under study. The most dispersed population is located in the canton of Carrillo. The following chart shows basic demographic information for the five selected municipalities:

Table 2. Basic information for the selected municipalities

Country	Catchment	Province	Canton	Total Population	Rural Population	Spatial extension (km^2)
Costa Rica	Tempisque	Guanacaste	Liberia	62,987	11,351	1,443.64
			Nicoya	50,825	28,426	1,325.57
			Santa Cruz	55,104	28,621	1,319.65
			Bagaces	19,536	10,416	1,272.08
			Carrillo	37,122	13,983	599.06

Indigenous communities

According to the National Commission on Indigenous Affairs (CONAI), the indigenous community Chorotega, mainly located in the territory of Matambú within the Guanacaste province, partially reside in the municipalities of Nicoya (of interest to this project) and of Hojancha[3].

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[4]
- Strategy for a sustainable agriculture adapted to climate change for the SICA region (2018-2030)[5]

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

- The Payment for Environmental Services (PSA for its Spanish acronym) was institutionalized by the 1996 Forest Policy.
- The 2009 National Climate Change Strategy, (ENCC for its Spanish acronym) is a government instrument that seeks to reduce the social, environmental and economic impacts of climate change, promoting sustainable development through economic growth, social progress and environmental protection through mitigation initiatives and actions of adaptation.
- The National Forest Development Plan (2011–2020, currently being renewed) guides forest development and includes forest land management; sustainability of forestry activity;

[3] http://www.conai.go.cr/nosotros.html
[4] http://www.siagua.org/sites/default/files/documentos/documentos/recursos_hidricos_centroamerica.pdf
[5] http://www.cac.int/sites/default/files/Estrategia%20ASAC%20-%20CAC.pdf

institutional coordination, efficiency and effectiveness; innovation and sustainability of financing; and climate change, mitigation and adaptation among others.

- The 2018 Climate Change Adaptation Policy has 3 specific objectives: to i) strengthen adaptive capacities and resilience conditions; ii) reduce the present and future vulnerability of human and natural systems. Moderate material damage and avoid human and livestock losses; and iii) take advantage of the opportunities presented by the adaptation.
- Costa Rica is also developing a National Adaption Plan through a GCF funded Readiness initiative, aiming at strengthening the country's capacity to integrate adaptation into regional and municipal planning, including the participation of government entities, the private sector and civil society. The project has a local-level component, focusing on the institutional capacity for effective integration of adaptation strategies in 20 cantons with different types of vulnerability and elaborating risk assessments and tools for prioritizing adaptation needs at territorial level in 62 additional cantons. Although the process is still at an early-stage, exchanges with the coordination team were conducted during the site-specific intervention plan development, and some of their results were cross-matched with the hydrological modelling (see section "35Cross-referenced information from the National Adaption Planning process").

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

- The 2017-2021 Territorial Rural Development Plan for Nandayure-Hojancha-Nicoya[6]
- The 2018 – 2030 Comprehensive Water Supply Plan for Guanacaste (PIAG)[7]
- The Human Development Plans[8]
- Management plans in Protected Wild Areas (ASP for its acronym in Spanish) and Farms
- The Local Management Plan for the Palo Verde Ramsar Site - Tempisque Sector (period 2018-2022)[9]
- The Regional Development Plan 2014-2030 for the Chorotega Region, that prioritizes problems of poverty and unemployment, aiming at an increase in production, productivity and regional competitiveness, capital investment for the agricultural and technological industry. On the issue of water resources, the need to improve the management of water resources is recognized both for populations and for private companies and the agricultural sector.

Finally, there are additional regulatory frameworks that the consulted bodies proposed to take into account during project implementation, mainly the Public Education curriculum and Education Plans, the agro-environmental agenda and the municipal supported initiatives.

Key actors - National level

Different public institutions must be involved in the process, considering most of them have a local office or representation in the target area. The main national actors would be: the Ministry of Planning; the National Directorate for Community Development (DINADECO); the Rural Development Institution (INDER); the National Service of Groundwater, Irrigation and Drainage

[6] https://www.inder.go.cr/nahoni/PDRT-Nandayure-Hojancha-Nicoya.pdf

[7] http://www.da.go.cr/wp-content/uploads/2018/04/Informe-Final_PIAAG-Version-Ditigal-Abril-2018.pdf

[8] https://www.municarrillo.go.cr/images/2017/files/planificacion/plan_de_desarrollo_humano_local_del_canton_carrillo.pdf
http://www.undp.org/content/dam/costa_rica/docs/undp_cr_santacruzpdhl_2014.pdf

[9] https://enbcr.go.cr/sites/default/files/pgl_tempisque_02oct2017_0.pdf

(SENARA); the Costa Rican Institute of Aqueducts and Sewers (AYA); the Meteorological Institute (IMN); the National Emergency Commission (CNE), and the Ministry of Public Education.

The **Ministry of Environment and Energy** (MINAE) is a key stakeholder, among which several bodies must be included, such as:

- The Climate Change Department (DCC)
- National System of Conservation Areas (SINAC)
- National Center for Geo-environmental Information (CENIGA for its Spanish Acronym).

For the **agriculture sector**, besides the Ministry of Agriculture and Livestock (MAG), the Costa Rican Institute of Fisheries and Aquaculture (Incopesca), the Integral Agricultural Marketing Program (PIMA) and the National Production Council (CNP) are important players.

Other institutions were also named during the consultation for **capacity building activities and climate change information:** universities (including the Mesoamerican Center for Sustainable Development of the Dry Tropics – CEMEDE), research centres (Organization for Tropical studies - OET), the National Land and Ecosystem Cover and Use Monitoring System (SIMOCUTE), the local organizations and academia.

Key actors - Local level

During the consultations, participants enumerated a series of **local bodies** that should be involved in the process, in particular:

- The Community Water Boards (Associations administering the communal aqueduct and sewer systems - ASADAS)
- The Cantonal Council for Interinstitutional Coordination (CCCI)
- Local Biological Corridor Council
- Local Conservation Councils
- Territorial Councils for Rural Development
- The Environmental Commissions (named for Santa Cruz)

Civil society organizations must also be involved through their various representations in the municipalities of Liberia, Santa Cruz, Carrillo, Nicoya and Bagaces. The NGO Global Conservation Standard was particularly named during the consultation workshop, as it had several projects in the target area, providing continued support to the Karen Mogensen private forest reserve and the restoration of mangroves in the community of Jicarál, in the Gulf of Nicoya, the delta of the Tempisque river. The Guanacaste Women Agenda was also highlighted as a key women organization in the area, complementing the Gulf of Nicoya Women's Federation that operates mainly in Nicoya's municipality.

Other organizations operating in the target area are considered, such as the Foundation for the balance between Conservation and Development (FUNDECODES); MELTCON; FUNDECOOPERACION; Guanacaste Dry Forest Conservation Fund; the Guardians of Nature and the Chorotega Agroforestry Association (UNFAOR – Chorotega).

Additionally, **producer organizations** were assessed with the intention of identifying public-private partnerships too. General entities were named, such as farmers' chambers and cooperatives, Cantonal Agricultural Centers, and Tourism Cooperatives for the private sector.

In addition to the national and regional actors named above, specific actors were considered for each municipality for the agriculture sector, as listed below.

Table 3. Main agricultural enterprises in the 5 targeted municipalities

	Liberia	Nicoya	Santa Cruz	Bagaces, C.	Carrillo
Main agricultural enterprises	Grupo san Jerónimo (agriculture); Novelteak Ltda. (timber marketing); CATSA (agriculture)	Pura Vida Melons (Melons production)	Centro Agrícola Guanagro (agriculture)	Hacienda Ciruelas; Grupo Pelón S.A. (rice manufacturing)	Ingenio El Viejo (sugar manufacturing)

Concerning **the financial institutions**, the main named actors are Bancomunales, Guanacaste Community Fund and the National Insurance System for crop insurance (INS). Another important scheme to consider is the National Forest Financing Fund (FONAFIFO), that was standardized by the National Forest Act to facilitate the development of Payment for Ecosystem Services' initiatives and projects.

Main livelihoods

Among the 5 selected municipalities, the percentage of the population dependent on agriculture varies from 8.4% (in Liberia) to 29.2% (in Bagaces), largely due to the degree of economic and urban development. The main agriculture productive activities in the target area is rice, cotton, sugar cane, corn, sorgo, beans, vegetables, coffee and fruits, melon, beekeeping, as well as livestock for meat and milk. All municipalities but Liberia also report on the collection of bivalve molluscs, crustaceans, polychaetes and mangrove fishing as a key economic livelihood. See annex 2 for the detailed ecosystems per municipality and its main related economic activity.

Besides the agriculture related livelihoods, it's important to take into account that the informal economy is common in the Chorotega Region, largely due to immigration from Nicaragua, which, in most cases, does not have regulated immigration status, resorting to informality to cover their own expenses. This translates into informal temporary work, including street sales and seasonal agricultural work for instance.

It is important to point out that part of this situation has been diminishing with the tourism industry, which has contributed to the generation of jobs that allowed a certain number of people to access the formal market. Also, the *Chorotega Market initiative* raises the generation of new jobs to prevent informal economic activities; however, it is still necessary to wait for substantive results.

Main available financial mechanisms

According to an initial financial assessment, for Costa Rica, overall availability of main lending products and relevant financial services (such as insurance) is ranked from good to excellent, providing sufficient basis for the introduction of EbA finance with present IFIs.

22 financial institutions were identified for the selected area, that offer a full range of financial services and products, with loan products at interest rates of a maximum of 36% and an estimated average for the target end beneficiary segment of 25%. Maximum maturity is up to 120 months and grace periods of up to 24 months.

The table below provides an of overview of main financial services' coverage in the 5 selected municipalities and 2 surrounding municipalities.

Table 4. Main financial services in the 5 targeted municipalities

Municipality	Banks	Cooperatives	Other	Products and services offered (summary)
Bagaces	2	0	0	Mainly credit
Cañas (serving populations from Bagaces)	3	5	1	Full range of financial products and services
Carrillo	5	1	0	Full range of financial products and services
Hojancha (serving populations from Nicoya)	1	1	0	Mainly credit
Liberia	9	8	4	Full range of financial products and services
Nicoya	2	6	3	Full range of financial products and services
Santa Cruz	5	5	2	Full range of financial products and services

During consultations, the financial mechanism that was most mentioned were "The Banks", a mechanism of funds managed directly by local groups for community development projects. On another hand, the participants showed some lack of trust in the financing mechanisms and portfolios of traditional banks.

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

Consultative process with communities

The following tables reflects the concerns of governmental employees from public institutions such as MINAE, SENARA, Ministry of Planning, as well as civil society represented by various groups from the municipalities of Liberia, Santa Cruz, Carrillo, Nicoya and Bagaces that participated in the consultation process to provide feedback and elements from a more territorial perspective. The list of participants can be found in Annex 1, and Annex 2 provides a more complete analysis of the main climate risk in each city and for each ecosystem.

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

Table 5. Perceived changes in the climate, disaggregated by sex

Variable	Men's perception	Women's perception
Changes in precipitation (intensity, frequency)	Longer dry periods Heavy rains in shorter periods and territorially located Irregular distribution of rains	Uncertainty of rains, floods, heaviest rains, irregular rains (day and year)
Changes in temperature	In dry season there is an increase in temperature and in longer periods Variation in temperature gradients	More heat (started 1982), drought (1997, 1998, 2015)
How long have these changes been observed?	A first group indicated that they were more frequent since 15 years, while another indicated since the 1970s and 1980s.	
Are climate events mentioned? Eg. El Niño	If they are mentioned associated with decreases of production in crops (bean, corn) and others such as watermelons and melons. Temperature increase Irregular rainfall distribution Decreased aquifers Headwater drought	Soil loss (this loss affects soil and wetland quality)
Other climate changes mentioned	Sudden tidal changes: increased coastlines that alter mollusc populations in wetlands	Fires

Table 6. Perceived uses of ecosystems and agro-ecosystems and perceived impacts

Ecosystem /agro-ecosystem	Perceived benefits and uses	Perceived impacts
Dry forest	Habitat, biodiversity, carbon capture, culturally seasoned fruits, tourism, timber, bee habitat (dispersers and pollinators), water supply and regulation (water bodies), firewood.	Flowering changes for some plants Moving snakes and bees to more protected areas Systematic death of forest species such as oak Effects on nesting of some birds (out of season) Reduction cloudy days
Gallery Forest	---	Decreased river flow Alteration in size and quantity of molluscs in rivers (Tempisque) Effects on nesting of some birds (out of season) Reduction cloudy days
Mangroves	---	Sedimentation (associated with deforestation) Reef disappearance Effects on nesting of some birds (out of season) Reduction cloudy days

Wetlands	Food (clams), fishing, tourism, habitat (birds), species recovery, carbon capture, agricultural production, recreation (mental health), research area (Jabirú).	Loss of biodiversity and ecosystem services Effects on nesting of some birds (out of season) Reduction cloudy days
Pastures	Dairy, economic income, cultural services (tradition, bulls), tourism, meat, food security, silvopastoral shadow.	Effects on nesting of some birds (out of season) Reduction cloudy days
Wet forest	---	Increased presence of birds in non-common ecosystems (crows)
Wooded Potreros	---	Affects pollinators, Forest and agricultural crops, Over exploitation of land and marine resources
Annual and permanent crops	Beans and corn: Food, tourism (economic income by blue zones), cultural rescue, soil conservation, agrobiodiversity, other crops of the environment (creole cucumber, legumes).	More water pressure and soil, Proliferation pests/disease
Pre-montane wet forest	---	Droughts affect crops (coffee, orange) and milk production, Species migration, More impact pressure of use
Dry And Deciduous Forest	---	Degradation of forests and ecosystems, Soil loss and water resource, Biodiversity loss

Table 7. Perceived impacts on the population disaggregated by sex

Variable	Men's perceived impacts in their lives*	Women's perceived impacts in their lives
Impacts on household tasks	Security, economic income, family integration, less employment	Decrease in the water makes household chores difficult. Drought water cuts add more work to women (water collection). At extreme events there is no food/water for children. The role of women in the home is reintensified.
Impacts on agricultural /labour work	Agricultural production impacts that mean more time in the field Increased forest fires Decreased water for irrigation New generations have no agricultural culture, dispatch farmers for land purchase, high pressure of land, temporary displacement of labor, high impact small producer	Less possibility of selling typical products that sell/cook women (tamales and tanelas). More work in floods (pulling cattle). More work on building lost infrastructure (fences and corral).
Economic impacts	Higher economic costs to serve crops and animals Need for more capital or more investment, less employment	Economic loss for the family. They lower household income from corn and bean sales. Less shifts, less revenue. Losses for women clams and fishermen of livestock production (less income).
Health impacts	Health effects mean more attention to families and higher economic spending Increased kidney disease due to water contamination (low flow in wells) Health, food safety	Change in diet for lack of dairy and protein. Need to replace food (dairy). Hunger (food security violated). Change in diet because of crop uncertainty. Diseases at home (stilts), intensified role of care of women (mites, viruses), skin diseases.

