# Concept Note

## Ecosystem-based Adaptation to increase climate resilience in the Central American Dry Corridor and the Arid Zones of the Dominican Republic

Multi-countries | Central American Bank for Economic Integration (CABEI)

15 March 2019

# Concept Note

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| Project/Programme Title: | Ecosystem-based Adaptation to increase climate resilience in the Central American Dry Corridor and the Arid Zones of the Dominican Republic |
| Country(ies): | Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panamá and the Dominican Republic |
| National Designated Authority(ies) (NDA): | Costa Rica – Ministry of Environment and Energy<br>Dominican Republic – Ministry of Environment and Natural Resources<br>El Salvador – Ministry of Development Cooperation<br>Guatemala – Ministry of Environment and Natural Resources<br>Honduras – Ministry of Energy, Natural Resources, Environment and Mining<br>Nicaragua – Ministry of Finance and Public Credit<br>Panama – National Environmental Authority of Panama |
| Accredited Entity (AE): | Central American Bank for Economic Integration (CABEI) |
| Date of first submission/ version number: | *[2019-02-07] [V.1]* |
| Date of current submission/ version number | *[2019-03-01] [V.2]* |

GREEN CLIMATE FUND



Please submit the completed form to **fundingproposal@gcfund.org**, using the following name convention in the subject line and file name: ***"CN-[Accredited Entity or Country]-YYYYMMDD"***

| **A. Project/Programme Summary (max. 1 page)** | | | |
|---|---|---|---|
| **A.1. Project or programme** | ☒ Project<br>☐ Programme | **A.2. Public or private sector** | ☒ Public sector<br>☐ Private sector |
| **A.3. Is the CN submitted in response to an RFP?** | Yes ☐ No ☒<br>If yes, specify the RFP: ______ | **A.4. Confidentiality[1]** | ☐ Confidential<br>☒ Not confidential |
| **A.5. Indicate the result areas for the project/programme** | Mitigation: Reduced emissions from:<br>☐ Energy access and power generation<br>☐ Low emission transport<br>☐ Buildings, cities and industries and appliances<br>☐ Forestry and land use<br>Adaptation: Increased resilience of:<br>☒ Most vulnerable people and communities<br>☒ Health and well-being, and food and water security<br>☐ Infrastructure and built environment<br>☒ Ecosystems and ecosystem services | | |
| **A.6. Estimated mitigation impact (tCO2eq over lifespan)** | | **A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)** | 1.75 million people |
| **A.8. Indicative total project cost (GCF + co-finance)** | 285,586,253.5 USD | **A.9. Indicative GCF funding requested** | 179,227,605 USD |
| **A.10. Mark the type of financial instrument requested for the GCF funding** | ☒ Grant ☐ Reimbursable grant ☒ Guarantees ☐ Equity<br>☐ Subordinated loan ☒ Senior Loan ☐ Other: specify | | |
| **A.11. Estimated duration of project/ programme:** | a) 7 years<br>b) repayment period, if applicable: 10 years | **A.12. Estimated project/ Programme lifespan** | 12 years |
| **A.13. Is funding from the Project Preparation Facility requested?[2]** | Yes ☐ No ☒<br>Other support received ☐ If so, by who: | **A.14. ESS category[3]** | ☐ A or I-1<br>☒ B or I-2<br>☐ C or I-3 |
| **A.15. Is the CN aligned with your accreditation standard?** | Yes ☒ No ☐ | **A.16. Has the CN been shared with the NDA?** | Yes ☒ No ☐ |
| **A.17. AMA signed (if submitted by AE)** | Yes ☒ No ☐<br>If no, specify the status of AMA negotiations and expected date of signing: | **A.18. Is the CN included in the Entity Work Programme?** | Yes ☒ No ☐ |
| **A.19. Project/Programme rationale, objectives and approach of programme/project (max 100 words)** | The impacts of climate change, including increasing temperatures, droughts and extreme rainfall events, threaten the livelihoods of vulnerable communities in Central America's Dry Corridor and the Dominican Republic's Arid Zones. Water supply is especially at risk, with knock-on effects on food security. The proposed project will address these impacts at the landscape and household level by promoting: i) Ecosystem-based Adaptation (EbA) across forests and agroforestry systems in prioritised watersheds; and ii) water-efficient technologies in rural communities. These solutions will be supported through: i) capacity building for local governments, financial institutions and communities; ii) loans and microfinance for EbA activities and natural resource-based businesses; and iii) mainstreaming EbA into policies and creating incentives. | | |

[1] Concept notes (or sections of) not marked as confidential may be published in accordance with the Information Disclosure Policy (Decision B.12/35) and the Review of the Initial Proposal Approval Process (Decision B.17/18).
[2] See here for access to project preparation support request template and guidelines
[3] Refer to the Fund's environmental and social safeguards (Decision B.07/02)

## B. Project/Programme Information (max. 8 pages)

### B.1. Context and baseline (max. 2 pages)

The Dry Corridor of Central America consists of semi-arid and sub-humid ecosystems that cover most of the Pacific slope of Guatemala, Honduras, El Salvador and Nicaragua, as well as smaller areas of Costa Rica and Panama. Defined as areas that have a dry season of at least four months, the Dry Corridor includes 64% of Central America's municipalities[4]. The term "Dry Corridor" emerged in recent years 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[5] – and have had severe impacts on agriculture and food security in the region. For example, during the 2015 drought, over three million people experienced acute food insecurity[6]. Similar climatic conditions to those of the Dry Corridor are found in the arid and semi-arid areas (hereafter 'Arid Zones') in the west of the Dominican Republic (see map in Annex 1), with similar solutions required to adapt to the impacts of climate change.

**Baseline scenario**

The Dry Corridor has a population of ~10.5 million people[7] and is Central America's most densely populated region. Nearly 60% of people in the Dry Corridor live in poverty, with the most severe poverty found in Nicaragua, Honduras, El Salvador and Guatemala. A further ~1.2 million people live in the Arid Zones of the Dominican Republic, which have the highest poverty rate in the country[8]. Across the Dry Corridor and the Arid Zones, poverty is most prevalent in rural areas[9]. Indigenous peoples are prominent in parts of the region, especially in Guatemala where they represent ~40% of the population[10], and they are typically most affected by poverty. As a result of this widespread poverty, rural communities in the region have limited capacity to adapt to the impacts of climate change.

Most rural people in the Dry Corridor and the Arid Zones depend on agriculture for their livelihoods. Coffee, and sugarcane are the most important export crops, with maize and beans being the main staple crops[11]. Agriculture is practised on both small and large scales. Smallholder farmers grow crops for subsistence and sale, while large commercial farms mainly produce crops for export. Livestock raising is important in some areas and is practised both in a semi-intensive and extensive manner. Within a catchment area, agricultural activities are typically arranged by altitude in the following way. Lowlands with fertile soils are used, often with irrigation, for intensive mechanised agriculture. Here, sugarcane, soybeans, peanuts, sorghum and sesame are produced, along with semi-intensive livestock raising. On the lower mountain slopes (up to 700 m), small- and medium-scale farmers produce basic grains (i.e. maize, beans and sorghum) and livestock. At higher altitudes (700–2000 m), coffee is grown, along with basic grains for subsistence and on occasion fruits and vegetables. Above 2000 m, there are coffee plantations and, in general, the best quality coffee is grown at these relatively high altitudes. In addition to agriculture, plantation forestry supports the livelihoods of local communities in certain parts. Timber is still harvested from natural forests in some areas, mainly in Honduras[12]. Since agriculture and forestry are greatly affected by local climatic conditions, the livelihoods of rural people in the Dry Corridor and Arid Zones are extremely sensitive to climate change. Severe agricultural losses because of climate change, coupled with extensive rural poverty, are major drivers of migration out of the region, especially from Honduras, Guatemala and El Salvador to North America[13].

Catchment areas in the Dry Corridor and the Dominican Republic's Arid Zones provide ecosystem services that are vital for the basic needs and livelihoods of rural people. Tree cover in the catchments maintain water yield and reduce flood risk. The dry forests and pine forests, as well as agroforestry systems (mainly shade-grown coffee), in the upper catchments are particularly important for water yield. However, much of the forest cover in the region has been lost as a result of deforestation through land use changes. Deforestation has been especially severe in the dry forests, with only ~2% of the historical extent remaining intact[14]. Unsustainable harvesting of wood (especially for firewood), fires and bark beetle infestations in pine forests currently threaten the remaining forest remnants in the region. Additional deforestation is also taking place to create space for cattle ranching and crops. As a result of this history of severe deforestation, all the countries in the region have committed to restoring large areas of forest under Initiative 20x20[15].