Other impacts	Slight changes can be seen in moving people to cooler areas Visitation changes in tourism. In dry times they stop visiting Nicoya and go more to the rivers of Bagaces for example Greater conflicts between humans and wildlife are seen over the movement of animals in search of water and food. Access to credit, decision-making, more risk, loss or weakening of producer infrastructure, use/legal framework limitations, cultural practice hunting affectation, expanding forest coverage with limitation of use, loss of roots	Heat causes fatigue for work away from home. It is necessary to replace foods that were previously produced well.

Progress on the National Adaption Planning process

Costa Rica is currently implementing the GCF Readiness Preparatory Support Programme "*Building sub-national capacities for the implementation of the National Adaptation Plan in Costa Rica*". As part of its output 1.1, "Current planning and climate information is assessed to facilitate the identification of adaptation options at the regional level.", a collection and synthesis of climate data was made, using official reports and data provided by the National Meteorological Institute, including future climate scenarios for temperature and precipitation, geographic analysis of losses and damages, and historical information of extreme climate events.

The synthetisation of climate information for each region included the elaboration of a map for the Chorotega region, to illustrate future climate scenarios for temperature and precipitation (using CORDEX and PRECIS models). Hazards from flooding and rising sea levels are illustrated in Figure 3, showing important risks of flooding in all five prioritized cantones. Figure 2 on another hand, was elaborated with geospatial analysis of historical economic losses and damages due to extreme climate events for the period 1988-2018. Among the 5 prioritized cantones of this programme, 4 of them account for the highest level of economic loss, between $ 450 to 6,253 million of Colones (74 thousand to 10.24 million USD in current exchange rates).

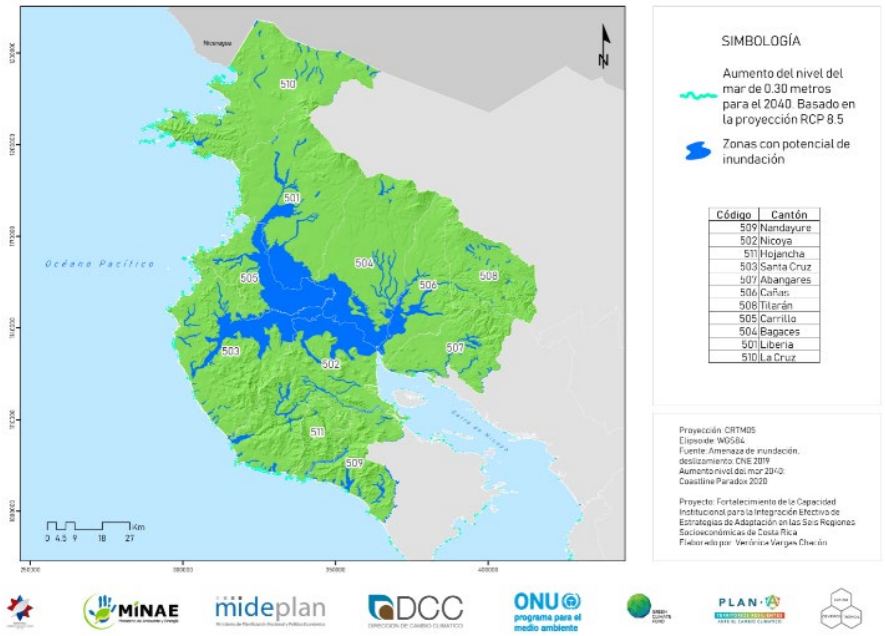


Figure 7. Threat by flooding and SLR (Sea-Level Rise) on an 8.5 RCP scenario in the Chorotega Region.[10]

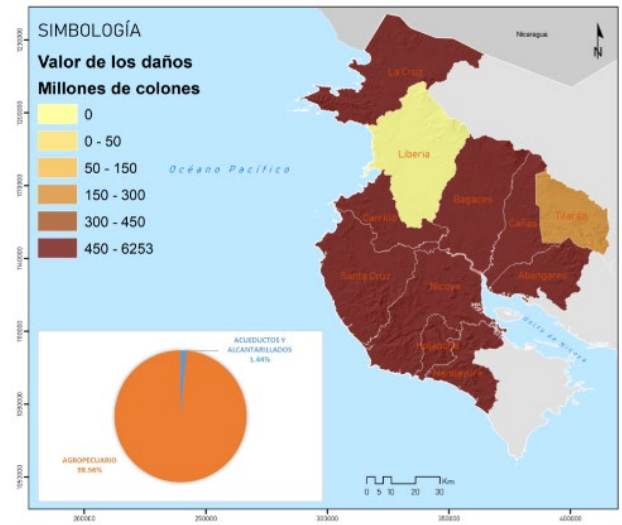


Figure 8. Economic value of impact by droughts from meteorological events derived from threats declared as national emergencies in the Chorotega region (1988-2018).[11]

This consultative process with the NAP coordination team led to identifying additional findings that corroborated the concerns participants had expressed during the community consultative workshops. While these results are produced at a broader scale (regional instead of cantonal), they are aligned with the needs identified and EbA solutions proposed. Additional exchanges with the NAP will allow to further mainstream EbA in policy frameworks.

[10] Source: IPR NAP Costa Rica, Feb 2021
[11] Source: IPR NAP Costa Rica, Feb 2021

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 adaptation solutions

Proposed adaptation measure	Justification (impact of climate change that the measure seeks to address)	Impacts of measurement on ecosystems/agro-ecosystems	Impacts of measurement on the lives of men and women
Water harvest	A relatively low-cost measure that already has low-scale experience	Increased water availability in vulnerable communities Decreased flow rates	Access to drinking water and irrigation. Improved quality of life Simplified household work Less time-sharing stress, Household economic benefits (decreased water receipt)
Reforestation	The country experience of the model of payment for environmental services and producer organizations in the territory is taken advantage of.	Improvement of biological runners Increased biodiversity Decreased sedimentation in rivers and wetlands	Economic opportunities for plantation work
Restoring the landscape	Guanacaste has extensive experience in catering from paddocks to secondary forest and taking advantage of the national restoration plan	Improving biological corridors Increased biodiversity Decreased sedimentation in rivers and wetlands Decreases pressure on Natural Resources	Greater economic opportunities Improvement in health and quality of life Increased options for tourism Changes in the attitude of local populations (increased awareness) Scenic beauty Redistribution of household tasks (less time spent on water harvesting)
Fire management	The incidence of fire due to the longer exposure time of dry seasons is an urgent and constant measure. In addition, there is experience of community and inter-agency work to address it	Biodiversity recovery (both forest and animal food) Decreased threats to villages Cleaner air	Improvement in health and quality of life (less respiratory diseases, less distress) Scenic beauty
Improved water availability	The limited reservoirs of water in the upper parts of the basins provide water to communities in dry corridor areas	Increased water availability in vulnerable communities	Access to drinking water and irrigation. In addition to improved quality of life
Control of invasive species	One of the biggest problems in wetlands (the typife) or some species of fish in mangroves affect biodiversity and local economies Climate-related pests and diseases	Increased biodiversity Landscape recovery Development of more tolerant varieties and more production	Improvement in quality of life with greater job choices

Proposed adaptation measure	Justification (impact of climate change that the measure seeks to address)	Impacts of measurement on ecosystems/agro-ecosystems	Impacts of measurement on the lives of men and women
	might proliferate and affect agricultural livelihoods		
Best agricultural practices	The largest economic activity in the region agriculture and livestock, and it requires changes to improve ecosystems	Soil improvement Landscape recovery Promote creole breeds	Increased productivity Improving quality of life

Other EbA interventions relevant to the basin

During the workshops, the consulted parties also exchanged on other interventions proposed by the project, more related to the capacity-building and awareness raising activities under the outputs 2 and 3. The main remarks were:

- For the promotion of local production/tourism and productive chains: this would be aimed at providing alternative livelihood (decreasing family outlay, improving family income) and could contribute to decrease rural population migration
- For Payment for Ecosystem Services: this is a common measure currently implemented in Costa to avoid biodiversity loss & forest cover loss, in which the participants showed interest in including.

4.4 Step 2.4 Perceived barriers and mitigation strategies during consultations

Table 9. Perceived barriers and mitigation strategies for the project's activities.

Component or activities	Existing barriers or difficulties that could arise	Strategies for tackling barriers
Water safety	• Lack of knowledge of the hydrological cycle by decision makers and villagers in general • Weak legal framework (obsolete water law) • Lack of appropriate technology • Incipient water management plans •	• Comprehensive and regional training to expand the range of action • Broader approaches, with ecosystem vision • Develop a communication strategy or campaign for CC effects and adaptation measures,
Food security	• Weak legal framework • Agro-export model • Lack of articulation in the agricultural sector • Different intervention approach different depending on the project's scale (Cantonal, catchment, etc.)	• Improving education and training • Activate crop insurance program • Inclusion of technologies and greater work with young people
Financial mechanism	• Lack of agricultural appropriations • Uncertain Land Tenure	• Strengthen and build communal financing mechanisms (e.g. Bancomunales)

	• Different intervention approach different depending on the project's scale (Cantonal, catchment, etc.) • Excess formalities and requirements that limit access, • Land tenure (ownership), • Mechanisms do not respond to regional reality • Competition with current conditions. • Accessibility complicated due to excessive requirements, guarantees, paperwork.	• Improving insurance mechanisms • Development of eco-finance cd mechanisms • Incorporate existing plans in the baseline • Innovate implementation models, • Development of partnerships • Develop a communication strategy or campaign to mainstream access to financial mechanisms, • Use the models of Cajas Rurales, ecological loans (Nectandra Foundation), INDER, and Fundecooperación. • Monitor resource usage. • Strengthen financial management capabilities (both administrative and user). • Avoid investing in private banking training. • Reduce administrative costs. • Work with multiple local organizations
Interinstitu-tional strategic linkage	• Lack of linkage and coordination between projects, • All instruments and platforms are not articulated • Different intervention approach different depending on the project's scale (Cantonal, catchment, etc.)	• Promoting strategic vision at the community level • Take advantage of platforms such as the Chorotega Wholesale Regional Market • Strengthen cantonal councils for interinstitutional coordination • Channel information to producers through regional platforms, territorial councils, INDER, COSEDES, local conservation councils, ASADAS
Restoration	• The timing of initiatives (short-term) • Different intervention approach different depending on the project's scale (Cantonal, catchment, etc.) • Lack of capacity in the design and implementation of adaptation measures, • No popular conceptualization of the effects of Climate change in the region,	• Create strategies for land-use compensation • Identify and prioritize pilot sites for the design of adaptation measures, • Development of a guide for adaptation measures
Infrastructure	• Different intervention approach different depending on the project's scale (Cantonal, catchment, etc.)	• Development of public infrastructure improvement projects but with strategic development approach
Basin management	• Different intervention approach different depending on the project's scale (Cantonal, catchment, etc.) • No landlord compensation mechanisms in water-refill zones • Non-integrated management tools for region planning	• Developing compensation mechanisms
Monitoring and Evaluation	• Lack of information and access to existing information • Integrated systems for the analysis and dissemination of information for decision-making	• Develop comprehensive information platform, • Increase awareness of existing information tools, • Identify of indicators and protocols for better systematization • Translate existing information for decision makers (governmental and non-governmental).
Payment for Environmental Services (PSA)	• Excludes areas (in the traditional CR PSA). • Requirements (not all potential beneficiaries haveall requirements required by law). • Change of use (Cannot make use change while PSA is in place).	• Consider Payment for Ecosystem Services in the project and raise awareness on its uses • Requirements adjusted to the reality of the basin (legal issues).
Environ-mental	• It is not explicit in the project and is considered necessary.	• Adjust it to the reality of the basin. • More friendly information for teachers and girls.

Education - Adapting to Climate Change	• It's usually very macro. • It requires interinstitutional coordination	• More participatory and inclusive methodologies (Bimodal lessons [practical], teachers, parents, children and public alliances). • Accessible technology for children and young people.

4.5 Step 2.5 Alignment with demand analysis from microfinance institutions

Microfinance portfolio analysis in Costa Rica

According to MIFIndex (https://www.mifindex.org/perfilnacionalcartera.aspx?pais=CR), 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 Costa Rica.

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, 22 financial institutions were identified in the pilot site in Costa Rica, displaying an adequate balance between nationally present and often regional or international banks and cooperatives and other types of smaller financial institutions. As an example, Fundecooperación is implementing partner of UN environment's MEbA II project for Latin America and Sub-Saharan Africa with 10 institutions currently introducing EbA finance and hence with the capacity to act as multiplier for the implementation of EbA finance in Costa Rica"

The total portfolio of the 16 REDACMIF institutions in the month of June 2020 was around 38M USD with 16M USD focused on the agricultural sector (42% of the total portfolio) covering a total of 10.181 clients with an average ticket size of 1473 USD. 100% of these clients were individuals and the average tenor period was over 24 months.

These numbers also refer to microfinance loans only, not considering SME and corporate finance which is expected to be higher participation in Costa Rica.

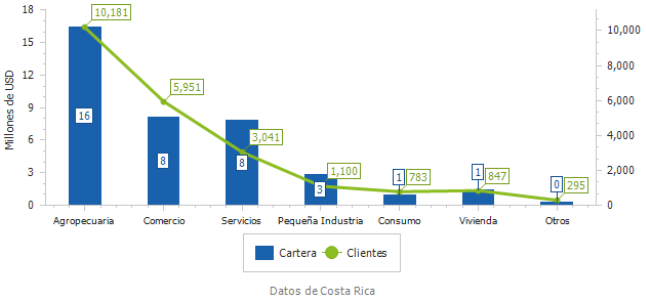


Figure 9. Microfinance portfolio distribution for Costa Rica June 2020. 16M USD in agriculture portfolio out of 38M USD total portfolio

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 Costa Rica:

1. Assuming linear disbursements and linear repayment, close to 5,000 loans are being disbursed in agricultural microfinance per year.
2. This translates into an estimated 420 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 Costa Rica

As part of the programme formulation process, a total of 16 financial entities were interviewed to understand the existing portfolios, credit demand and current financial support to EbA in the Dry Corridor in Costa Rica.

The main climate risks identified by these institutions in Costa Rica were aligned with those identified through the community consultations including rain pattern changes, decreased water availability, extreme rainfall events and heat extremes.
Additionally, the most representative impacts identified by respondents was reduced water availability, as well as productivity loss, and soil degradation.

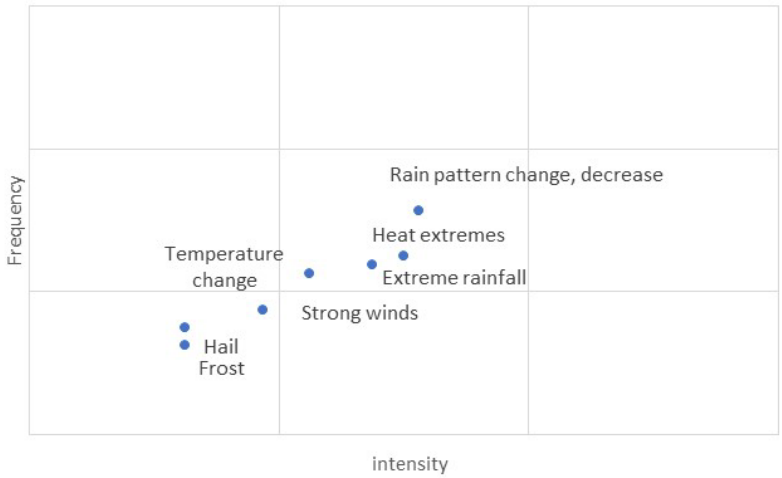


Figure 10. Main climate risks and impacts identified by MFIs in the Dry Corridor in Costa Rica

The surveys with these institutions requested about the EbA solutions used by small producers in Costa Rica. 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. 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. 50% of respondents said organic inputs and drip irrigation are practices 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 because farmers are already familiar with and making use of them.

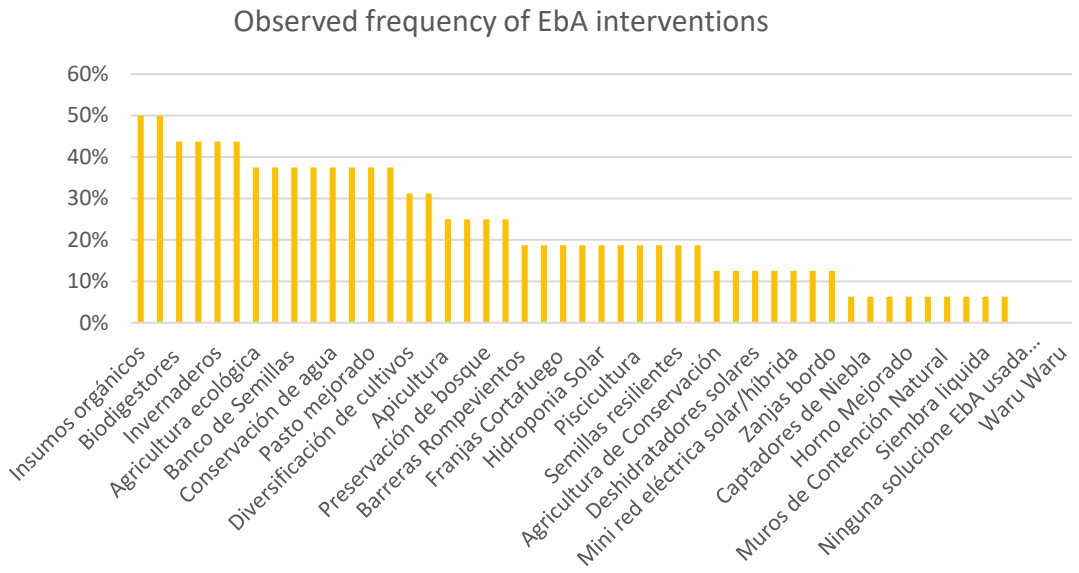


Figure 11. Observed frequency of EbA interventions already applied by local producers

The financial institutions interviewed stated that they are providing credits to the agricultural sector and in some cases, they have developed 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.

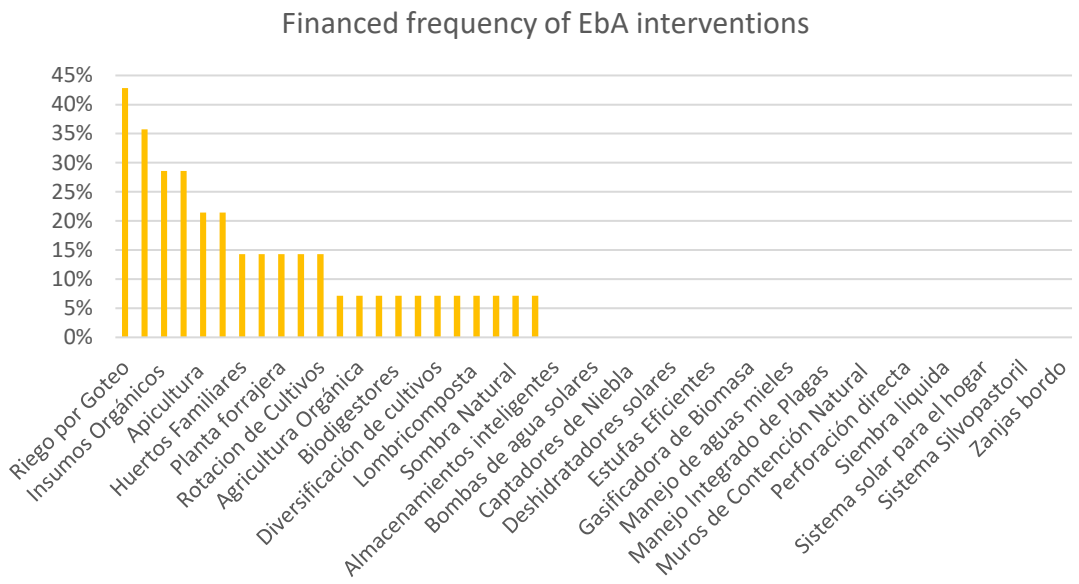


Figure 12. Frequency of financed EbA interventions by local financial institutions

Lending facility feasibility in Costa Rica

Costa Rica has the smallest microfinance sector in the region, still 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 (75M USD from GCF and 50M USD from CABEI) 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 Costa Rica

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 Piedras River sub-basin for the modelling purpose in Costa Rica

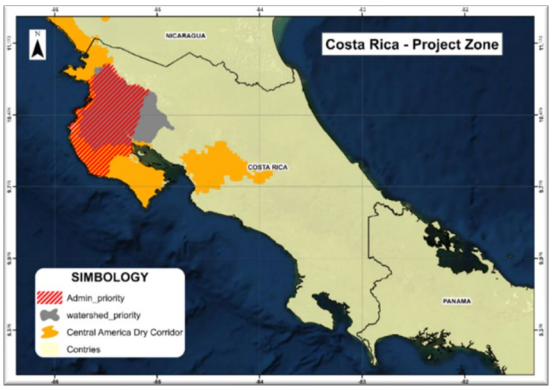


Figure 13. Project zone map Costa Rica

Based on the prioritization of the Tempisque basin as the pilot intervention site for Costa Rica, the Piedras River subbasin and the San Jeronimo River were selected for the climate impact modelling. This basin includes the majority of prioritized municipalities compared to the other subbasins and presents a favourable scenario for hydrological modelling[12] (see figures below). Piedras and Jeronimo subbasins are located within the Tempisque watershed, northwest of Costa Rica.

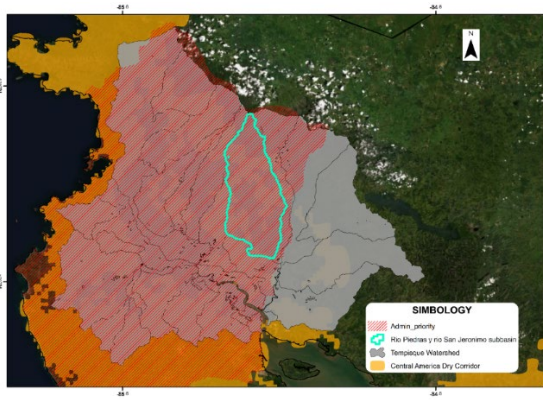


Figure 14. Costa Rica pilot basin: Piedras and San Jeronimo subbasin, Tempisque watershed- Costa Rica

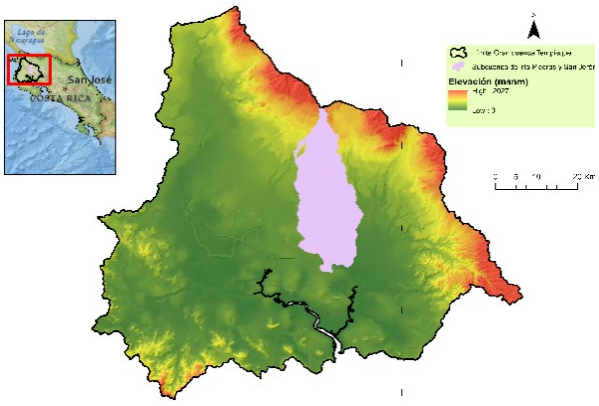


Figure 15. The Piedras and San Jeromino subbasin in the Tempisque watershed

The plot basin topography includes estuaries, mountainous areas, and volcanoes, describing a considerable variation in altitude gradient. 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

[12] Basin covers volcanic and coastal areas (Low altitudinal gradient)

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.

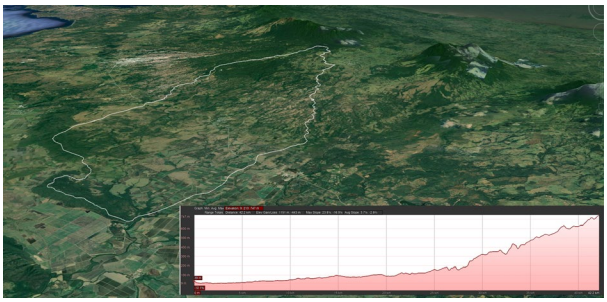


Figure 16. Longitudinal profile of Piedras and San Jeronimo subbasin, Costa Rica

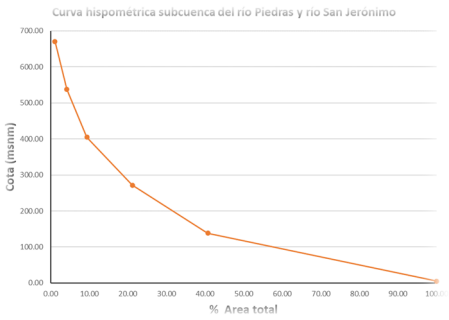


Figure 17. Hypsometric curve Piedras River and San Jeronimo River

Data availability: Input data (DEM, hydroclimatic data, land use, soil cover)[13] for hydrological modelling was provided by government and education institutions.

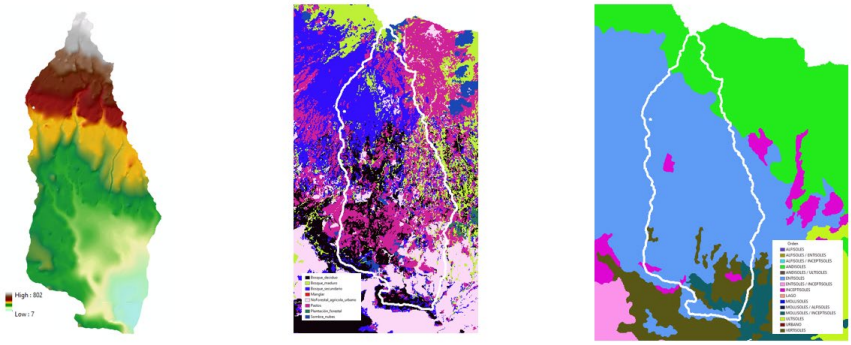


Figure 18. Input data Piedras and San Jeronimo subbasin, Costa Rica (Digital elevation model, land use and soil type)

Land use diversity: Based on the land use map, Piedras and San Jeronimo subbasin has diverse land uses with a combination of forest and agriculture. There are some intensive production areas in the lower part of the basin. Considering this, the implementation of adaptation measures is feasible.

5.2 Step 3.2 Identification of the main climate risks

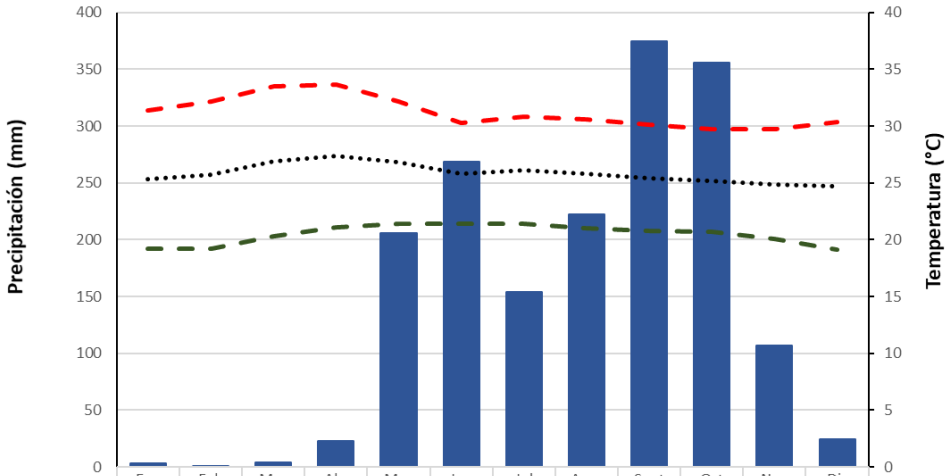
Climate of reference

The model used the Liberia city climate as reference. It is located close to the basin centre.

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

Basin climate is tropical humid (66%) and tropical sub-humid (34%). Mean annual precipitation and temperature are 1744 mm and 25.8 °C, respectively. The driest month is February (1mm), and the wettest month is September (375 mm). April is the month with the highest value of temperature (27.4 °C). December is the coldest month of the year (24.7°C).

Based on the time series (1982 – 2012), the difference between precipitation of the wettest and the driest month is 374 mm. Mean temperature varies 2.7°C.



	Ene	Feb	Mar	Abr	May	Jun	Jul	Agos	Sept	Oct	Nov	Dic
Precipitación (mm)	3	1	4	23	206	269	154	222	375	356	107	24
Temperatura media (°C)	25.3	25.7	26.9	27.4	26.8	25.8	26.1	25.8	25.4	25.2	24.9	24.7
Temperatura min. (°C)	19.2	19.2	20.3	21.1	21.4	21.4	21.4	21	20.8	20.7	20.1	19.1
Temperatura máx. (°C)	31.4	32.2	33.5	33.7	32.2	30.3	30.8	30.6	30.1	29.7	29.7	30.4

Figure 19. Climograph Piedras and San Jeronimo subbasin, Costa Rica.

Climate change scenarios

This study considers a 9.7% precipitation decrease and temperature increase of 0.9°C, according to RCP 4.5 climate change scenario projected for 2050 and a decrease of 14% for RCP 8.5 for 2050[14]. Figure 20 below present current and future trends in Piedras and San Jeronimo subbasin and the projected monthly anomalies.