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[4] UNESCO, 2010. Atlas de zonas áridas de América Latina y el Caribe. Available at: http://documentos.dga.cl/PHI847.pdf.
[5] Cai et al., 2015. ENSO and greenhouse warming. Nature Climate Change, 5: 849.
[6] FAO, 2017. Chronology of the Dry Corridor: The impetus for resilience in Central America. Available at: http://www.fao.org/in-action/agronoticias/detail/en/c/1024539
[7] FAO (2016) Base de Datos Principal AQUASTAT.
[8] As estimated in 2017. Thomas Brinkhoff: City Population, http://www.citypopulation.de
[9] The level of rural poverty is 74% in Honduras and 68% in Guatemala.
[10] Government of Guatemala, 2012. Caracterización estadística República de Guatemala. Available at: https://www.ine.gob.gt/sistema/uploads/2014/02/26/5eTCcFlHErnaNVeUmm3iabXHaKgXtw0C.pdf
[11] Imbach, P., et al., 2017. Climate change, ecosystems and smallholder agriculture in Central America: an introduction to the special issue. Climatic Change. 141:1–12
[12] van der Zee et al. (2012) Estudio de caracterización del Corredor Seco Centroamericano, tomo I, FAO. Available at: http://reliefweb.int/sites/reliefweb.int/files/resources/tomo_i_corredor_seco.pdf
[13] World Food Programme et al., 2017. Food security and emigration: Why people flee and the impact on family members left behind in El Salvador, Guatemala and Honduras. Available at: https://www.wfp.org/content/2017-food-security-emigration-why-people-flee-salvador-guatemala-honduras
[14] WWF, 2018. Ecoregion NT0209. Available at: https://www.worldwildlife.org/ecoregions/nt0209
[15] El Salvador, Honduras, Nicaragua and Panama: 1 million ha per country; Guatemala: 1.2 million ha; Costa Rica: 2.7 million ha. Available at: http://www.wri.org/our-work/project/initiative-20x20

In addition to water catchment degradation, water resources in many parts of the region are impacted on negatively by: i) overexploitation; ii) surface water and aquifer contamination by various economic activities; iii) limited sewerage treatment; iv) modification of the physical structure of water courses[16]; and v) inefficient use of water for human consumption and economic activities. These threats are largely linked to limited information and technical capacity amongst water users and national decision makers for the adoption of water-efficient technologies and approaches. Agriculture is the greatest water user in the region. Cash crops on commercial farms are often irrigated, but most staple food crops are entirely rainfall dependent, especially in the case of smallholder farmers.

**Climate change impacts**
Central America's Dry Corridor is one of the world's most vulnerable tropical regions to the impacts of climate change[17], with Honduras, Nicaragua, Guatemala, the Dominican Republic and El Salvador recognised as being among the fifteen most vulnerable countries in the world to climate events[18]. Past climate trends and future projections show that the region's climate is changing in several ways, including: i) temperatures increasing significantly across the region; and ii) shifting rainfall patterns. In most parts of the Dry Corridor, rain seasons are shortening and the intensity of midsummer droughts[19] is increasing[20]. Droughts that extend over a year or more are also becoming increasingly frequent and severe, mainly because of the increasing frequency and intensity of El Niño events. Concurrently, extreme rainfall events are increasing in frequency and severity because of changes in La Niña, which forms part of the El Niño Southern Oscillation (ENSO) cycle that strongly influences the region's climate. Overall, the Dry Corridor and the Dominican Republic's Arid Zones are predicted to expand because of climate change-related increases in temperatures and drought frequency. Currently, the Dry Corridor encompasses ~64% of the municipalities in Central America's municipalities; it is expected to extend to ~82% by 2050.

These changes in the region's climate are predicted to have the following impacts.

- Decreased harvests of maize, beans, coffee and other important crops, leading to increased poverty, food insecurity and migration from rural areas[21]. This will occur through direct climate impacts (e.g. droughts and floods) as well as indirect impacts (e.g. declines in crop pollinators) on crops[22].
- Changes in the land area suitable for growing specific crops, with declining areas expected for coffee and beans across the region. However, cool highland areas may become more suitable for these crops and this is likely to catalyse forest clearing in the water recharge zones of catchments[23].
- Increased frequency of wildfires, causing further forest degradation and threatening farming, forest-based livelihoods and fuelwood supply[24].
- Increased occurrence and extent of southern pine beetle outbreaks in the natural pine forests of Honduras and Guatemala[25], with negative impacts on forestry and water supply from catchments. Pine beetle outbreaks increase in intensity after wildfires.
- Increased flooding and reduced aquifer recharge because of extreme rainfall events.

These severe climate change impacts are exacerbated by the baseline problems of forest loss and degradation, decreasing water supply and food insecurity. Consequently, comprehensive adaptation interventions are needed to increase the climate resilience of vulnerable rural communities in the Dry Corridor and the Dominican Republic's Arid Zones.

**Alignment with regional and national priorities and institutional context**
The proposed project will contribute to the achievement of international, regional and national targets on climate change adaptation (see Annex 6). It is fully aligned with the national priorities of the seven countries, including their Nationally Determined Contributions (NDCs). Two levels of institutional organisation are particularly relevant to the proposed project. At the supranational level, the seven countries belong to the Central American Integration System (SICA), with the

[16] Global Water Partnership Centroamérica, 2017. La situación de los recursos hídricos en Centroamérica: Hacia una gestión integrada.
[17] IPCC (2014). Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
[18] Kreft et al., 2016. Global Climate Risk Index 2017. Who suffers most from extreme weather events? Weather-related loss events in 2015 and 1996 to 2015. Bonn: Germanwatch e.V.
[19] The rain season in the Dry Corridor lasts from May to October, interrupted in August by a period of lower precipitation known as the mid-summer drought, *canícula* or *veranillo*.
[20] Rauscher et al., 2008. Extension and intensification of the Meso-American mid-summer drought in the twenty-first century. Climate Dynamics 31: 551-571.
[21] Hannah et al., 2017. Regional modeling of climate change impacts on smallholder agriculture and ecosystems in Central America. Climatic Change 141: 29-45.
[22] Imbach et al., 2017. Coupling of pollination services and coffee suitability under climate change. Proceedings of the National Academy of Sciences.
[23] Bouroncle et al., 2017. Mapping climate change adaptive capacity and vulnerability of smallholder agricultural livelihoods in Central America. Climatic Change, 141: 123–137.
[24] Imbach et al., 2012. Modeling potential equilibrium states of vegetation and terrestrial water cycle of Mesoamerica under climate change scenarios. Journal of Hydrometeorology, 13: 665-680.
[25] Rivera Rojas et al., 2010. Cambio climático y eventos epidémicos del gorgojo descortezador del pino Dendroctonus frontalis en Honduras. Forest Systems, 19: 70-76.

preparation of this concept note originating at the request of the Council of Ministers of the Central American Commission on Environment and Development (CCAD) of the SICA. At the subnational level in each country, there are “mancomunidades”, associations of municipalities with legal personality, that provide a practical framework for resource management across municipalities, in particular water management.

**Barriers to climate change adaptation**
The proposed project will address the following barriers to climate change adaptation in the region:
- Limited knowledge and understanding of climate change impacts among decision-makers.
- Limited knowledge and understanding of Ecosystem-based Adaptation (EbA)[26] and other adaptation measures among decision-makers and communities.
- Insufficient implementation of existing policies on climate change adaptation and limited integration of EbA and other adaptation measures into sectoral policies.
- Limited technical capacity within governments and local communities to implement EbA and other adaptation measures.
- Limited knowledge and technical capacity to adopt technologies and approaches for efficient water use.
- Limited access to financial resources for the implementation of EbA and water-efficient technologies in the private sector.
- Limited access to credit for adaptation interventions among vulnerable populations.
- Absence or limited development of economic incentives for investment in sustainable natural resource management and EbA.

For a full description of these barriers, see the Pre-Feasibility Study (Annex 8).

## B.2. Project/Programme description (max. 3 pages)

**Proposed solution:** The project will implement an innovative approach to support and finance the implementation of ecosystem-based adaptation (EbA) strategies to build the climate resilience of vulnerable communities in the Dry Corridor of Central America and the Arid Zones of the Dominican Republic. Project interventions will target three different scales, namely landscapes, enterprises and communities, and will establish three interrelated financing mechanisms, including a. grant fund, a guarantee fund and a credit line. At the landscape level, the project will protect and restore forests, wetlands and agroforestry systems, using grant finance to identify and implement locally appropriate EbA solutions. This will be supported by the establishment of water funds to promote long-term sustainability for landscape level restoration. At the enterprise level, the project will promote climate-resilient agricultural practices by establishing accessible credit lines for EbA, supported by a guarantee fund. At the community or household level, the project will promote the uptake of water-efficient technologies using a combination of grant financing and EbA credit lines supported by guarantees.

The project will harness the growing body of knowledge on effective EbA solutions in the wider region, with impactful EbA strategies and water-efficient technologies being sourced from ongoing projects such as *inter alia* CABEI’s CAMBio II, UN Environment’s MEbA II and IDB’s EcoMicro. By building on this increasing regional expertise on last-mile EbA implementation and financing, the project will provide an integrated system of financing and technical advisory to foster EbA at scale across the Dry Corridor and Arid Zones. The restoration of ecosystems through EbA will improve water security under future climate conditions by improving hydrological flow and the infiltration of rainwater into groundwater reserves, while the use of innovative and efficient technologies will reduce the demand for water[27]. This will be supported by the strong financial mechanisms established by the project. To facilitate the sustainability and upscaling of the proposed interventions, the project will support policy development at regional, national and municipal level, especially for the establishment of financial mechanisms such as water funds or tax subsidy schemes. The knowledge generated through the project will be collected within a regional knowledge hub and disseminated across the region to inform decision-making.

**Intervention sites:** A target catchment area will be selected in each country during the development of the Funding Proposal, i.e. seven catchments in total. Criteria for the selection of intervention sites are provided in Annex 3.

**Component 1: Creation of local and national capacities.**

*Outcome 1. Technical capacity of local government, farmers and rural communities as well as both accredited and non-regulated financial institutions to implement EbA and other adaptation measures increased.* Outcome 1 will be achieved by overcoming the knowledge and technical capacity barriers currently limiting the implementation of EbA across the region. The technical capacity of local governments, commercial farmers and rural communities to implement EbA interventions will be enhanced.

[26] “Ecosystem-based Adaptation refers to “the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change” (Convention on Biological Diversity, 2009)
[27] Concrete technologies or methodologies to be promoted are listed in Annex 8.