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

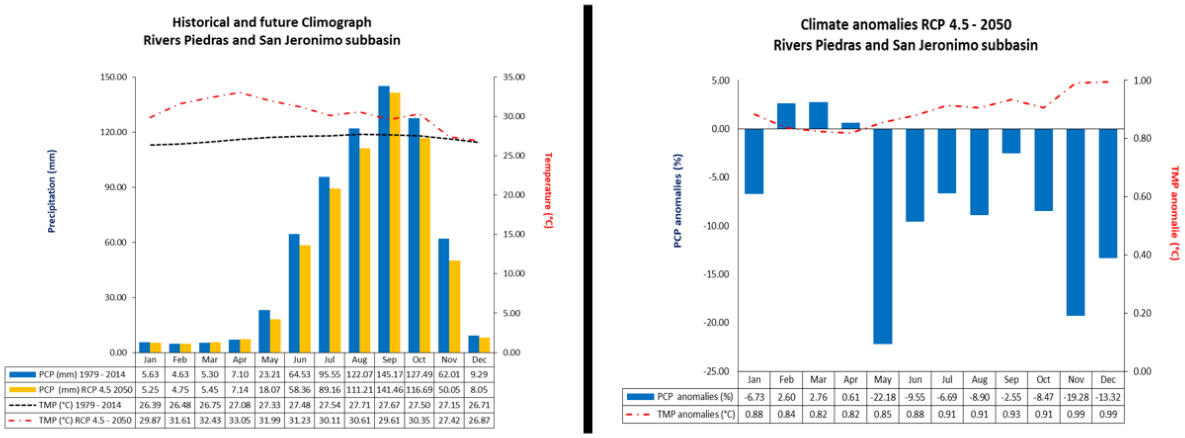
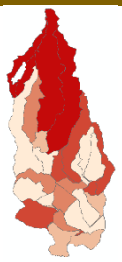
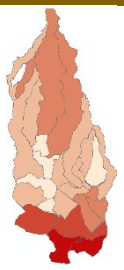
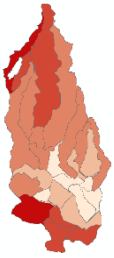
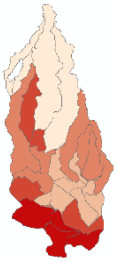
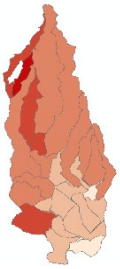
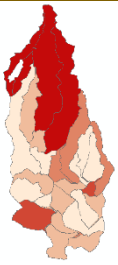
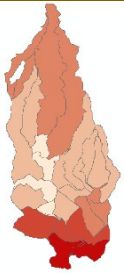
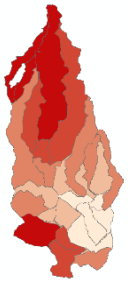
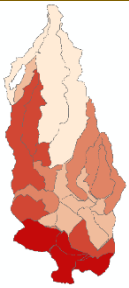
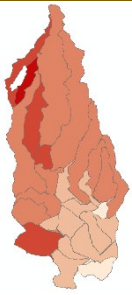
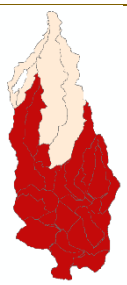
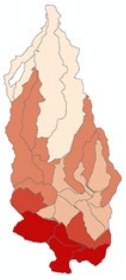
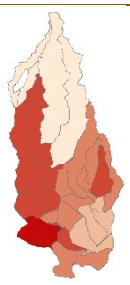
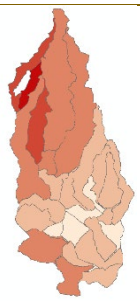
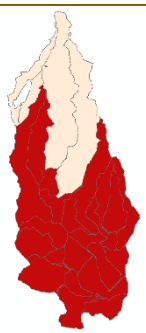
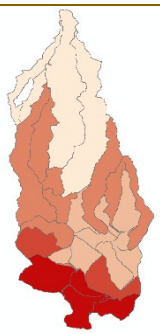
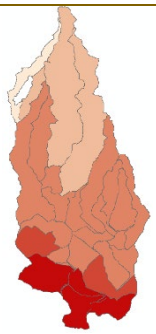
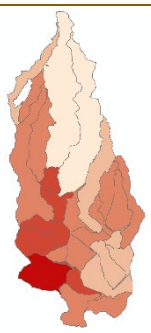
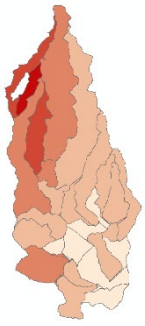


Figure 20. Climate anomalies projected for 2050 under RCP 4.5 scenario in the Piedras and San Jeronimo subbasin, Tempisque watershed, Costa Rica

These changes in precipitation and temperature have direct impacts over hydrological variables In the catchment. Table 1010 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 water yield (between 14.1% and 20.1% for 2050) with consequent decrease in groundwater recharge. The impacts over the erosion rate show an increase for the RCP 4.5 while it shows a significant decrease for RCP 8.5 to 2050. This is directly linked to the substantive decrease in annual precipitation, but it creates a high risk of erosion during extreme events due to the aridity of the soil under these conditions.

Table 10. Main impacts in the Rio Piedras Subbasin over hydrological variables for scenarios RCP 4.5 and 8.5 for the 2050 and 2100 horizon

Rio Piedras Subbasin, Costa Rica	PRECIPITATION	SOIL WATER	PERCOLATION	WATER YIELD	EROSION
Climate Change RCP 4.5 - 2050					
Change (%) for RCP 4.5 - 2050	Decrease -9.7%	Decrease -1.4%	Decrease -0.6%	Decrease -14.1%	Increase 2.8%

Rio Piedras Subbasin, Costa Rica	PRECIPITATION	SOIL WATER	PERCOLATION	WATER YIELD	EROSION
Climate Change RCP 8.5 - 2050					
Change (%) for RCP 8.5 - 2050	Decrease -14.0%	Decrease -1.6%	Decrease -5.0%	Decrease -20.1%	Decrease -8.1%
Climate Change RCP 4.5 - 2100					
Change (%) for RCP 4.5 - 2100	Decrease -81.2%	Decrease - 53.5%	Decrease -97.9%	Decrease -99.5%	Decrease -97.0%
Climate Change RCP 8.5 - 2100					
Change (%) for RCP 8.5 - 2100	Decrease-83.0%	Decrease-71.5%	Decrease - 98.9%	Decrease -97.8%	Decrease -98.4%

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 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, this is directly related in the hydrological model to precipitation rates. In the RCP 4.5 to 2050 we can observe an increase of erosion, however, in the longer term and more intense climate change scenarios, erosion rates show substantive decrease 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 50 to 70%, 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 to evaluate their impact over ecosystem services on water availability and erosion control.

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 high 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.

This modelling exercise was undertaken for climate change conditions under RCP 4.5 scenario at 2050.

Table 11. Adaptation scenarios in the Piedras and San Jeronimo subbasin, Tempisque watershed, Costa Rica

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 larger than 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 9.7% and temperature will increase by 0.90°C. Projected climatic conditions will reduce soil water by 1.4 %, percolation by 10.6%, and water yield by 14.1%. Erosion will increase by 1.6%.

As observed in the following tables and maps, the implementation of EbA measures produce positive hydrological impacts at local and 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 responses compared to the BAU scenario.

The following table summarizes the response of the hydrological variables to the different intervention scenarios and levels of intervention.

Table 11. Variation between climate change scenario without adaptation measures and climate change scenario with adaptation measures in the Piedras and San Jeronimo subbasin, Tempisque watershed, Costa Rica

SCENARIOS				Scenarios name	Watershed level				COMMENTS
Adaptation measures			Level		SW	PERC	WYLD	EROSION	
NO				Climate Change	-1,38	-10,61	-14,05	1,55	CC (% change)
Adaptation measure 1: Conservation and restoration forest	1a	ForestConservation	low	ForestConservationlow	1,35	10,66	14,02	-3,68	Change compared to Climate change scenario
		ForestConservation	middle	ForestConservationmiddle	1,23	11,42	13,93	-13,84	
		ForestConservation	hight	ForestConservationhight	1,08	12,23	13,80	-28,03	
	1b	ForesRestoration	low	ForesRestorationlow	1,33	10,68	14,01	-4,01	
		ForesRestoration	middle	ForesRestorationmiddle	2,63	22,73	30,26	-11,02	
		ForesRestoration	hight	ForesRestorationhight	1,09	11,02	13,78	-16,96	
Adaptation measure 2: Establishment of agroforestry systems		SAF_Increase	low	SAF_Increaselow	1,37	10,75	14,04	-2,99	
		SAF_Increase	middle	SAF_Increasemiddle	1,32	10,69	14,00	-4,52	
		SAF_Increase	hight	SAF_Increasehight	0,57	11,78	13,30	-44,37	
Adaptation measure 3: Implementation of efficient irrigation systems		Agriculture with irrigation	low	Agriculture with irrigationlow	1,37	10,62	14,05	-1,71	
		Agriculture with irrigation	middle	Agriculture with irrigationmiddle	1,36	10,71	14,04	-2,51	
		Agriculture with irrigation	hight	Agriculture with irrigationhight	1,34	10,88	14,02	-3,97	
Adaptation measure 4: Vegetative barriers		LivingBarriers	low	LivingBarrierslow	1,38	10,67	14,05	-2,21	
		LivingBarriers	middle	LivingBarriersmiddle	1,38	10,70	14,05	-3,50	
		LivingBarriers	hight	LivingBarriershight	1,39	11,66	14,05	-20,23	
Combined scenarios		Mix	low	Mixlow	1,27	10,83	13,95	-7,54	
		Mix	middle	Mixmiddle	1,02	11,27	13,72	-21,70	
		Mix	hight	Mixhight	0,61	12,00	13,35	-43,72	

As observed, under climatic conditions RCP 4.5 2050:

- Forest conservation and restoration adaptation measures have the potential to neutralize the impacts of climate change on the water dynamics in the basin. For example, the moisture of water in the soil increases (1.5% in average), as well as percolation (13.1% in average), and water production (16.7% in average), while erosion decreases (12.9% in average). Within these two measures, forest restoration (in medium levels of intervention) has greater benefits in increasing soil water, percolation, and water production, while forest conservation is more beneficial for reducing erosion (medium and high levels of intervention).
- The establishment of agroforestry systems can increase soil water moisture (1.1% in average), percolation (11.1% in average), water production (13.8% in average), and decrease erosion (17.3% in average). A low and medium level of intervention favour processes related to soil water content and water production in the basin, while a high level of intervention shows greater benefits in percolation processes and erosion reduction,

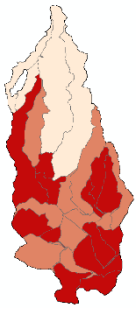
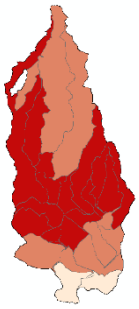
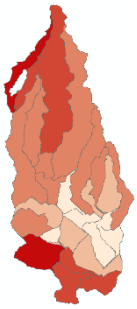
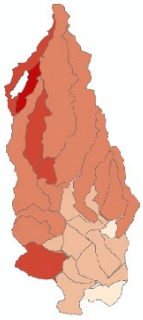
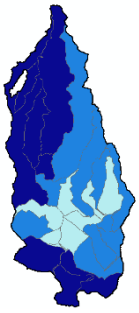
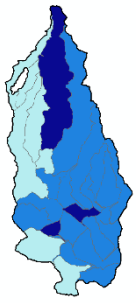
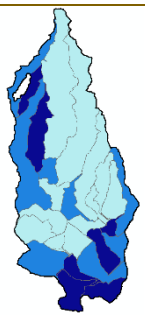
which would allow a lower impact, mainly in the dry season, due to changes in precipitation patterns and increased temperature in the agricultural production systems in the basin.

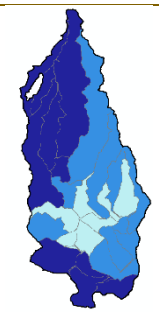
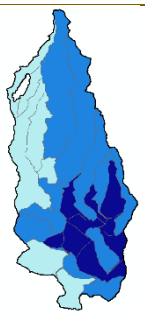
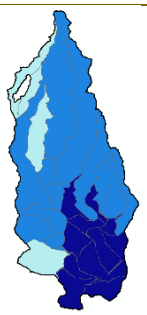
- Establishing efficient irrigation systems helps to mitigate the water deficit in productive systems. These systems can increase soil water (1.4% in average), percolation (10.7% in average), water production (14% in average), and decrease erosion (2.7% in average).
- Establishing living barriers has the potential to reduce erosion (up to 20.2% in a high intervention level). This measure also favours soil moisture (1.4% in average), increases percolation (11% in average) and water production (14.1% in average). At a high level of intervention, erosion reduction can be up to 20%. For all cases, a high level of intervention will bring the greatest benefits.
- The combination of adaptation measures has the potential to increase soil water content (1% in average), percolation (11.4% in average), water production (13.7% in average) and decrease erosion (24.3% in average). For a medium level of intervention, the combination of adaptation measures would have the best results in average.

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 a 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 12. Summary of results for different adaptation interventions' scenarios on 2050, RCP 4.5

Rio Piedras Costa Rica	PRECIPITATION	SOIL WATER	PERCOLATION	EROSION
Climate Change RCP 4.5 – 2050 No adaptation interventions				
Change (%)	Decrease 9.7%	Decrease 1.4%	Decrease 10.6%	Increase 1.6%
Climate Change RCP 4.5 – 2050 Adaptation interventions (middle combined interventions)				
Change (%)		Increase 1.0%	Increase 11.3%	Decrease 21.7%

Climate Change **RCP 4.5 – 2050** **Adaptation interventions** **(high combined interventions)**			
Change (%)	Increase 0.6%	Increase 12%	Decrease 43.7%

As observed, climatic anomalies projected (4.5 RCP 2050) will have a negative impact on the hydrological dynamics of the basin if no adaptation measures are implemented. Decreases in soil water content (-1.4%), percolation (-10.6%) and water production (-14.1%) will affect processes related to the availability of water for the plants, water recharge processes and decrease in the flow of rivers and streams. Likewise, erosive processes will tend to increase.

Adaptation measures, at different levels of intervention, provide hydrological benefits in the basin, which contribute to climate resilience for ecosystems and productive systems. Adaptation measures that were modelled favour the water content in the soil, water sources in general and help preserve water recharge areas, maintaining production levels in the basin and mitigating the impacts caused by the projected decrease in precipitation. These benefits are essential, especially during the dry season, where the decrease in rainfall is considerable.

Since the basin has diverse land uses, with patches of forest and productive systems, a combined intervention approach is more appropriate. This would allow that the adaptation measures benefit the ecosystem and population in a more holistic way, recovering hydrological services, maintaining livelihoods, and increasing climate resilience.

In summary:

- Combined adaption measures at medium and high-level produce more holistic benefits at local and basin scale.
- Adaptation measures (Nature-based solutions) contribute to create resilience to drought events. Combined interventions at high and intermediate level may alleviate water stress during the dry season.
- Adaptation measures (Nature based solutions) provide hydrological benefits and contribute to creating resilience to present and projected climate conditions.

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 Tempisque 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 Tempisque 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 Tempisque 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 catchement.

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.