Output 1.1. Technical assistance to local governments to adopt and implement climate-resilient land management practices. Land use plans for the seven target catchments will be revised to account for current and future climate change risks, integrating EbA measures and promoting stakeholder engagement into development planning. These revisions will be based on an integrated process of biophysical evaluations, social assessments and economic valuations of natural capital at each site. Secondly, technical capacities of institutions will be strengthened to implement adaptation activities and facilitate access to financial mechanisms and incentives for on-the-ground implementation of sustainable land management (SLM) and EbA practices. In addition, access to finance to implement the plans will be facilitated by sharing information about the financial mechanisms to be implemented under Component 2.

Output 1.2. Technical assistance for farmers and rural communities to implement EbA practices and water-efficient technologies and to develop natural resource-based businesses and alternative climate-resilient livelihoods. This output will be achieved through three activities. Activity 1.2.1 will introduce sustainable land management (SLM) practices to improve the provision of ecosystem services from water catchments, primarily water supply and regulation. These interventions will target the conservation and restoration of at least 36,000 hectares[28] across the seven catchments, including forests, wetland remnants and agroforestry systems. This will be done through three interconnected approaches, namely to: i) conserve and restore forested areas and existing agroforestry systems; ii) establish new mixed plantations of native species and agroforestry systems; and iii) develop sustainable fuelwood sources. Activity 1.2.2 will address the projected increases in water scarcity in the region under future climate conditions by reducing demand for water in the domestic as well as agricultural sectors. Technical assistance will be provided to commercial farmers, smallholder subsistence farmers, local communities and individual households to adopt water- and energy-efficient technologies, including drip irrigation, rainwater harvesting and solar water pumping. To reduce the pressure of fuelwood collection on remnant forests, activities to improve the efficiency of biomass fuel sources will be implemented, including firewood drying, charcoal production, and the introduction of energy-efficient biomass stoves. These energy-efficient technologies will reduce biomass requirements, thereby reducing ecosystem degradation resulting from fuelwood collection, supporting the protection of watersheds in the seven target catchments. Particular attention will be paid to the inclusion of women in this activity, especially considering their active role in water and fuelwood use. Activity 1.2.3. will include provision of training to local communities on how to develop small natural resource-based businesses (NRBs) that will support the implementation and maintenance of EbA interventions, as well as businesses that will benefit from ecosystems goods and services provided through EbA. In addition, access to finance for NRBs will be facilitated by sharing information about the financial mechanisms to be implemented under Component 2. Businesses that support EbA implementation will include the establishment of tree nurseries and the manufacturing, distribution or repair of water-efficient technologies, while businesses that benefit from EbA interventions will include ecotourism and the collection of non-timber forest products (NTFPs). The establishment of NRBs will not only contribute to the upscaling of EbA interventions but will also enhance the resilience of vulnerable communities by providing climate-resilient income-generating opportunities.

Output 1.3. Enhanced capacity of accredited financial institutions and non-regulated financial institutions to finance and re-finance EbA practices and water-efficient technologies. Activities under Output 1.3 will provide interested financial institutions and non-regulated financial institutions (where applicable) with technical support to: i) manage local ad-hoc committees for the financing of FOGESIA (see Component 2), for facilitating access to the guarantee fund and for the management of EbA credit lines; ii) to replicate best practices in last-mile EbA financing as identified in CAMBio II, ARECA[29] and MEbA II; and iii) to leverage and replicate the capacity of IFIs (including commercial banks) to promote and finance large-scale EbA projects as well as small-scale EbA interventions in rural communities. This will include capacity building for financial intermediaries on the concepts, financial methodology, and tools to provide products and services oriented to EbA technologies.

**Component 2: Financing EbA activities at different levels**

*Outcome 2. Capacity of financial institutions to offer financial products and services for EbA investments increased, including access to on-lending funds and mechanisms.* Building on the experiences of the three regional projects of CABEI's CAMBio II[30], UN Environment's MEbA II[31] and IDB's EcoMicro[32], Outcome 2 will be achieved by establishing three interrelated financial mechanisms dedicated to identifying and promoting relevant adaptation activities in the Dry Corridor and the Arid Zones of the Dominican Republic. Financing to local structures will be provided through an existing network of intermediary financial institutions (IFIs) accredited by CABEI. Building on lessons learned and successful solutions from the above-mentioned projects for delivering finance across the "last mile" to end beneficiaries, the proposed project will focus on providing refinancing and risk transfer facilities for EbA activities, promoting an approach of bottom-up identification of EbA interventions and top-down financing for EbA. In this way the proposed project will take advantage

[28] The number of hectares targeted in each project site will be provided in the Funding Proposal.
[29] Accelerating Renewable Energy Investments through CABEI in Central America (ARECA).
[30] GCF FP097: Productive Investment Initiative for Adaptation to Climate Change (CAMBio II). See https://www.greenclimate.fund/projects/fp097
[31] Micro-finance for ecosystem-based adaptation, second phase under development. See http://unepmeba.org/en/
[32] EcoMicro is a Technical Cooperation Program by the Inter-American Development Bank's Multilateral Investment Fund (MIF), co-financed by Global Affairs Canada, the MIF and Nordic Development Fund. See http://www.ecomicro.org/en-us/

of the increasing body of knowledge on last-mile EbA financing in the region and will streamline and strengthen the required refinancing solutions and mechanisms under one roof. Potential EbA activities and water-efficient technologies that could receive financing through these mechanisms are listed in the Pre-Feasibility Study (Annex 8).

<u>Output 2.1. Trust fund established to support bottom-up selection and promotion of local EbA activities through non-reimbursable financing.</u> Activities under Output 2.1 include the establishment of the FOGESIA (Fund for Integrated Social Water Management) trust fund to provide a financial mechanism for CABEI accredited IFIs provide on-the-ground EbA-oriented grant support through institutions such as *mancomunidades,* and municipalities associations, among others. This trust fund will establish two types of standing committees responsible for the allocation of its funding, namely: i) a strategic committee at regional level; and ii) ad-hoc committees at national level that will be managed by accredited IFIs. The fund will support community-based adaptation efforts, the establishment of local water funds incorporating payments for ecosystem services (PES) via seed funding, as well as the local incubation and acceleration of proven EbA technologies, among other activities. This will be supported by creating a framework for IFIs to access the trust fund as well as to set-up and manage local mechanisms (see Component 1). Potentially, once successful EbA solutions are identified, an incentive scheme will be developed to provide cash refunds on loan principals granted by local regulated or non-regulated IFIs (see Output 2.3) in line with defined EbA criteria.

<u>Output 2.2: A guarantee fund is set up and operational to support EbA financing.</u> CABEI will set up and manage a guarantee fund that supports the financing of private investments into EbA at farm, enterprise (including agroindustry) and household level. This will possibly be expanded to the community level, depending on the developed financial products in the above-mentioned regional projects, (for example the promotion of community banks). The EbA activities to be financed will be selected from those detailed in the Pre-Feasibility Study (Annex 8), while other activities may be developed from experiences in the above-mentioned projects. The guarantee fund will provide a first loss mechanism for climate and technology risks to accredited IFIs of up to 10% of approved EbA financing and be directly managed by CABEI. Through this guarantee fund that supports the introduction of EbA finance, interested financial institutions will be incentivised to seek greater traction in this field. Activities under Output 2.2 will provide: i) technical support to CABEI for establishing and managing the guarantee fund; ii) technical support to interested accredited IFIs to access the fund; and iii) the funding for the guarantee fund itself.

<u>Output 2.3. EbA lending facility (“EbA credit line”) established and capacity of IFIs increased to access and channel funds for small- and large-scale EbA investments at farm-, enterprise- and household-level.</u> With growing experiences from the implementation of the three reference projects mentioned above, the capacity of local financial institutions to provide last-mile EbA finance is increasing. A growing concern of participating financial institutions in these projects is access to additional reimbursable funds to support their EbA financing activities. This output will address this need by providing a dedicated EbA lending facility at below-market conditions. IFIs accredited by CABEI will be able to access the EbA credit line for direct on-lending to final customers or financial intermediation to local non-regulated (financial) institutions such as community banks (if applicable), cooperatives or producers associations, among others. While credit risk will be borne by the respective IFIs, potential climate and technology risks will be (partially) transferred via the abovementioned guarantee mechanism (Output 2.2). Activities under this will hence focus on: i) the development and implementation of the credit facility; ii) the replication of successful on-the-ground or last-mile solutions from the three reference projects; iii) the disbursement of funds to IFIs; and iv) the promotion and mainstreaming of the EbA credit line for investors.

**Component 3: EbA mainstreaming and knowledge management**

*Outcome 3: Knowledge and awareness of climate change adaptation and its financing disseminated across the region and integrated into local and national policies.* This will be achieved by enhancing the capacity of decision-makers to assign economic value to ecosystem services, thereby catalysing the development of economic incentives for the adoption of EbA practices. A central knowledge hub will provide a platform for the dissemination of information across the region, supporting decision-makers to adopt an evidence-based approach to planning.

<u>Output 3.1. Enhanced capacity of national- and local-level decision-makers to integrate climate change adaptation and the valuation of natural capital into policies.</u> Activities under Output 3.1 will build the technical capacity of national- and local-level decision-makers to promote climate change adaptation in the Dry Corridor and Arid Zones. This will be achieved by developing, firstly, a natural capital valuation policy and, secondly, a wide range of innovative economic incentives. The capacity of institutions to demonstrate the value and effectiveness of EbA interventions to policymakers will also be strengthened. The effectiveness of interventions will be based on a specific set of criteria that defines the monetary value of increasing: i) the supply of ecosystem goods – including water, fuelwood and timber; ii) production from agroforestry and sustainable plantations – including coffee and timber; and iii) ecosystem services – including improved water quality, enhanced groundwater recharge, soil conservation and increased biodiversity. The project will also mainstream EbA into regional, national and local policies to promote the sustainable management of natural resources in the Dry Corridor and Arid Zones under future climate conditions. Finally, economic incentives – such as water funds and payment for environmental services – will be developed and implemented to promote the uptake of EbA interventions across the region. Specifically, the project will: i) provide technical inputs for the design of incentive programmes; and ii) develop protocols and criteria for the implementation of incentives. The incentive programmes will

draw on best practices and lessons learned from ongoing initiatives, including the: i) “incentivo forestal” in Guatemala; ii) payment for environmental services in Panama and Costa Rica; ii) Water Fund of the city of Quito in Ecuador[33]; and iii) water funds established in cities in Guatemala, Costa Rica and the Dominican Republic[34].

<u>Output 3.2. Regional knowledge hub established for the dissemination of information on EbA in the Dry Corridor and Arid Zones.</u> Activities under Output 3.2 will establish a regional knowledge hub to support decision-making for climate change adaptation, and drought and flood risk management. The information products made available through the knowledge hub will be demand driven and will draw on best practices and lessons learned from governments, municipalities, community-based organisations, water managers and private sector stakeholders. By centralizing the knowledge hub, information will be easily disseminated across the region and decision-makers will be able to learn from the experiences of other countries within the region (e.g. UN Environment REGATTA and other platforms).

[33] This Fund receives contributions from public sources, private organizations and NGOs that are channelled through a mercantile trust legally established as a patrimonial fund of increasing endowment. An independent finance manager invests the capital and the revenues are used to carry out concrete actions (e.g. restoration and conservation of water sources, management, improvement of infrastructure).

[34] http://waterfunds.org/

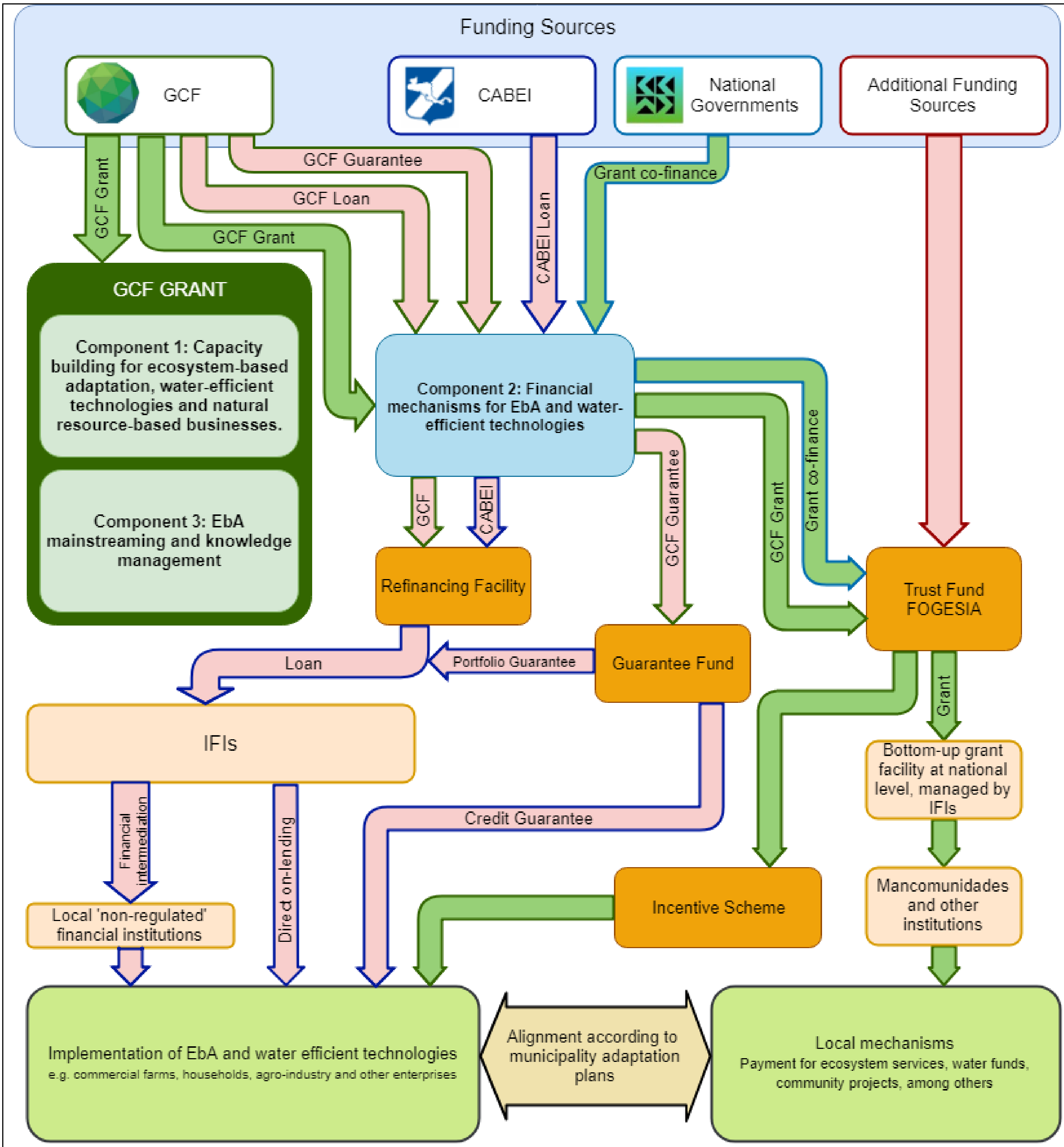



*Figure 1. Overview of project components, funding sources, financial mechanisms and financial flows.*

**Theory of Change**

Climate change projections for the Dry Corridor and Arid Zones predict increasing temperatures and shifting rainfall patterns across the region, with the consequent intensification of the midsummer drought and reduced recharge of groundwater reserves. This is resulting in the expansion of the Dry Corridor, a decreased water supply and an increased frequency and intensity of floods. To overcome this problem, it is necessary to: i) implement integrated catchment management and restore catchments; ii) improve hydrological flow and infiltration of rainwater into groundwater reserves; and iii) reduce demand for scarce water resources. However, several barriers are currently preventing countries in the region from achieving these goals, including limited: knowledge and awareness of climate change and adaptation options; technical capacity to implement EbA interventions; access to financial resources; economic incentives to adopt SLM practices. To overcome these barriers, the proposed project will invest in interventions to: i) increase the technical capacity of local government, commercial farmers and rural communities to implement EbA and other adaptation measures; ii) increase the capacity of financial institutions to offer products and services for EbA; iii) disseminate knowledge and raise awareness of climate change adaptation across the region; iv) integrate EbA into local and national policies and incentives; and iv) implement adaptation interventions across seven catchments in the Dry Corridor and Arid Zones. These interventions will contribute to the achievement of the GCF's Fund-level Outcomes A5.0, A7.0 and A8.0[35], leading to the improved climate resilience of communities in the Dry Corridor and Arid Zones.

**Implementation arrangements:** The implementation mechanisms will be defined in the full proposal considering the nature of the different components of the proposed project, and the strengths of UN Environment and CABEI for the execution of the different activities. A Memorandum of Understanding has been already signed between these institutions. Main stakeholders include the Central American Commission on Environment and Development (CCAD, Spanish acronym), national governments (co-financiers of the project, they are key stakeholders because of their capacity to define and implement policy), "mancomunidades" and municipalities, NGOs, CSOs, financial institutions and private investors as well as academia and research centres that will be involved in Component 3 on knowledge management. Below it is outlined the comparative advantages of the main partners in this proposal:

- **The Central American Bank for Economic Integration (CABEI)** is a multilateral bank for the development of Central America. CABEI´s mission is to promote the economic integration and the balanced economic and social development of its founding member countries, attending and aligning itself with the interests of all of its member countries. CABEI supports public and private development projects that generate jobs and contribute to improving its member countries productivity and competitiveness, as well as contribute to increasing the Region's human development indicators. During the past 56 years, CABEI's support to the Region has resulted in approvals greater than US$30.9 billion and disbursements by more than US$26.2 billion.

- **UN Environment** is experienced in conducting projects that promote adaptation to climate change at global, regional and national levels. Through these projects, UN Environment develops innovative solutions for national governments and local communities to adapt to the current and predicted effects of climate change in an environmentally sound manner. This is achieved by: i) providing methods and tools to support decision-making; ii) addressing barriers to implementation; iii) testing and demonstrating proposed solutions; and iv) enhancing climate resilience by restoring valuable ecosystems that are vulnerable to climate change. UN Environment has accumulated a substantial knowledge base through its experience of implementing previous and ongoing projects. This experience is globally recognised and includes community-based and natural resource management projects. UN Environment also has strong technical and scientific capacity in the field of climate change. Specifically, the agency's work on climate change adaptation focuses on three main areas: i) Science and Assessments; ii) Knowledge and Policy Support; and iii) Building the Resilience of Ecosystems for Adaptation.