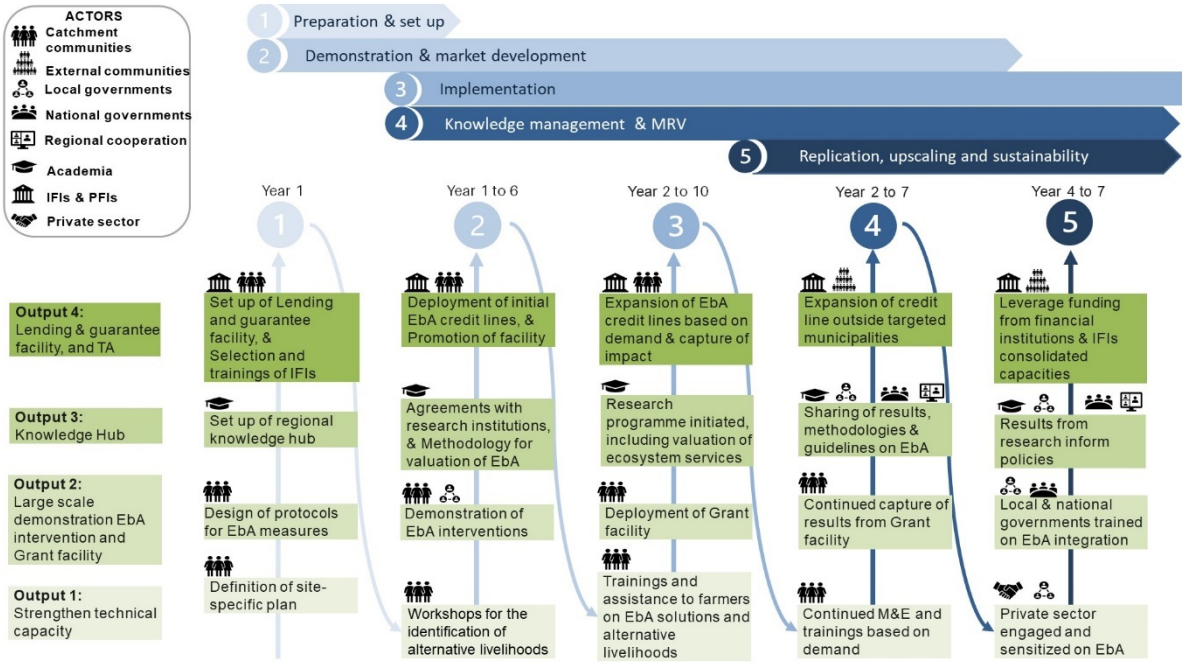


Figure 21. Graphic representation of implementation strategy

1/ Set up and preparedness

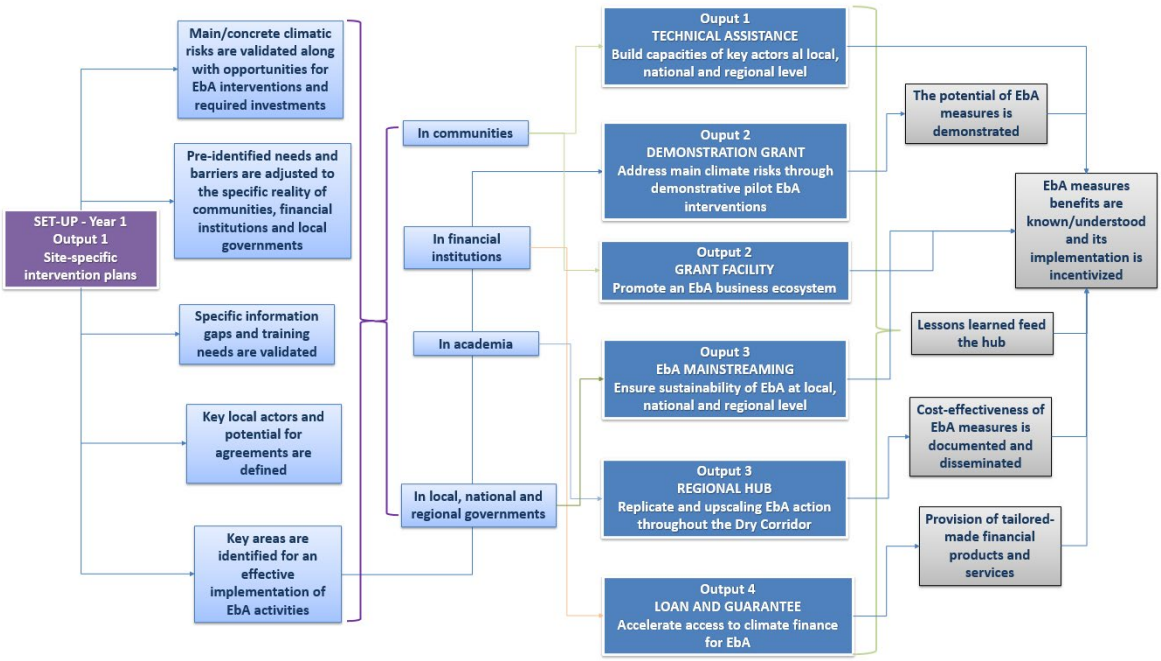
During this first stage of the project, the site-specific implementation plans based on vulnerability and hydrological models will be strengthened and finalized in consultation with communities and key actors including detailed climate risk assessments.

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.

Stage 1/ Preparedness and set up	Related activities	Year 1 Q1	Q2	Q3	Q4	Year 2 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.

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									

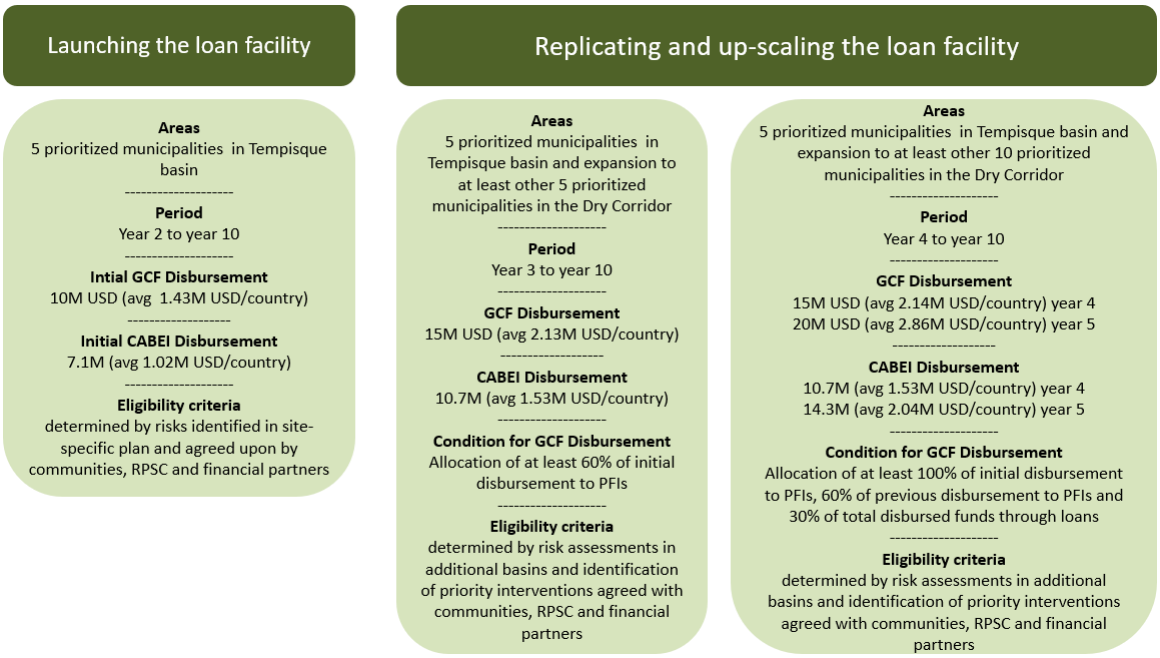
3/ Implementation

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 5 prioritized municipalities in the Tempisque 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.

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				Year 7			
		Q21	Q22	Q23	Q24	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 Tempisque 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 Tempisque 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 recharge and increased erosion	1.1 Forest protection	$ 9,95	583	$ 5.805	Communal land	community	Increased water infiltration Erosion control
	1.2. Forest protection and restoration of Water recharge areas an riparian areas	$ 1.275,53	250	$ 318.882	Communal land	Community	
	1.3. Forest restoration	$ 422,49	835	$ 352.779	Communal land	Community	
	2.1 Plantations for timber and firewood	$ 1,581,48	490	$ 774.925	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	$ 2,268,36	165	$ 374.280	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	$ 576,05	100	$ 57.605	Coffee farms	Coffee farmers	
	3.3 SilvopastorII system - diversified living fence arrangements	$ 2,268,36	165	$ 374.280	Pastural land	Pastural land owners	
	3.4. SilvopastorII systems - individual trees	$ 554,61	165	$ 91.511	Pastural land	Pastural land owners	

Increased forest fire risk	4.1 Implementation of Firebreaks for forests and plantations	$ 4,519,59	15	$ 67.794	Communal forest; Forest plantations	Community; Forest plantation owners	Decreased impacts by forest fires
	5.1. Mixed forest nurseries (wood, firewood and fruit trees)	$ 8,102,49	5	$ 40.512	Communal land	community	Increased recovery after forest fires
Increased erosion	6.1 Construction of living barriers (1000 m)	$ 275,25	15	$ 4.129	Farms on vulnerable slopes	Farmers located in vulnerable slopes	Increased soil retention Increased soil humidity Decreased erosion
Increased flooding	6.2. Drainage superficial construction	$ 5,292,01	15	$ 79.380	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)	$ 2,050,00	23	$ 47.150	Community buildings	Community members	Increased water availability
	Community-level rainwater reservoirs (500 m3)	$ 8,500,00	25	$ 212.500	Communal land	Community	Increased water availability
TOTAL COST				**$2.801.533**			

Priority areas for intervention

Eligibility criteria for the EbA landscape interventions

- Areas located in the 5 selected municipalities in the Tempisque 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 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

The potential locations for the prioritized EbA interventions have been identified in the Tempisque 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.

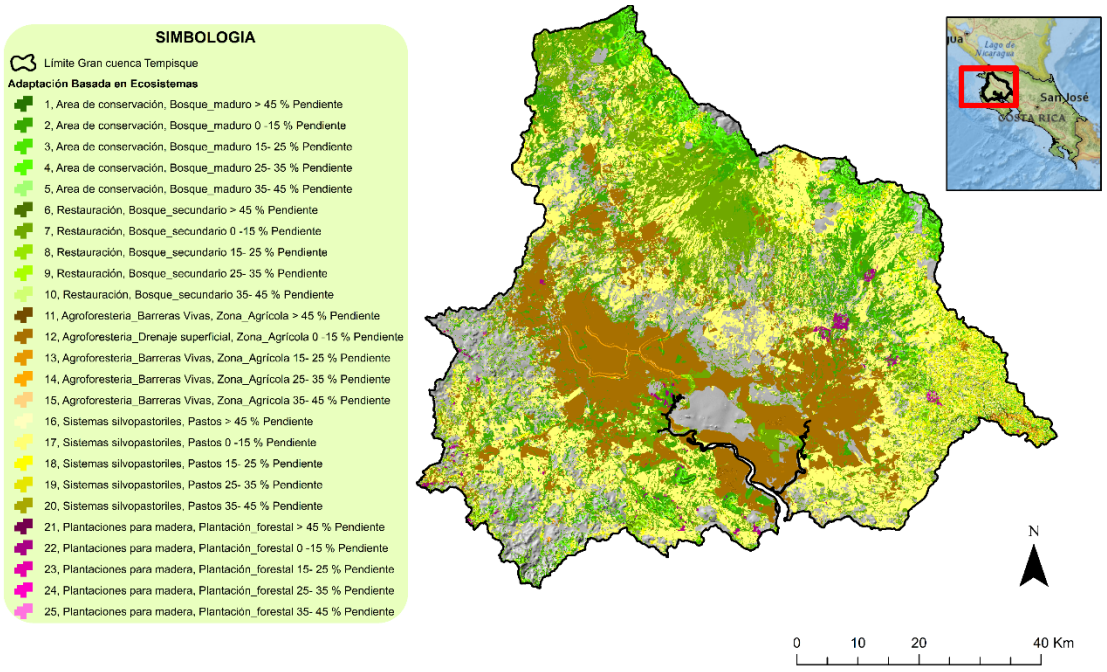


Figure 22. Potential areas for EbA interventions in the Tempisque basin.

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 green colours. Mature forests are located mainly at altitudes between 100 and 1000m and ranging slopes between 0 and 30 degrees. 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. 80,000 ha
- TOTAL AREA OF INTERVENTION. 583 ha (0.7% of total area)

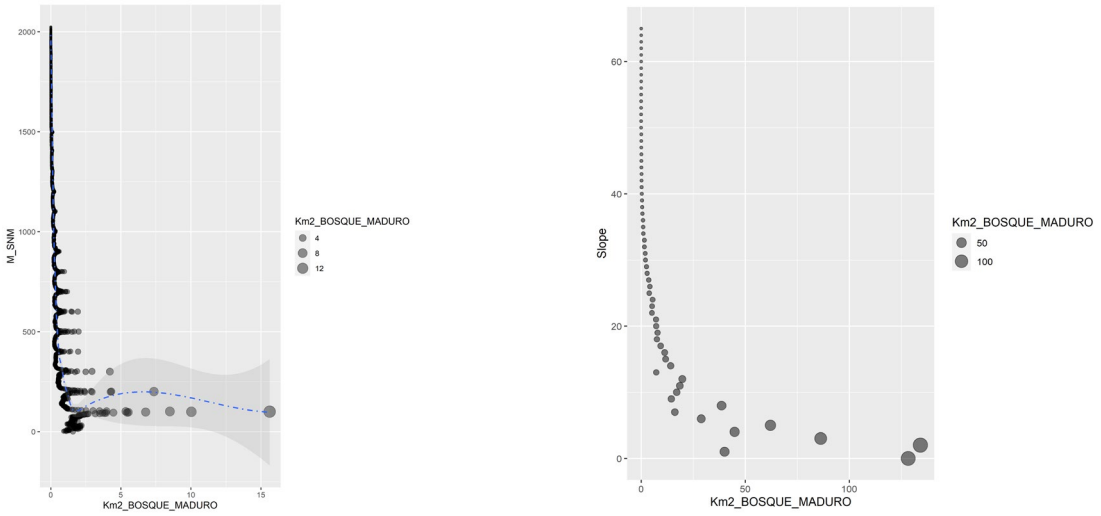


Figure 23. Total area of mature forest per altitude and slope in the Tempisque basin

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 darker green colours. Secondary forests are located mainly at altitudes between 100 and 500m and ranging slopes between 0 and 20 degrees. 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. 100,000 ha
- TOTAL AREA OF INTERVENTION. 1085 ha (1.09% of total area)