## B.3. Expected project results aligned with the GCF investment criteria (max. 3 pages)

**Impact potential**

The proposed project will contribute to the GCF fund-level impacts of: i) increased resilience and enhanced livelihoods of the most vulnerable people, communities, and regions; ii) increased resilience of health and well-being, and food and water security; and iii) improved resilience of ecosystems and ecosystems services. It is estimated that the project will directly benefit ~1.75 million people across seven catchment areas, one in each of the participating countries. These direct beneficiaries represent ~15% of the total population of the Dry Corridor and the Dominican Republic's Arid Zones. The project will also indirectly benefit a large number of people (estimated number to be confirmed in Funding Proposal) across the region by facilitating increased access to credit for natural resource-based businesses, mainstreaming EbA into national policies and building the capacity of governments to implement EbA.

**Paradigm shift**

The proposed GCF project will affect a paradigm shift in the management of catchment areas and water demand in the Dry Corridor and Arid Zones. The shift will see governments promoting large-scale EbA and the private sector (including commercial farmers and entrepreneurs in rural communities) having the financial resources and technical skills to implement impactful adaptation interventions. This will be achieved through a number of innovative approaches. Firstly, to address the increasing water stress of the region under climate change, the project will focus on increasing water supply from water catchments and reducing demand from domestic and agricultural users. The supply of water will be secured through the restoration and sustainable management of forests, wetlands and agroforestry landscapes. Water demand will be managed by promoting water-efficient technologies and approaches. Secondly, the project will catalyse the autonomous upscaling of EbA interventions and water-efficient technologies by combining policy instruments (e.g. economic incentives such as payments for environmental services) with financial mechanisms (e.g. commercial loans and microfinance). Thirdly, the project will promote the development of natural-resource based businesses and alternative livelihoods at the community level. These businesses and alternative livelihoods will be linked to EbA activities and the water-efficient technologies promoted by the project ensuring long-term sustainability. In summary, the project will

[35] A5.0 – Strengthened institutional and regulatory systems for climate responsive planning and development; A7.0 – Strengthened adaptive capacity and reduced exposure to climate risks; A8.0: Strengthened awareness of climate threats and risk reduction processes

catalyse EbA beyond the project's target catchments by incorporating sustainability, scalability, replicability, knowledge-sharing, the creation of an enabling environment for private sector investors, and policy improvements in its design.

Potential for scaling up and replication
The on-the-ground interventions of the proposed project are inherently scalable, since the project will create enabling conditions for policy environment, financial mechanisms and a knowledge base that extend beyond the target catchments and across the region. The project interventions of EbA as well as water- and energy-efficient technologies will be replicable across catchments in the region, since all of the Dry Corridor and Arid Zones have similar climate change adaptation needs.

Potential for knowledge and learning
The proposed project includes several strategies for knowledge-sharing and learning. Training and technical capacity building activities are included in all the project components. The project will disseminate information to private investors, as well as local and national governments of the benefits of EbA and the associated financing mechanisms. A central knowledge hub will be established under Component 3 to compile best practices and lessons learned from the project as well as from relevant past and ongoing initiatives. In addition, the social, economic and environmental impacts of project interventions, including the cost-effectiveness of EbA, will be measured through ongoing monitoring and evaluation. These findings will be disseminated to policymakers and decision-makers to catalyse further uptake of EbA and water- and energy-efficient technologies, as well as the enabling financing mechanisms and economic incentives.

Creation of an enabling environment for EbA and water- and energy-efficient technologies
The proposed project will create an enabling environment for the upscaling and replication of EbA and other adaptation measures in the following ways:

- Human capital will be strengthened by training and knowledge-sharing under Component 1.
- Social capital will be strengthened in particular by facilitating the participation of a wide range of people in land management, efficient water-use approaches and natural resource-based businesses, especially under Outputs 1.1, 1.2 and 1.3.
- Natural capital will be strengthened by restoring and sustainably managing ecosystems, establishing plantations, and promoting agroforestry (Outputs 1.3, 2.1 and 2.2), as well as through the adoption of water-efficient technologies (Output 1.2).
- Economic capital will be increased through large-scale EbA interventions (Components 2 and 3) as they will create and maintain functional ecosystems and agroforestry landscapes that generate products for consumption or sale. The adoption of water- and energy-efficient technologies under Components 1 and 2 will create or improve household and community-level infrastructure assets. Both these aspects will be linked to the promotion of natural resource-based businesses, including creating business opportunities for women and young people.

Contribution to the regulatory framework and policies
The enhanced local evidence-base for EbA that will be created through the knowledge hub and the monitoring and evaluation of project activities will support national and local-level decision-makers to implement policies and incentives for EbA, in particular through improved valuation of natural capital. Under Component 3, existing regulatory frameworks and policies on ecosystem management will be improved both through technical inputs on climate change adaptation and by alignment with effective financing mechanisms for EbA.

**Sustainable development**
The proposed project will contribute to the achievement of the following Sustainable Development Goals (SDGs). The main contributions of the project will be to SDG 6 – Clean water and sanitation, SDG 11 – Sustainable cities and communities, and SDG 13 – Climate action and SDG 15 – Life on land. In addition, the project will contribute to SDG 1 – Poverty reduction, SDG 7 – Affordable and clean energy, SDG 8 – Decent work and economic growth, SDG 9 – Industry innovation and infrastructure, and SDG 10 – Reduced inequalities. The expected positive environmental, economic and social impacts of the project are outlined in the table below.

**Table 1:** Expected positive environmental, economic and social impacts of the proposed GCF project.

| Environmental | Economic | Social |
|---|---|---|
| • Restoration of ~36,000 ha of degraded and climate vulnerable ecosystems through reforestation, forest management, agroforestry systems[36] and sustainable fuelwood practices, resulting in improved ecosystem services[37]. Expected benefits will include:<br>○ enhanced soil fertility through accumulation of organic matter; | • The implementation of EbA and other adaptation measures along with enabling financial mechanisms will result in a reduction of rural poverty in the region, job diversification and improved incomes.<br>• Opportunities to develop natural resource-based businesses and alternative livelihoods, | • Increased financial inclusion, poverty reduction and reduced inequality.<br>• Inclusion of women and youth in novel business opportunities.<br>• Increased food security through the adoption of EbA actions that ensure food security. |

[36] de Sousa et al., 2017. Suitability of Key Central American Agroforestry Species Under Future Climates: An Atlas. ICRAF Occasional Paper No. 20. Turrialba, Costa Rica. Available at: http://www.worldagroforestry.org/atlas-central-america
[37] Harvey et al., 2016. The potential of Ecosystem-based Adaptation to deliver adaptation and sustainable development benefits to smallholder farmers. SBSTA 44, Bonn Climate Change Conference, May 2016.

| | | |
|---|---|---|
| ○ reduced soil erosion;<br>○ enhanced water infiltration and soil moisture retention;<br>○ improved water quality and availability;<br>○ enhanced biodiversity and habitats;<br>○ increased ecosystem services; and<br>○ improved landscape connectivity.<br>• Risk management: conserved or restored wetlands, forests and agroforestry systems act as natural buffers, controlling and mitigating the impact of floods, droughts, extreme temperatures and wildfires.<br>• Maintenance of carbon sinks.<br>• The use of water-efficient technologies will also contribute to improved water quality and availability by decreasing consumption. | considering climate scenarios and market demand for products and services.<br>• Cost savings through the adoption of water efficient technologies.<br>• Access to EbA financing for companies and natural-resource based businesses.<br>• Increased access to credit will reduce financial barriers to implementing adaptation measures and will increase awareness among IFIs and commercial banks of market opportunities.<br>• Savings through avoided loss and damage: Measures such as conserved wetlands, forests and agroforestry systems act as natural buffers against climate events and can be more cost-effective than grey adaptation alternatives such as dams or infrastructure works[38]. | • Maintenance of traditional knowledge complemented with other types of knowledge.<br>• Empowerment and social cohesion enhanced by participative processes.<br>• Positive impacts on migration: improved economic opportunities are likely to reduce rural outmigration by young people.<br>• Increased water security of households through the adoption of water-efficient technologies such as rainwater harvesting systems.<br>• Enhanced sustainability of local livelihoods, *inter alia* through the use of agroforestry species according to their suitability under future climate conditions. |

**Needs of the recipients**
The seven beneficiary countries are extremely vulnerable to the impacts of climate change, particularly considering the high poverty levels in the region (see Section B.1). In this context the countries have limited financial resources without donor support to: i) implement large-scale EbA interventions at the landscape level; ii) implement small-scale water- and energy-efficient technologies at community or household level; iii) establish effective financial mechanisms that develop climate-resilient, natural resource-based livelihoods; and iv) strengthen policies, institutions and knowledge sharing for the implementation of EbA and economic incentives for EbA. At the local level, communities do not have the financial resources, knowledge base, or technical capacity to: i) develop, implement, and maintain EbA and other adaptation measures; ii) co-ordinate the frequent, cross-sectoral, multi-stakeholder engagement that is necessary for EbA and other adaptation interventions; and iii) capitalise on EbA interventions by generating new private income streams from the ecosystem goods and services produced by restored climate-resilient ecosystems.

**Countries ownership**
The proposed project will contribute to the achievement of regional and national targets for climate change adaptation. At a regional level, the project is aligned with the policies, strategies and programmes of the Central American Integration System (SICA). At a national level, the project is aligned with the countries' priorities for climate change adaptation, as expressed in government policies and strategies and their NDCs. Please refer to Annex 6 for further information. In addition, there is strong political support for the project at both regional and national level, as described in Section B.4. A technical consultation process with government representatives from the different countries on adaptation priorities was also undertaken in 2016, 2017 and 2018 (see Annex 7 for further information).