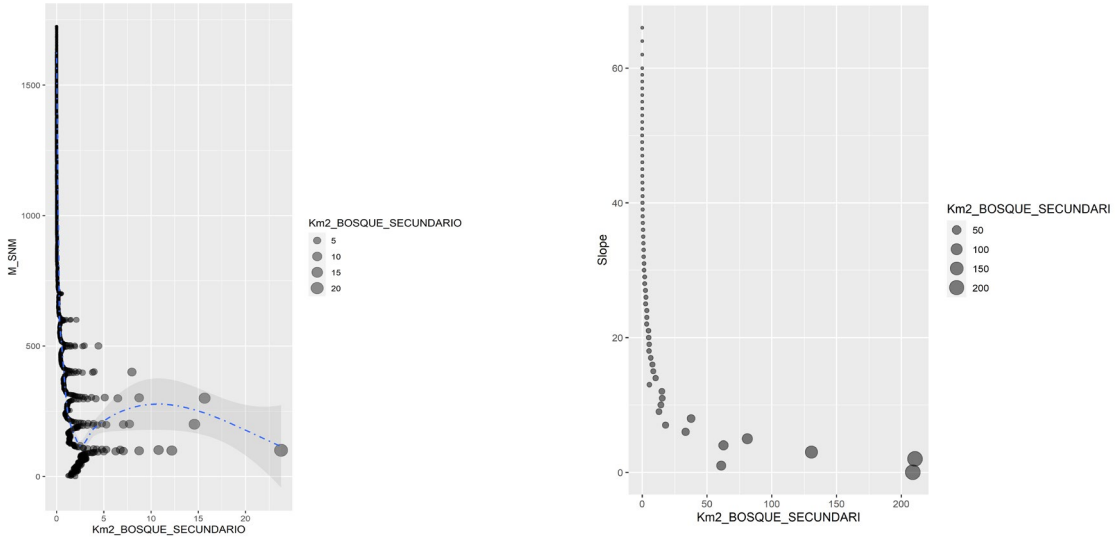


Figure 24. Total area of mature forest per altitude and slope in the Tempisque basin

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 0and 200 meters and ranging slopes between 0 and 10 degrees. 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. 100,000 ha
- TOTAL AREA OF INTERVENTION. 199 ha (0.20% of total area)

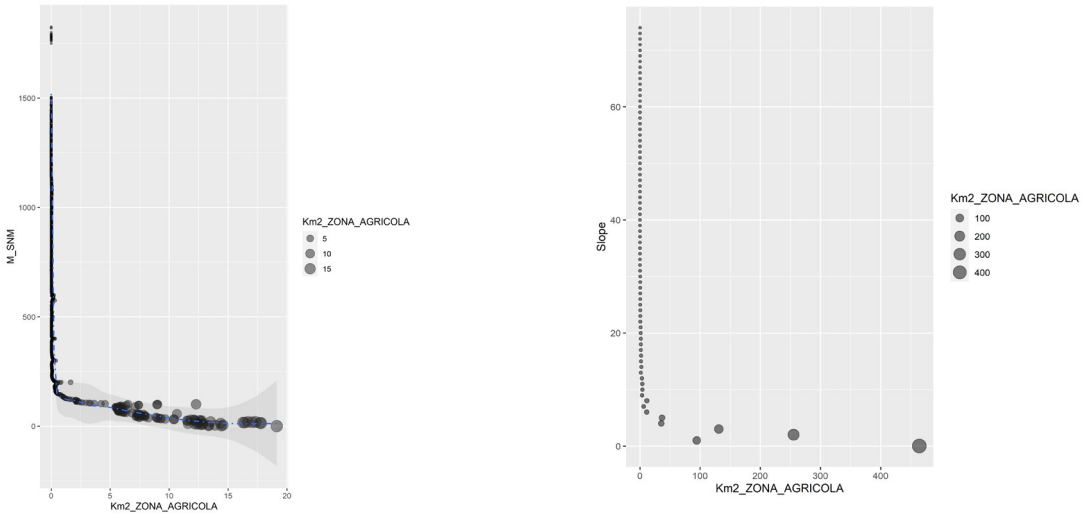


Figure 25. Total area of agriculture per altitude and slope in the Tempisque basin

SILVOPASTORIL SYSTEMS/LIVING FENCES interventions will be undertaken mainly over pasture that expands widely throughout the basin indicated in the map in yellow colours. Pasture land is distributed in a wide rage of altitudes from 0 to 600 meters, but mainly concentrated below 100 meters and ranging slopes between 0 and 10 degrees. 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. 160,000 ha
- TOTAL AREA OF INTERVENTION. 264 ha (0.17% of total area)

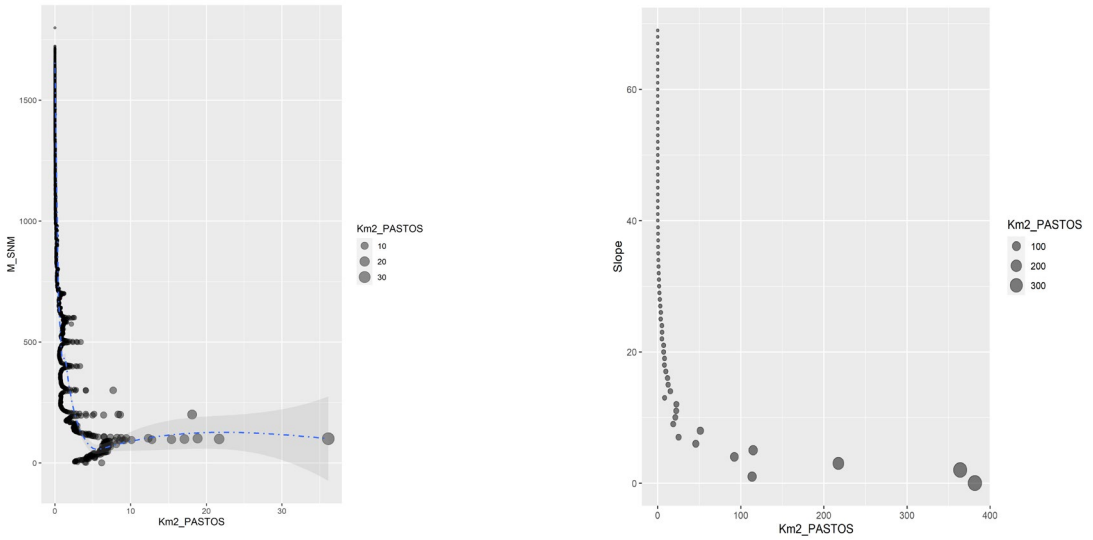


Figure 26. Total area of pasture per altitude and slope in the Tempisque basin

SUPERFICIAL DRAINAGE 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 0and 200 meters and ranging slopes between 0 and 10 degrees. 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. 100,000 ha
- TOTAL AREA OF INTERVENTION. 9.75 ha (0.01% of total area)

Beneficiaries of the grant component

The interventions selected for this component are mainly focused on 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 interventions

Costa Rica has committed a total of USD 8,388,919 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.

Costa Rica 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 or leasing schemes.

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 Costa Rica 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 Tempisque 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.

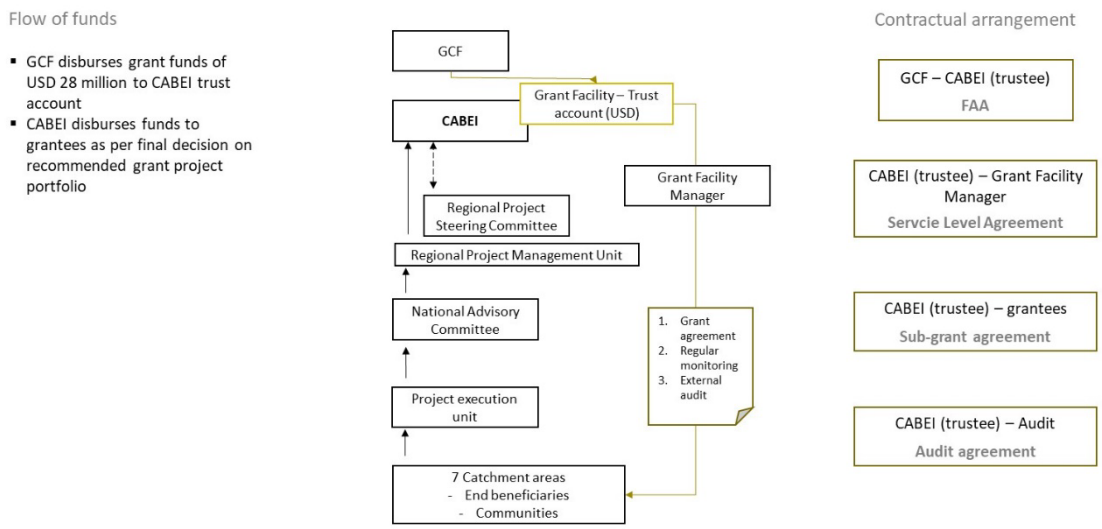


Figure 27. Grant facility mechanism

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 Tempisque basin (Output 2.2)

Finally, previous activities are expected to provide populations in the Tempisque 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 resource- 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 detailed 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 market 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 the risk assessment undertaken for the Dry Corridor and with the adaptation priorities identified in the adaptation planning instruments at local and national level

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.

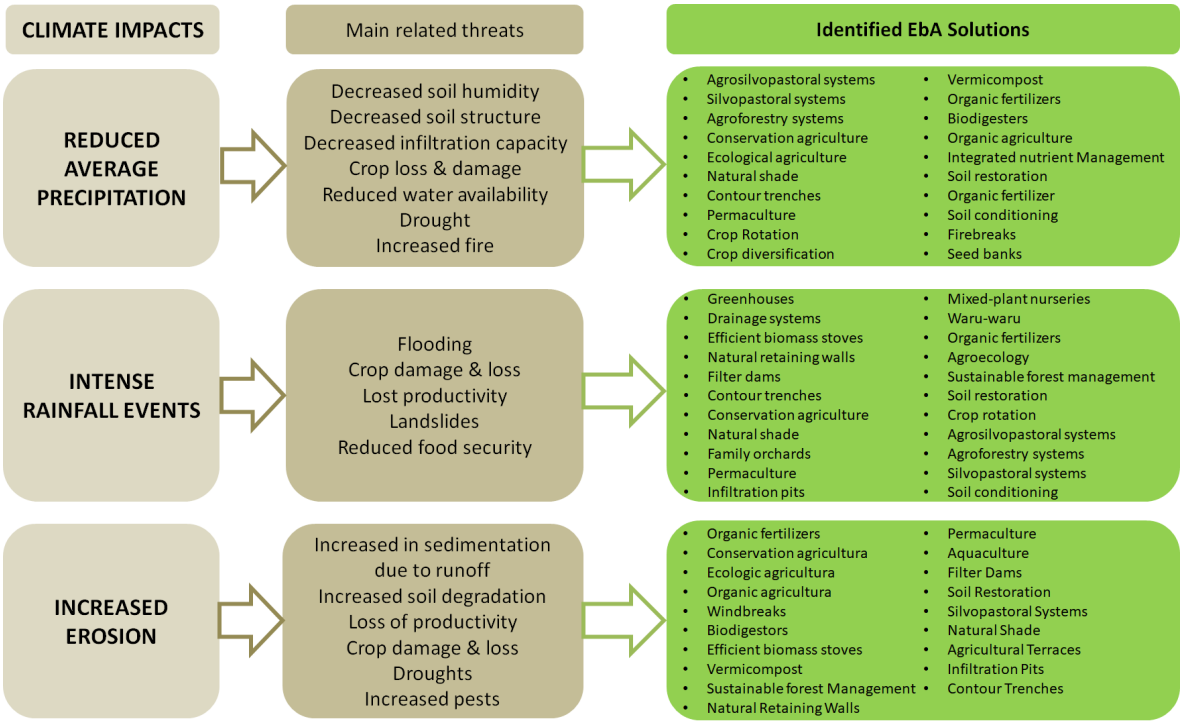


Figure 28. Identification of EbA measures according to climate risks

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 Costa Rica, 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 Tempisque 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: during the consultations, 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 Costa Rica, for example, main national institutions include universities, research centers, the private sector, the Ministry of Environment and Energy, Ministry of Agriculture and Livestock, the Costa Rican Institute of Fisheries and Aquaculture, the Integral Agricultural Marketing Program, the National Production Council, the

Ministry of Planning, the National Directorate for Community Development, the Rural Development Institution, the National Service of Groundwater, Irrigation and Drainage, the Costa Rican Institute of Aqueducts and Sewers, the Meteorological Institute, the National Emergency Commission and the Ministry of Public Education.

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:

Integration of EbA in policy and regulatory frameworks at the local level focusing mainly on water management regulations and water management community structures as well as local land use planning instruments.

- The 2017-2021 Territorial Rural Development Plan for Nandayure-Hojancha-Nicoya[15]
- The 2018 – 2030 Comprehensive Water Supply Plan for Guanacaste (PIAG)[16]
- Management plans in Protected Wild Areas (ASP for its acronym in Spanish) and Farms
- The Local Management Plan for the Palo Verde Ramsar Site - Tempisque Sector (period 2018-2022)[17]

National policies

- The National Forest Development Plan (2011–2020, currently being updated)
- The 2018 Climate Change Adaptation Policy
- National Adaption Plan

Regional policies

- Regional Environmental Framework Strategy, 2015-2020, CCAD[18]
- Strategy and Plan for the Integrated Management of Water Resources in Central America[19]
- Strategy for a sustainable agriculture adapted to climate change for the SICA region (2018-2030)[20]

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 capacity of local government, farmers and rural communities to implement EbA and other adaptation measures.	• Technical capacity of local government 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,	Capacity scorecard[21] Household surveys Local level monitoring reports (as established	Baseline to be determined at inception phase	2 local institutions with at least Level 3 Capacity 14,800 males 7,000 females	5 local institutions with at least Level 7 Capacity 32,500 males 17,500 females	Local monitoring systems provide sufficient detail to guide effective planning. The training of trainers programme, supported by training workshops and farmer-to-farmer

[15] https://www.inder.go.cr/nahoni/PDRT-Nandayure-Hojancha-Nicoya.pdf
[16] http://www.da.go.cr/wp-content/uploads/2018/04/Informe-Final_PIAAG-Version-Ditigal-Abril-2018.pdf
[17] https://enbcr.go.cr/sites/default/files/pgl_tempisque_02oct2017_0.pdf
[18] https://www.sica.int/documentos/estrategia-regional-ambiental-marco-eram-2015-2020_1_94463.html
[19] http://www.siagua.org/sites/default/files/documentos/documentos/recursos_hidricos_centroamerica.pdf
[20] http://www.cac.int/sites/default/files/Estrategia%20ASAC%20-%20CAC.pdf
[21] 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?
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.

	water/resource-efficient technologies, and/or climate-resilient livelihood options.	through Activity 1.1.1)				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	Site surveys Remote sensing data Implementation reports	0 ha of new forest protection zones	250 ha of forest protection zones.	583 ha of forest protection zones	Introducing SLM practices will enhance the provision of ecosystem services.
	• Ha of natural forest in major recharge areas and riparian zones.		0 ha of new natural forest	100 ha of natural forest in major recharge areas and riparian zones	250 ha of natural forest in major recharge areas and riparian zones	Communities will continue to use the introduced technologies and will not revert to old practices.
	• Ha of restored forested areas.		0 ha of restored forest	400 ha of restored forested areas across	835 ha of restored forested areas	Communities will continue to use the introduced technologies and will not revert to old practices
	• Km of living fence agroforestry systems.		0 km of living fence agroforestry systems	80 km of living fence agroforestry systems	165 km of living fence agroforestry systems	
	• Ha of agroforestry systems for natural shade in coffee plantations.		0 ha of new agroforestry systems for natural shade	40 ha of agroforestry systems for natural shade in coffee plantations	100 ha of agroforestry 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	165 km of diversified living fence silvopasture systems	
	• Ha of silvopasture systems using individual trees.		0 ha of new	80 ha of silvopasture systems using	165 ha of silvopasture systems using	

			silvopasture systems	individual trees	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[22]	1,200 tons of fuelwood produced	19,600 tons of fuelwood produced	
	• Rainwater harvesting capacity		0 m^3 rainwater harvesting capacity	260 m^3 rainwater harvesting capacity	575 m^3 rainwater harvesting capacity	
	• Rainwater storage capacity		0 m^3 rainwater storage capacity	5,500 m^3 rainwater storage capacity	12,500 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 and the Local Management Plan	Policy uptake scorecard[23]	Limited integration of CCA in municipal-level political and technical decision-making for climate resilience	2 municipalities with at least Level 1 policy uptake	All 5 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.
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	• # of financial or support mechanisms in place to provide EbA on-lending funds to PFIs	Statutes of created financial or support mechanisms Management reports	0 (Financial Mechanisms not yet operational)	2 (Financial Mechanisms operational)	2 (Financial Mechanisms operational)	PFIs need specific EbA financing and support (e.g. risk transfer) mechanisms to fully take advantage of last-mile solutions

[22] 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".

[23] 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.

Financial Institutions (PFI), including PFI access to EbA on-lending funds and support mechanisms. .	• # of specific financial or non-financial products and services offered by PFIs geared towards EbA investments • Institutional capacity of financial institutions to channel funds for small- and large-scale EbA investments strengthened	of financial or support mechanisms Internal product information PFI communication material & press releases Digital management reports Audit reports (general + programme-specific) Institutional capacity scorecard[24]	Baseline to be determined at inception phase Baseline to be determined at inception phase	2 2 institutions with at least Level 3 (out of 5) capacity	4 4 institutions with at least Level 4 (out of 5) capacity	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 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

[24] 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:

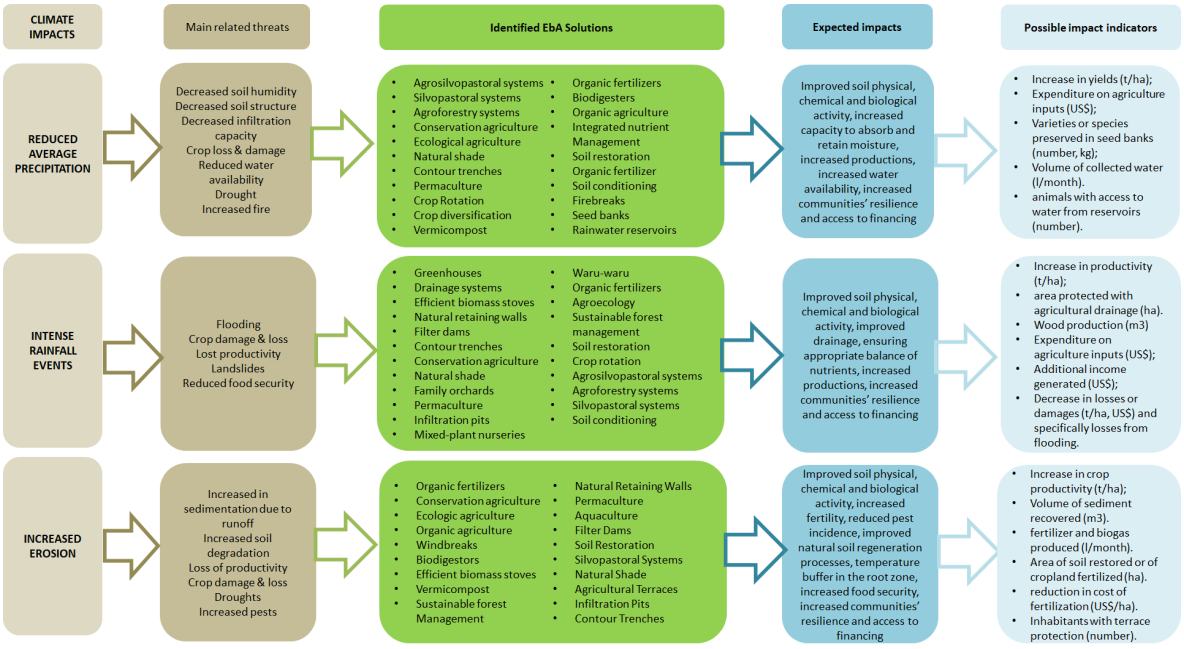
i) EbA solutions: does the institution have a basic understanding of concrete EbA and efficient water management solutions and is it able to distinguish and verify the application of these solutions by target end beneficiaries (survey-based)?
ii) Information management: is internal information management 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.

building, awareness raising activities with community members and for the generation of information on the valuation of ecosystem services.

The table below summarizes some of the indicators that will be used to measure implementation and impact of the project in the 5 municipalities of the Tempisque 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.



7. Annexes

1. Lists of participants of local consultations

Local consultation held on October 2019

Name	Organization	E-mail
Anthony Ruiz Rodríguez	SINAC/ACT/RNUSC	anthony.ruiz@sinac.go.cr
Esteban Blanco Calvo	Direction of Climate Change	estebanbcalvo@gmail.com
Jorge Alvarez R.	INDER/RCDCH	jalvarezr@inder.go.cr
Roberto Zúñiga Muñoz	SINAC-ACT	roberto.zuniga@sinac.go.cr
Angel Guevara Villegas	SINAC/ACAT	angel.guevara@sinac.go.cr
Ethel Araya	Civic Association of Nicoya	kuki@harmonyprojects.com
Ana S. Dareño	SINAC-ANAH	anaaraya@yahoo.com
Alexander León Campos	SINAC-ACAT	alexander.leon@sinac.go.cr
Alejandro Villalobos González	SENARA	avillalobos@senara.go.cr
Juan Carlos Aguirre	CBP	jca81kool@gmail.com
Rotney Piedra Chacón	SINAC-ACT	rotney.piedra@sinac.go.cr
Sidney García Cháves	MAG	sgarcia@mag.go.cr
Xinia Campos Palma	SINAC-Nicoya	xinia.campos@sinac.go.cr
Dunia Martínez López	Nicoyagua Foundation	dmartinez@nicoyagua.org
Oscar Pérez Barquero	SINAC-Nicoya	oscar.perez@sinac.go.cr
Nelson Marín M.	SINAC-ACT	nelson.marin@sinac.go.cr
Marco Bustos Salazar	SINAC-ACE	mbustos@acguanacaste.ac.cr
José Carlos Leal R.	SINAC-ACT	jose.leal@sinac.go.cr
Emel Rodríguez Paniagua	Community League of Water	emel9017@gmail.com
Asdrúbal Venegas Sánchez	Guanacaste Association of Water and Forest	avenegas2201@hotmail.com
Luis Alberto Castillo León	FUNDECONGO	luiscastillo@fundecongo.or.cr
Flor Alicia Gutiérrez Espinoza	FUNDECONGO	fundecongo@yahoo.com
Kemblie Ajón Acosta	Council NA-HO-NI	leekemblie@gmail.com
Lesbia Sevilla Estrada	SINAC	lesbiasevilla@sinac.go.cr
Nazareth Porras Quirós	MIDEPLAN	nazareth.porras@mideplan.go.cr
Adriana Camareno R.	ASADA Santa Marta Nosara	acueductosantamarta@gmail.com
Suray Carillo	FEDEAGUA	suraycarillo@gmail.com
Francisco Ramírez Vega	SINAC-ACG	framirez@acguanacaste.ac.cr
Juan Bravo Ch.	CENEDE	juanbrv@gmail.com
José Joaquín Calvo D.	SINAC	joaquin.calvo@sinac.go.cr
Sonia Lobo Valverde	SINAC	sonia.lobo@sinac.go.cr
Jorge Vásquez Jiménez	FUNDECODES	fundecodeshojancha@gmail.com
Professional staff from institutions involved in this proposal		
Jaime Valverde Rojas	CUDECA	jaime.valverde@cudecasc.org
Mercedes Alexandra Sánchez	CCAD-SE	msanchez@sica.int
Olman Varela Durán	CUDECA	olman.varealad@gmail.com

Pictures from the workshop activities


Cantón
Beneficios recibidos del sitio

2. EbA measures identified by MEbA programme according to main climate risks

Up to 3 main climate risks addressed*	EbA measures		Climate change threats and impact addressed	EbA intervention's characteristics		
				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 Sudden Temperature Changes	39	Waru-waru	drought, crop damage, flooding, lost productivity, reduced food security, need for greater inputs, reduced water availability	Collective	**$17,513**	1
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 Costa Rican municipalities, as well as selected adaptation solutions to address threats to these systems

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
Liberia	Dry forest	Forest conservation Recreation / Tourism Sustainable wood harvesting	Climate regulation Capture and storage CO2 Pollinators and dispersers Erosion control Habitat for species Regulation against natural disasters	Loss of forest cover (due to water stress and fungal infection). Disruption of the nutrient cycle due to a lack of moisture Displacement of species (e.g. pollinator and dispersant species, such as leaf-cutter ants) Increase of exotic and invasive species Extinction of species Affectation of plant metabolism (trees) Reduction of the genetic bank Reduction of regulation of the hydrological cycle Increase of runoff, erosion, sedimentation Increase of vines that impacts the development of the forest	Higher incidence of forest fires Agriculture (e.g. extensive cane and rice crops) Urbanization (e.g. tourism developments) Deforestation (illegal logging)	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use • Monitoring and monitoring investigation of climate impacts on biodiversity
	Rain forest	Forest conservation Tourism	Climate regulation Capture and storage CO2 Pollinators and dispersers Erosion control Habitat for species Regulation against natural disasters	Loss of species (e.g. populations of bromeliads, epiphytes and orchids due to the increased incidence of sunlight) Moisture loss Higher impact of solar radiation Lower water collection	Deforestation Pesticide pollution Hydroelectric development Large-scale geothermal energy production Agriculture (e.g. pineapple, orange and palm) Hunting	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use • Monitoring and monitoring investigation of climate impacts on biodiversity

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Cloud forest	Forest conservation Tourism	Climate regulation Capture and storage CO2 Pollinators and dispersers Erosion control Habitat for species Regulation against natural disasters	Forest disappearance Loss of cloud areas	Illegal logging Agricultural frontier and pressure for change in land use Increase in the use of agrochemicals and pesticides Burning of garbage and fire	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use • Monitoring and monitoring investigation of climate impacts on biodiversity
	Caribbean humid forest	Forest conservation Tourism	Climate regulation Capture and storage CO2 Pollinators and dispersers Erosion control Habitat for species Regulation against natural disasters	Reduction of photosynthesis and forest productivity Affecting forest regeneration processes	Illegal logging Agricultural frontier and pressure for change in land use Increase in the use of agrochemicals and pesticides Burning of garbage and fire	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use • Monitoring and monitoring investigation of climate impacts on biodiversity
	Gallery forest	Forest conservation Tourism	Climate regulation Capture and storage CO2 Pollinators and dispersers Erosion control Habitat for species Regulation against	Changes in the structure and composition of the forest Mortality and displacement of flora and fauna species	Illegal logging Change of use for agricultural crops (e.g. tiquizque, pineapple, grass, orange) Hunting Infrastructure	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use • Monitoring and monitoring research on climate impacts on biodiversity

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
			natural disasters			• Reforest local aquifer recharge areas
	Mangroves	Fish productivity and biodiversity CO2 capture	Fish productivity and biodiversity CO2 capture	Loss of the ecosystem due to increased waves and sea level Increase in temperatures (e.g. ocean) Lower availability of fresh water Impaired species reproduction capacity Loss of carbon sinks Changes in salinity Changes in mangrove composition Increase in sedimentation due to runoff	Organic and chemical pollution Deforestation Sedimentation Mangrove drainage Garbage Pollution through tourism infrastructure (wastewater) Bad agricultural practices Operation without shrimp control Rice and cane crops Land movements for tourism developments that cause erosion and sedimentation	• Ecological restoration of mangroves • Fire management • Sustainable tourism • Prevent fragmentation of mangroves • Ecological and climate monitoring
	Wetlands			Desiccation of water bodies Changes in structure and decomposition		• Ecological restoration of wetlands • Fire management • Sustainable tourism • Ecological and climate monitoring

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Annual and permanent crops	Cultivation and production of rice, cotton, sugarcane, corn, sorghum, beans, vegetables, coffee and fruits, mainly melon, beekeeping.	Food supply Climate regulation Carbon sequestration and storage Pollination	Production problems due to loss of pollinators Availability of water Loss or dissolution production crops Soil loss and erosion Forest fires Forest fires	Drought Natural disasters Pests Soil degradation	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater harvesting - small reservoirs • Water harvesting • Soil conservation practices • Recovery and maintenance of protection areas for springs, streams and rivers • Training in good agricultural practices • Integral farms • Other agricultural practices
	Ducks	Livestock for meat, milk	Provision of food Provision of genetic material	Climate change. Lack of fodder on the farm. Lack of water in the area. Increase in temperatures Increase in diseases and death gained Reduction of productivity	Climate variability and climate change Drought Soil degradation Forest fires	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • . Rainwater collection - small reservoirs. • Water harvest • Soil conservation practices • Recovery of areas with greater forest potential than fodder • Recovery and maintenance of protection areas for springs, streams and rivers
Nicoya	Dry forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation	Loss of coverage due to illegal logging and forest fires Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure) Decrease of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Extensive livestock	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Wet forest	Forest conservation Tourism Use of sustainable wood	Supply of wood, firewood Water supply Water regulation Carbon cycle regulation	Loss of coverage due to illegal logging and forest fires increase in temperatures Reduction of rainfall Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure)) Reduction of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Extensive livestock	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Residence in the application of policies and controls on forest use
	Very humid premontane forest	Forest conservation Tourism Use of sustainable wood	Supply of wood, firewood Water supply Water regulation Carbon cycle regulation	Loss of coverage due to illegal logging and forest fires Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure) Decrease of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Loss of forest cover	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Mangroves	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing Transport and service corridors	Coastal protection Climate regulation Carbon sequestration Fishing production Recreational Pollination It provides food and shelter to a large number of species that spawn and have a niche there	Alteration in the migration of migratory species Decrease in water availability Loss of aquatic species Increased susceptibility to forest fires Change in species abundance	Overexploitation of resources and use of destructive techniques Overuse of agrochemicals Sedimentation by anthropogenic activities Black water Deforestation Invasion of protection areas Pressure for aquaculture spaces Livestock expansion Natural system modifications (dredging, dams, etc.)	• Ecological restoration of mangroves • Fire management • Sustainable tourism • Prevent fragmentation of mangroves • Ecological and climate monitoring
	Wetlands	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing	Water regulation (hydrological flows) Water purification and waste treatment Natural hazard regulation Water provision Biodiversity habitat	Alteration in the migration of migratory species Decrease in water availability Loss of aquatic species Increased susceptibility to forest fires Change in abundance of species Introduction invasive species Habitat losses and other effects on flora and fauna	Overexploitation of resources and use of destructive techniques Overuse of agrochemicals Sedimentation by anthropogenic activities Black water Deforestation Invasion of protection areas Pressure for aquaculture spaces Residential and commercial development Modifications of the natural	• Ecological restoration of wetlands • Fire management • Sustainable tourism • Ecological and climate monitoring