**Efficiency and effectiveness**
The proposed GCF project will achieve cost-effectiveness primarily by using an EbA approach. The cost-effectiveness of an EbA approach to forest management is well-documented in the scientific literature[39,40]. EbA is an effective way to build the climate-resilience of communities who are reliant on ecosystem goods and services. Moreover, EbA requires small investments compared to the long-term environmental and socio-economic benefits it provides[41]. Small-scale water- and energy-efficient technologies are also proven to be cost-effective (see Annex 8: Pre-Feasibility Study). Furthermore, the project will scale-up successful existing interventions and will integrate adaptation activities into complementary existing programmes. The program will also build on existing relationships and infrastructure (e.g. "mancomunidades" and CABEI-accredited financial entities), and will share resources with and draw on the experiences of UN Environment and CABEI, which have implemented successful projects in the same or similar contexts and countries. The established, robust financial management processes of the implementing partner/s will be used by the project to ensure maximum financial efficiency. The effectiveness of project interventions will be ensured through strong monitoring and evaluation, including monthly and biannual reporting of indicators. The financial model for the project will be developed in collaboration with CABEI during the preparation of the Funding Proposal.

**B.4. Engagement among the NDA, AE, and/or other relevant stakeholders in the country (max ½ page)**

This Concept Note was prepared at the request from the Ministry of Environment and NDA in El Salvador[42], on behalf of the CCAD. Four meetings have been held by the CCAD during which the Ministers of Environment of the seven participating countries have established strategic priorities to guide the design of the proposal, including: i) the provision

[38] De Groot et al,.2013. Benefits of Investing in Ecosystem Restoration. Conserv Biol 27:1286–1293.
[39] Colls A, Ash N, Ikkala N (2009) Ecosystem-based Adaptation: a natural response to climate change. International Union for Conservation of Natural Resources (IUCN), Gland, Switzerland.
[40] Munang R, Thiaw I, Alverson K, et al (2013) Climate change and Ecosystem-based Adaptation: A new pragmatic approach to buffering climate change impacts. Curr Opin Environ Sustain 5:67–71.
[41] Jones HP, Hole DG, Zavaleta ES (2012) Harnessing nature to help people adapt to climate change. Nature Climate Change 2, 504-509.
[42] This project idea was identified through the UN Environment/UNDP/ WRI GCF Readiness Programme

of water as a central axis for adaptation; ii) the application of the EbA approach; iii) the search for synergies and co-benefits between adaptation and mitigation; and iv) the consideration of transformational alternatives for economic activities that cannot be adapted to the changing climate by technological adjustment. Furthermore, a broad stakeholder consultation process was undertaken at technical level, including six national workshops. Comments and suggestions from the focal points of the participating countries were also included, through a consultation process facilitated by UN Environment and the Executive Secretariat of the CCAD. Finally, contributions from representatives of governmental and non-governmental organizations based in the region were collected during the regional workshop "Climate solutions through technology and financing in Central America" organised by UN Environment, CTCN and CABEI. For a detailed description of these participation processes and the list of people consulted, see Annex 7. Further stakeholder consultations will be conducted during preparation of the Funding Proposal, for in-depth definition of project outputs, activities and implementation modalities. These consultations will ensure public and private investments are channelled to activities and projects that have the necessary social support.

## C. Indicative Financing/Cost Information (max. 3 pages)

### C.1. Financing by components (max ½ page)[43]

| Component | Indicative cost (USD) | GCF financing | | Co-financing | | |
|---|---|---|---|---|---|---|
| | | Amount (USD) | Financial Instrument | Amount (USD) | Financial Instrument | Name of Institutions |
| Component 1: Creation of local and national capacities. | 25,220,365 | 6,995,365 | Grant | 18,225,000 | Grant | TBD |
| Component 2: Financing EbA activities at different levels | 240,287,120 | 40,287,120 | Grant (Trust/guarantee funds) | TBD | TBD | TBD |
| | | 120,000,000 | Loan | 80,000,000 | Loan | TBD |
| Component 3: EbA mainstreaming and knowledge management | 11,945,120 | 11,945,120 | Grant | TBD | TBD | TBD |
| Indicative total cost / activities (USD) | 277,452,605 | 179,227,605 | | 98,225,000 | | |
| Project management costs (5%)[44] | 8,133,648.5 | 8,133,648.5 | Grant | | | |
| TOTAL | 285,586,253.5 | | | | | |

### C.2. Justification of GCF funding request (max. 1 page)

The governments of the seven participating countries have insufficient resources, knowledge and technical capacity to promote innovative natural resource-based adaptation interventions. The resources required to effect a paradigm shift in the region's approach to natural resource management exceed those that can be supplied through public sector financing. The economic situations of the participating countries are outlined in the table below.

| Country | Inequality index (Gini)[45] | Economic status[46] | Public debt to GDP[47] | Economic growth (GDP growth annual%)[48] |
|---|---|---|---|---|
| Costa Rica | 48.7 | Upper middle income | 66.2 | 4.3 |
| Dominican Republic | 45.3 | Upper middle income | 47.1 | 6.6 |
| El Salvador | 40.0 | Lower middle income | 68.1 | 2.4 |

[43] These costs are indicative, based on the latest trends in the region, considering an increased interest of financial institutions to finance ecosystems-based adaptation and the success stories of initiatives such as CAMBio I + II, ARECA, MEbA II, among others. Based on these trends, it is expected that financial institutions, in conjunction with suppliers of EbA solutions (inputs, technologies, training / technical assistance), will seek dissemination in other areas of the dry corridor and arid zones of the Dominican Republic. The specific amount of the program will be defined on the basis of more concise and in-depth studies during the preparation of the full proposal.

[45] Nicaragua and Guatemala: estimations from CIA Factbook, 2014. Available at: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2172rank.html. Data for other countries from World Bank, 2016. Available at: https://data.worldbank.org/indicator/SI.POV.GINI
[46] UN World Economic Situation and Prospects, 2017. Available at: https://sustainabledevelopment.un.org/content/documents/25012017wesp_full_en.pdf
[47] CIA Factbook. 2017 estimations. Available at: https://www.cia.gov/library/publications/the-world-factbook/rankorder/2186rank.html source.
[48] World Bank data, 2016.

| | | | | |
|---|---|---|---|---|
| Guatemala | 53.0 | Lower middle income | 30.1 | 3.1 |
| Honduras | 50 | Lower middle income | 51.9 | 3.6 |
| Nicaragua | 47.1 | Lower middle income | 46.0 | 4.7 |
| Panama | 50.4 | Upper middle income | 38.8 | 4.9 |

Given this constrained fiscal space, there are limited opportunities to implement climate change adaptation interventions in the region without additional assistance. While scope has been identified for partial loan financing at the regional level, the extent of public debt in the individual countries constrain their borrowing capacities with regards to global recommended borrowing limits. GCF grant financing is therefore requested to build the capacity of governments to implement climate change adaptation interventions and administer loan financing to foster long-term resilience.

### C.3. Sustainability and replicability of the project (exit strategy) (max. 1 page)

The sustainability and replicability of the project will be ensured through four elements in the project design: policy support; financial instruments; private sector involvement; and capacity development. The details of each of these elements are described below.

- **Policy support:** Monitoring, evaluation, and organisation of lessons learned and best practices from project activities will provide national and local-level decision-makers with relevant knowledge and information to adopt climate-resilient policies and incentives. Existing regulatory frameworks and policies for ecosystem management and restoration will be reviewed to include information on appropriate financial mechanisms for implementation of adaptation interventions.
- **Financial instruments:** By creating a framework for the valuation of ecosystem services, the project will facilitate the quantification of long-term economic benefits of large-scale EbA interventions. The provision of economic incentives and financial mechanisms will ensure that potential beneficiaries are able to sustain and scale-up project interventions independently, while also promoting further investment in EbA (see Annex 8, Section 10 for more details).
- **Private sector's involvement:** The financial instruments established under Component 2 will provide incentives for the private sector to invest in EbA, while activities under Component 3 will build awareness of the private sector to the potential benefits of climate change adaption.
- **Capacity Development:** Component 3 is specifically designed to ensure the information generated through project activities is disseminated across the region to build the capacity of institutions to implement climate change adaptation interventions, building a strong knowledge sharing platform. Furthermore, capacity building and technical assistance activities under Component 1 will strengthen the project partners' capacities to sustain the results and achievements of the project in the long term.

## D. Supporting documents submitted (OPTIONAL)

☒ Map indicating the location of the project/programme

☒ Diagram of the theory of change

☐ Economic and financial model with key assumptions and potential stressed scenarios

☒ Pre-feasibility study

☐ Evaluation report of previous project

☒ Results of environmental and social risk screening

**Self-awareness check boxes**

| |
|---|
| Are you aware that the full Funding Proposal and Annexes will require these documents? Yes ☒ No ☐<br><br>• Feasibility Study<br>• Environmental and social impact assessment or environmental and social management framework<br>• Stakeholder consultations at national and project level implementation including with indigenous people if relevant<br>• Gender assessment and action plan<br>• Operations and maintenance plan if relevant<br>• Loan or grant operation manual as appropriate<br>• Co-financing commitment letters |
| Are you aware that a funding proposal from an accredited entity without a signed AMA will be reviewed but not sent to the Board for consideration? Yes ☒ No ☐ |

**List of Annexes**

**Annex 1 – Map of the Central American Dry Corridor and the Dominican Republic's Arid Zones**

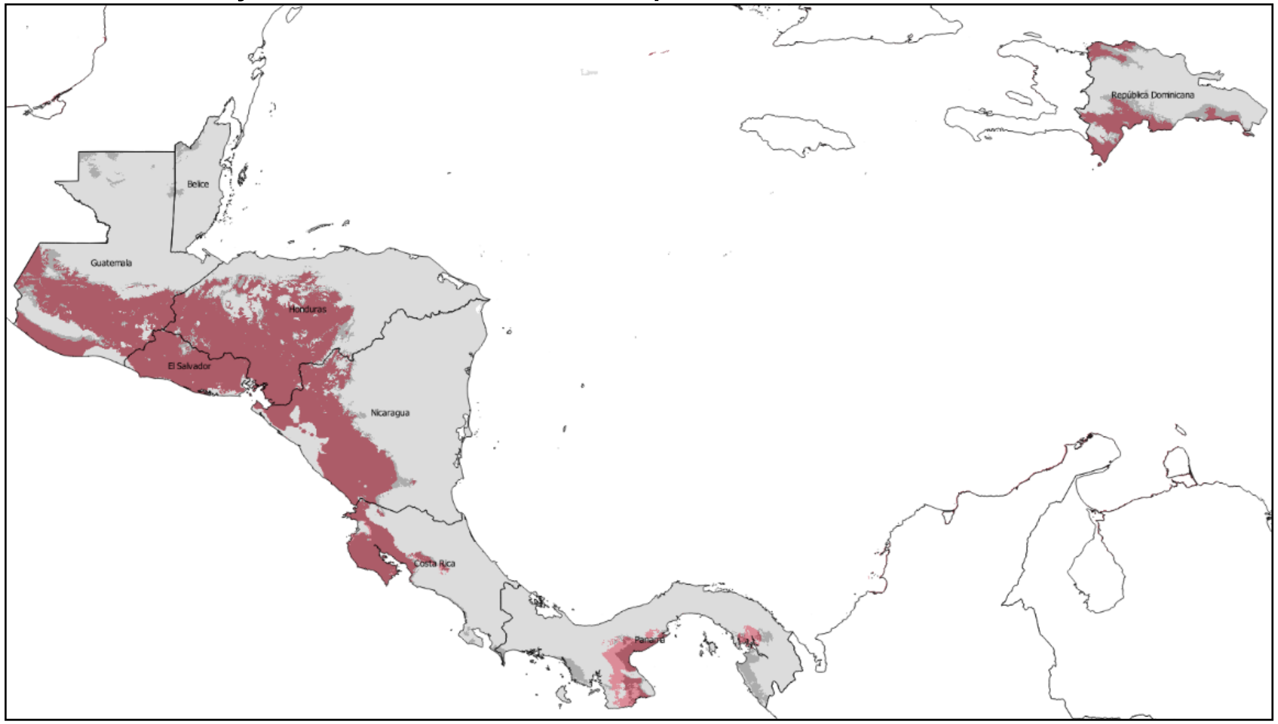



Figure 1. Current extent (red) and projected extent in 2050 (red and grey) of the Central American Dry Corridor and the Dominican Republic's Arid Zones[49]. The Dry Corridor is expected to expand from covering 64% of Central American municipalities to 85% by 2050. Map based on calculations by the International Center for Tropical Agriculture (CIAT), using the current climate distribution[50], future scenarios[51] and evapotranspiration estimations[52,53].

[49] Projected 2050 extent based on Representative Concentration Trajectory (RCP) 8.5, since according to the latest Emissions Gap Report published by UN Environment (2017), national commitments will only reach one third of the emissions reduction required by 2030 to meet current mitigation objectives.

[50] Hijmans et al., 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology, 25: 1965-1978.

[51] Ramirez-Villegas & Jarvis, 2010. Downscaling Global Circulation Model outputs: The Delta Method. Decision and Policy Analysis Working Paper No. 1, CIAT. Available at: http://ccafs-climate.org/downloads/docs/Downscaling-WP-01.pdf

[52] Allen et al., 2006. Evapotranspiración del cultivo: guías para la determinación de los requerimientos de agua de los cultivos. FAO, Rome; Droogers & Allen, 2002. Estimating reference evapotranspiration under inaccurate data conditions. Irrigation and Drainage Systems 16: 33-45.

[53] The calculations consider that a month is dry when the relationship between precipitation and evapotranspiration is less than 0.5.

**Annex 2 - Examples of EbA and other adaptation measures to be implemented by the program**

| | Measure | Description and considerations in the framework of this proposal | Adaptation benefits and other co-benefits |
|---|---|---|---|
| | | ***Large-scale Ecosystem based Adaptation*** | |
| 1. | Ecological restoration of **forest** and **wetlands remnants** (Rey Benayas et al. 2009, Chazdon et al. 2017, Clewell & Aronson 2007) | Ecological restoration can be defined as the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. In the context of this proposal, this measure includes activities in **forest** and **wetland** remnants[54].<br>• ***Passive restoration*** (to cease the damaging activity). Includes activities such as installing fences for livestock in riparian areas, to allow the secondary succession process to recover riparian forests, or the recovery of the hydrological flow of estuaries through the removal of sediments, to induce the natural regeneration of mangroves.<br>• ***Active restoration***: (mechanisms to facilitate the ecological succession or tree cover establishment), e.g. seeding and planting trees (including fruit trees), and fire management for natural forests.<br>Other adaptation measures presented in this table are also related to ecological restoration and sustainable forest management (see measures 2, 3 and 4), provide inputs for restoration initiatives (n°5, mixed nurseries) or relates to specific restoration practices (n° 6, firebreaks). | Benefits include:<br>• Reduced soil erosion as a result of binding action of roots as well as increased canopy cover.<br>• Increased infiltration of rainwater into soils, relative to degraded soil, thereby increasing water security under conditions of climate change.<br>• Carbon sequestration and storage through increased tree cover and soil conservation.<br>• Reduced vulnerability to climate-related hazards, particularly landslides.<br>• Enhanced biodiversity and improved landscape aesthetics, thereby supporting the development of ecotourism businesses.<br>• Increased generation of useful or commercially valuable products such as timber and multiple non-timber forest products, thereby improving household income and food security.<br>• The economic benefits of ecosystem and biodiversity services generated by 1 ha of tropical forest have been valued at more than US$ 16,000, with an average of US$ 6,120 in 2007 (TEEB 2009). |
| 2. | Sustainable production of wood and **firewood** | • This measure refers to the sustainable production of firewood in natural forests based on the management of native species with re-sprouting capacity[55] and plantations of species that provide firewood and other goods.[56]<br>• This measure should be coupled with the promotion of efficient biomass stoves. | • Benefits on ecosystem services and biodiversity on provision, regulation and support (Same as above). |
| 3. | Mixed **plantations** with native species | This measure refers to reforestation with native species in **natural forests** and **plantations**, using:<br>• Fast growing species of commercial value.[57]<br>• Slow growing species for precious hardwood production[58]. | • Benefits on ecosystem services and biodiversity on provision, regulation and support (Same as above). |

[54] Although the classic unit for ecological restoration is an ecosystem, the spatial scale can be expanded to a landscape or watershed. At this scale, the process considers a mosaic of interacting ecosystems (including natural forests and wetlands, but also plantations, agroforestry systems and other agricultural systems).
[55] Mainly *Quercus* spp.
[56] A good example is *Gliricidia sepium*. *Gliricidia* fix nitrogen in the soil, is easily propagated, fast growing and provides fodder.
[57] E.g. Cedrela odorata (cedro, Spanish cedar), *Cordia alliodora* (laurel, salmwood; Spanish elm) and *Schizolobium parahyba* (gallinazo, Brazilian fern tree).
[58] E.g. *Dalbergia* sp (cocobolo.) and *Astronium graveolens* (ronrón).

| | Measure | Description and considerations in the framework of this proposal | Adaptation benefits and other co-benefits |
|---|---|---|---|
| 4. | Recovery or establishment of **agroforestry systems** (Somarriba et al. 2014, The World Bank Group, CIAT, CATIE (2014) | • Agroforestry systems can be defined as an integrated approach to the production of trees and of non-tree crops or animals on the same piece of land.<br>• In the context of this proposal, agroforestry systems to protect water recharge zones refer mainly to **shade-grown coffee**. In some countries (e.g. El Salvador) these agroforestry systems are the only/main type of tree cover in water recharges zones.<br>• This measure refers to both the **recovery** of existing agroforestry systems and the **establishment** of new ones, through **improved agroforestry practices** such as the renewal of coffee plantations with coffee varieties resistant to new climate conditions, pests and diseases, the inclusion of fruit trees for income diversification, or the inclusion of shade trees species with commercial value[59] for the transition from full-sun coffee cultivation to shade-grown coffee.<br>• Dispersed trees in pastures is a common **silvopastoral** system in the region. It can be considered part of the adaptation actions, but not in critical areas for regulation of the water flow, as they provide less soil protection. | Agroforestry can improve the resilience of agricultural production to current climate variability as well as long-term climate change through the use of trees for intensification, diversification and buffering of farming systems.<br><br>In particular, benefits include:<br>• Improved binding of soils by roots, thereby preventing erosion and maintaining topsoil during erratic, heavy rainfall.<br>• Increased provision of food – even under conditions such as drought – thereby increasing food security.<br>• Increased soil fertility as a result of nutrient-rich leaf litter and nitrogen fixation.<br>• Increased availability of fodder for increased resilience of animal husbandry.<br>• Increased incomes through product diversification (e.g. firewood, wood and fodder), certification, and payments / compensation for ecosystem services. |
| 5. | Firebreaks | • Firebreaks are a common practice in the context of ecosystem restoration and conservation and sustainable forest management to prevent forest fires from spreading before they damage ecosystems, croplands or infrastructure.<br>• In Guatemala and Honduras, firebreaks are also part of the practices to manage the Pine beetle outbreak. | • Firebreaks protect material, agricultural and ecosystem services; hence their benefit is related to their effectiveness at providing protection. E.g., a 400 m firebreak would protect 1 ha of forest.<br>• Firebreaks construction could represent an opportunity for generate temporal incomes and dissemination of the benefits of ecosystem services and other adaptation measures |
| 6. | Mixed nursery | • Mixed-plant nurseries are agronomic facilities where plants are germinated and cultivated under controlled conditions of light and moisture.<br>• Their main purpose is to reproduce resilient native species for reforestation or restoration (see Measures 1, 2, 3 and 4) and can contribute to diversify income through the sale of high-quality timber or fruit trees (such as avocado). | • Rehabilitating the forest ecosystem where the nursery is established decreases the pressure on timber resources, contributes to recover soil fertility and to retain moisture.<br>• Mixed nurseries are an opportunity for green business in combination with restoration, sustainable forest management and agroforestry systems: E.g. 13,500 timber trees, 6,750 fruit trees, and other purposes species (such as ornamental plants), after a period of three years, could generate an approximate income of US$ 31,000. |
| | | ***Water- energy-efficient technologies*** | |