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
					system (dredging, dams, etc.) Invasive species	
	Annual and permanent crops	Cultivation and production of rice, cotton, sugarcane, corn, sorghum, beans, vegetables, coffee and fruits, mainly melon, beekeeping.	Food supply Climate regulation Carbon sequestration and storage Pollination	Production problems due to loss of pollinators Availability of water Loss or dissolution production crops Soil loss and erosion Forest fires Forest fires	Drought Natural disasters Pests Soil degradation	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater harvesting - small reservoirs • Water harvesting • Soil conservation practices • Recovery and maintenance of protection areas for springs, streams and rivers • Other agricultural practices
	Ducks	Livestock for meat, milk	Provision of food Provision of genetic material	Climate change. Lack of fodder on the farm. Lack of water in the area. Increase in temperatures Increase in diseases and death gained Reduction of productivity	Climate variability and climate change Drought Soil degradation Forest fires	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater collection - small reservoirs. • Water harvest • Soil conservation practices • Recovery of areas with greater forest potential than fodder • Recovery and maintenance of protection areas for springs, streams and rivers

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
Santa Cruz	Dry forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Loss of coverage due to illegal logging and forest fires Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure) Decrease of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Extensive livestock	• Ecological restoration of remaining forests and wetlands • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use
	Wet forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Loss of coverage due to illegal logging and forest fires increase in temperatures Reduction of rainfall Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure)) Reduction of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Extensive livestock	• Ecological restoration of remaining forests and wetlands • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Residence in the application of policies and controls on forest use + H26: H27

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Very humid premontane forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Loss of coverage due to illegal logging and forest fires Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure) Decrease of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Loss of forest cover	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use
	Mangroves	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing Transport and service corridors	Coastal protection Climate regulation Carbon sequestration Fishing production Recreational Pollination It provides food and shelter to a large number of species that spawn and have a niche there	Alteration in the migration of migratory species Decrease in water availability Loss of aquatic species Increased susceptibility to forest fires Change in species abundance	Overexploitation of resources and use of destructive techniques Overuse of agrochemicals Sedimentation by anthropogenic activities Black water Deforestation Invasion of protection areas Pressure for aquaculture spaces Livestock expansion Natural system modifications (dredging, dams, etc (	• Ecological restoration of mangroves • Fire management • Sustainable tourism • Prevent fragmentation of mangroves • Ecological and climate monitoring

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Wetlands	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing	Water regulation (hydrological flows) Water purification and waste treatment Natural hazard regulation Water provision Biodiversity habitat	Alteration in the migration of migratory species Decrease in water availability Loss of aquatic species Increased susceptibility to forest fires Change in abundance of species Introduction invasive species Habitat losses and other effects on flora and fauna	Overexploitation of resources and use of destructive techniques Overuse of agrochemicals Sedimentation by anthropogenic activities Black water Deforestation Invasion of protection areas Pressure for aquaculture spaces Residential and commercial development Modifications of the natural system (dredging, dams, etc.) Invasive species	• Ecological restoration of wetlands • Fire management • Sustainable tourism • Ecological and climate monitoring
	Annual and permanent crops	Cultivation and production of rice, cotton, sugarcane, corn, sorghum, beans, vegetables, coffee and fruits, mainly melon.	Food supply Climate regulation Carbon sequestration and storage Pollination	Production problems due to loss of pollinators Availability of water Loss or dissolution production crops Soil loss and erosion Forest fires	Drought Natural disasters Pests Soil degradation	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater harvesting - small reservoirs • Water harvesting • Soil conservation practices • Recovery and maintenance of protection areas for springs, streams and rivers • Other agricultural practices

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Ducks	Livestock for meat, milk	Provision of food Provision of genetic material	Climate change. Lack of fodder on the farm. Lack of water in the area. Increase in temperatures Increase in diseases and death gained Reduction of productivity	Climate variability and climate change Drought Soil degradation Forest fires	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater collection - small reservoirs. • Water harvest • Soil conservation practices • Recovery of areas with greater forest potential than fodder • Recovery and maintenance of protection areas for springs, streams and rivers
Bagaces	Seasonal wet forests	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Deforestation (e.g. Upper Basin of the Zapote and Guacalito River). Land degradation due to poor agricultural practices. Reduction of aquifer recharge areas (e.g. Miravalles). Modification of migration, reproduction and phenological patterns. Alteration of the food chain. Decrease in endemism. Progress of agricultural and urban production. Loss of biological connectivity. Migration of species. Increase of invasive species.	Deforestation and hunting. Change of use (agricultural and urban frontier advance). Water contamination. Extraction of species (e.g. birds). Resource extraction from Miravalles National Park.	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on the use of the forest • Environmental education • Strengthen biological corridor strategy • Awareness campaigns and sense of belonging
	Very humid forests	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Extinction of species (eg freshwater). Modification of migratory patterns. Loss of endemism. Increase in pathogens Water imbalance Affectation of groundwater levels and decrease of water infiltration. Water pollution by agricultural production. Displacement of species. Soil damage due to erosion.	Deforestation and hunting. Resource extraction from Miravalles National Park. Change of use Water extraction for human and productive consumption. Construction of reservoirs for electricity production / Water pollution	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on the use of the forest • Environmental education • Strengthen biological corridor strategy

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
					due to productive activities. Extraction of species of floras and fauna	• Awareness campaigns and sense of belonging
	Cloud forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Precipitation decrease (e.g. horizontal rain). Change of land use due to agricultural pressure (e.g. vegetables). Modification of species migration patterns. Reduction of species (e.g. bromeliads, epiphytes, micro-fauna). Higher incidence of solar brightness. Decrease in endemism. Disappearance of cloud forest. Reduction of infiltration and surface water flows. Trophic chain alteration.	Deforestation and hunting. Resource extraction from Miravalles National Park. Land concentration in few hands. Accelerated tourism development. Pollution by solid and liquid waste by urbanization. Extraction of species of floras and fauna.	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on the use of the forest • Environmental education • Strengthen biological corridor strategy • Awareness campaigns and sense of belonging

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Dry forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation Natural disaster regulation	Changes in the flowering cycle (e.g. Yellow Cortez). Affectation of pollinator species. Change in ecosystem (e.g. spiny forests, increase of xerophilous forest). Increase vulnerability of species. Change in the structure and composition of forests. Modification of reproduction patterns. Extinction or reduction of species (e.g. microfauna). Increase of forest fires. Affectation of biological corridors. Displacement of species (e.g. to high areas). Alteration of the food chain. Lower water availability and increased concentration of arsenic in water.	Forest fires. Deforestation and hunting. Pressure for land (tourism, agriculture and housing). Change of land use. Increased runoff due to increased built area. Increase of solid waste. Water availability problems. Illegal exploitation and over-exploitation of artisanal wells.	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on the use of the forest • Environmental education • Strengthen biological corridor strategy • Awareness campaigns and sense of belonging
	Mangroves	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing Transport and service corridors	Coastal protection Climate regulation Carbon sequestration Fishing production Recreational Pollination It provides food and shelter to a large number of species that spawn and have a niche	Variations of salinization in mangroves that causes loss of mangroves. Modification of the habitat of the crustaceans. Reduction of species (e.g. waterfowl). Loss of coverage. Change in micro-climates. Species extinction. Displacement of species (e.g. crocodiles).	Pollution by spills. Extraction of species (e.g. fish, crustaceans and mollusks). Increase in sedimentation due to agricultural activities. Change of use for pasture planting and residential construction. Extraction of materials such as coal	• Ecological restoration of mangroves • Fire management • Sustainable tourism • Prevent fragmentation of mangroves • Ecological and climate monitoring • Awareness campaigns and sense of belonging

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
			there			
	Wetlands	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing	Water regulation (hydrological flows) Water purification and waste treatment Natural hazard regulation Water provision Biodiversity habitat	Variations of the tides that impact on the water table of the wetlands. Alteration of native species. Loss of water mirrors. Modification of migration patterns. Increase in invasive species. Modification of species behavior. Water deficit Disproportion of sex of animals (e.g. reptiles). Species extinction. Loss of storage capacities. Displacement of species (e.g. crocodiles). Germplasm loss. Reduction of nesting areas. Increase of sedimentation by agricultural and tourist activity. Salinization of water sources. Precipitation decrease	Ecosystem drainage. Introduction of species. Increase in sedimentation due to agricultural, tourist and reservoir activities. Urban growth. Pollution. Expansion of extensive livestock.	• Ecological restoration of wetlands • Fire management • Sustainable tourism • Ecological and climate monitoring • Awareness campaigns and sense of belonging
	Annual and permanent crops	Cultivation and production of rice, cotton, sugarcane, corn, sorghum, beans, vegetables, coffee and fruits, mainly melon.	Food supply Climate regulation Carbon sequestration and storage Pollination	Production problems due to loss of pollinators Availability of water Loss or dissolution production crops Soil loss and erosion Forest fires Forest fires	Drought Natural disasters Pests Soil degradation	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater harvesting - small reservoirs • Water harvesting • Soil conservation practices • Recovery and maintenance of protection areas for springs, streams and rivers • Other agricultural practices

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Ducks	Livestock for meat, milk	Provision of food Provision of genetic material	Climate change. Lack of fodder on the farm. Lack of water in the area. Increase in temperatures Increase in diseases and death gained Reduction of productivity	Climate variability and climate change Drought Soil degradation Forest fires	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater collection - small reservoirs • Water harvest • Soil conservation practices • Recovery of areas with greater forest potential than fodder • Recovery and maintenance of protection areas for springs, streams and rivers
Carrillo	Dry forest	Forest conservation Tourism Use of sustainable wood	Wood supply, firewood Water regulation Carbon cycle regulation	Loss of coverage due to illegal logging and forest fires Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure) Decrease of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Extensive livestock	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use
	Wet forest	Forest conservation Tourism Use of sustainable wood	Supply of wood, firewood Water supply Water regulation Carbon cycle regulation	Loss of coverage due to illegal logging and forest fires increase in temperatures Reduction of rainfall Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure)) Reduction of food availability for species Changes in phenological patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Residence in the application of policies and controls on forest use

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
				Alterations in species reproduction patterns	Extensive livestock	
	Very humid premontane forest	Forest conservation Tourism Use of sustainable wood	Supply of wood, firewood Water supply Water regulation Carbon cycle regulation	Loss of coverage due to illegal logging and forest fires Decrease in water resources Loss of pollinators and seed dispersers Increase in the decrease of species (abundance, composition and structure) Decrease of food availability for species Changes in phenological patterns Alterations in species reproduction patterns	Uncontrolled use of fire for agricultural activities and intentional use Anthropogenic activities that fragment the forest Overuse of agrochemicals Hunting and illegal logging Change of land use Extraction of precious wood Loss of forest cover	• Ecological restoration of forests • Fire management • Sustainable forest management in primary and secondary forests for the sustainable production of forest and non-timber products • Insistence on the application of policies and controls on forest use
	Mangroves	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing Transport and service corridors	Coastal protection Climate regulation Carbon sequestration Fishing production Recreational Pollination It provides food and	Alteration in the migration of migratory species Decrease in water availability Loss of aquatic species Increased susceptibility to forest fires Change in species abundance	Overexploitation of resources and use of destructive techniques Overuse of agrochemicals Sedimentation by anthropogenic activities Black water Deforestation Invasion of protection areas Pressure for aquaculture spaces	• Ecological restoration of mangroves • Fire management • Sustainable tourism • Prevent fragmentation of mangroves • Ecological and climate monitoring

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
			shelter to a large number of species that spawn and have a niche there		Livestock expansion Natural system modifications (dredging, dams, etc.)	
	Wetlands	Tourism Collection of bivalve molluscs, crustaceans, polychaetes and fishing	Water regulation (hydrological flows) Water purification and waste treatment Natural hazard regulation Water provision Biodiversity habitat	Alteration in the migration of migratory species Decrease in water availability Loss of aquatic species Increased susceptibility to forest fires Change in abundance of species Introduction invasive species Habitat losses and other effects on flora and fauna	Overexploitation of resources and use of destructive techniques Overuse of agrochemicals Sedimentation by anthropogenic activities Black water Deforestation Invasion of protection areas Pressure for aquaculture spaces Residential and commercial development Modifications of the natural system (dredging, dams, etc.) Invasive species	• Ecological restoration of wetlands • Fire management • Sustainable tourism • Ecological and climate monitoring

Municipality	Ecosystems and main agro-ecosystems	Main uses or activities	Other perceived benefits	Main threats	Perceived causes of threats	Selected adaptation solutions
	Annual and permanent crops	Cultivation and production of rice, cotton, sugarcane, corn, sorghum, beans, vegetables, coffee and fruits, mainly melon.		Production problems due to loss of pollinators Availability of water Loss or dissolution production crops Soil loss and erosion Forest fires	Drought Natural disasters Pests Soil degradation	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater harvesting - small reservoirs • Water harvesting • Soil conservation practices • Recovery and maintenance of protection areas for springs, streams and rivers • Other agricultural practices
	Ducks	Livestock for meat, milk	Provision of food Provision of genetic material	Climate change. Lack of fodder on the farm. Lack of water in the area. Increase in temperatures Increase in diseases and death gained Reduction of productivity	Climate variability and climate change Drought Soil degradation Forest fires	• Recovery or establishment of agroforestry and silvopastoral systems • Fire management • Rainwater collection - small reservoirs • Water harvest • Soil conservation practices • Recovery of areas with greater forest potential than fodder • Recovery and maintenance of protection areas for springs, streams and rivers