[59] Such as *Cordia alliodora*

| | Measure | Description and considerations in the framework of this proposal | Adaptation benefits and other co-benefits |
|---|---|---|---|
| 7. | Efficient biomass stoves (Lambe & Ochieng 2015, Soluciones Prácticas 2015) | • The different models of efficient biomass stoves are made with local supplies. They use less biomass (firewood) than traditional stoves to obtain energy and eliminate smoke from the kitchens.<br>• While there is a long history of improved cookstove programs in Central America, many of these initiatives have not been adopted in a sustained way, due to the poor performance of cookstoves in the field, the absence of quality standards, and the lack of attention to the needs of the end users. Hence, evaluation of previous programs will be important for the design of the measure. | • Maintenance of soil fertility (The charcoal obtained serves to restore the soil, which increases its productivity)<br>• Reduced greenhouse gas emissions (The efficient combustion of the gasifier reduces the emissions of $CO_2$ in 3 tons per family unit per year)<br>• For people who cook indoors with wood in an unventilated or partially ventilated space, the introduction of efficient biomass stoves is a significant health benefit. |
| 8. | Firewood drying and charcoal production (CATIE 2015) | • This measure consists of using solar and half orange ovens to obtain dry firewood and charcoal, respectively, with better quality standards. The half orange ovens, built with bricks, guarantee a process of carbonization more efficient and economic than the artisanal production, based on pits dug in the ground.<br>• The experience in Nicaragua shows that dry firewood and quality charcoal could be part of profitable value chains. | • Half-orange ovens increase the production yield by 10% and produce higher quality charcoal.<br>• The reduction of smoke and risk of burns improve the working conditions of the producers.<br>• Dry firewood produces less smoke and has fewer biological attacks and consequently can be sold at a higher price. It also reduces transport costs.<br>• The collection of wood for drying and the production of coal allows controlling its legal origin, if it comes from forests with authorized management plans. |
| 9. | Rainwater collection - small reservoirs | • This practice consists of collecting rainfall from ground surfaces using micro-catchments to divert or slow runoff so that it can be stored before it can evaporate.<br>• The second option consists of collecting flows from a river, storm or other natural watercourse which can be stored and used to improve soil moisture. | • Reservoirs support the restoration of natural ecosystems and agriculture due to increased relative humidity and access to water.<br>• Carbon capture through increased tree cover and soil conservation.<br>• A 500 $m^3$ reservoir can meet the water needs for 80 animals or up to 2500 $m^2$ of vegetable crops during a period of low water levels. Placement in the marketplace of the 60,000 vegetable plants produced would be equivalent to an annual income of US$ 3,000 to 5,000. |
| 10. | Rainwater harvest systems from rooftops (GWP Centroamerica 2017b) | • This basic technology involves the collection of rainwater from rooftop catchments and diversion to a storage reservoir (tank) for later use. | • The availability of water within the household implies an average saving of 30% of women's time (INCAP, 2016), which can represent between four and five hours a day depending on the place (PAHO 2010). |
| 11. | Solar photovoltaic water pumping systems (Chandel et al. 2015, Foster & Cota 2014) | • This technology convert sunlight into electricity to pump water for community water supply and irrigation.<br>• They are relatively simple, reliable, cost competitive, and low maintenance.<br>• There is a good match between seasonal solar resource and seasonal water needs (dry season). | • Reduction of expenses: There have been dramatic price reductions in PV modules over the past decade, by over 80%, while prices for competing gasoline or diesel fuel have risen by over 250%.<br>• Reduced greenhouse gas emissions (minimizes the dependence on diesel, gas or coal-based electricity). |

| | Measure | Description and considerations in the framework of this proposal | Adaptation benefits and other co-benefits |
|---|---|---|---|
| 12. | Drip irrigation (Netherlands Water Partnership 2005) | • This technology involves dripping water onto the soil at very low rates.<br>• Drip irrigation reduces water consumption and loss of soil and nutrients.<br>• Simplified systems that use local supplies can have very low investment costs. | Benefits include:<br>• Erosion prevention and maintenance of soil fertility<br>• Increased resilience to drought due to efficient use of scarce water resources (decrease in water consumption by up to 70%).<br>• Increased quality and quantity of products due to efficient use of fertilizers and controlled supply of nutrients with irrigation water.<br>• Increase in income of up to 35% due to improvements in productivity. |
| 13. | Ceramic filters to purify water (CF+S 2006) | • This is a technology to eliminate microbiological components of water.<br>• An experience developed in Nicaragua shows the importance of quality controls and training for local manufacturers. | • Given the reduction in availability of drinking water in the proposal area, and its degree of contamination, it is considered a complementary measure of adaptation.<br>• Increase in local labour sources and incomes<br>• Reduction of diarrheal diseases |
| 14. | Ecotourism | • Economic development tool based on conserving and sustainably using existing ecosystem services and making them available to visitors.<br>• In the context of this proposal, low-scale local tourism in natural ecosystems or in agricultural areas (agrotourism) that allows visitors to appreciate nature, and the values and cultural traditions associated with it, and purchase sustainable products, could be promoted. | • Ecotourism projects promote the conservation of natural areas and agroforestry systems while safeguarding their biological and cultural diversity.<br>• Local population is benefited with around 30% of jobs generated by ecotourism projects.<br>• This type of tourism is based on local resources, is low impact and offers socio-economic benefits to the populations responsible for conserving the goods or services promoted. |

**Annex 3. Criteria for the selection of intervention sites**

Project interventions will be implemented within a single basin in each of the seven participating countries. The identification and selection of target intervention sites will be based on a set of objective criteria[60] related to: i) climate change vulnerability, (including biophysical criteria such as exposure, sensitivity of natural systems, and adaptive capacity of local population); ii) relevance or representativeness for each country.

From the previous initial consultation process (see details in annex 7), it has been possible to define a broad area where the intervention sites will be located:

Table. 1. Preliminary intervention areas defined by workshops in 2016.

| **Country** | **Departament or Province** | **Number of municipalities** |
|---|---|---|
| Costa Rica | Guanacaste | 13 |
| El Salvador | San Miguel, Usulután, La Unión, Ahuachapán, Santa Ana, Morazán | 50 |
| Guatemala | El Progreso, Zacapa, Chiquimula | 13 |
| Honduras | La Paz, Intibucá y Lempira | 8 – 24 |
| Nicaragua [61] | To be Determined | TBD |
| Panamá | Coclé, Herrera y Los Santos | 4 |
| República Dominicana | Dajabón, Monte Cristi, Santiago Rodríguez, Valverde | 14 |

These sites were selected considering their location in the dry corridor, risk and vulnerability to climate change, particularly, taking into account a. exposition (especially drought) and b. vulnerability factors: i. environmental vulnerability to deforestation and degradation; ii. Social vulnerability, particularly linked to poverty; and c. economic, considering livelihoods impacts in the local population.

A three-step process will be applied using these criteria to select specific project sites. These steps are described below.

*Step 1 – Identification of potential catchments in each target site.* The first step is to identify potential candidate catchments for project implementation. This will be based on a simple set of criteria to be defined during the feasibility study. Potential criteria include classification of eligible catchments based on: ii) a threshold for geographic extent and hydrological flow; and iii) a threshold for population coverage obtaining water from the basin. These criteria will eliminate catchments that are too small or do not support a large enough population to elicit transformational change in their respective countries.

*Step 2 – Detailed vulnerability assessments:* For each of the catchments identified in Step 1, a detailed vulnerability assessment will be conducted to assess the potential impacts of climate change and classify the environmental and socio-economic vulnerability. These assessments will be based on biophysical information available through local and global datasets. Catchments will be ranked according to vulnerability scores calculated on the set of criteria outlined below.

[60] It should be noted that the proposed criteria and indicators are tentative and should be confirmed after the evaluation of available and consistent information during the feasibility study.

[61] There was no workshop activity in 2016 in Nicaragua. In this country, the sites will be defined in 2019.

1. Current and potential impact of climate change. Water availability rates (for example, Water Scarcity Index, Water Stress Index, Water Resource Vulnerability Index and the Water and Poverty Index) are reported as aggregated data by country and do not include the effects of climate change. These values will be used to define the baseline water stress within each catchment. Climate models will then be used to determine the potential impacts of climate change on the hydrological ecosystem services of Central America, extended to the Dominican Republic[62].
2. Processes that affect vulnerability to climate change. Non-climate related factors such as ecosystem degradation that influence the vulnerability of local communities within a catchment to the impacts of climate change will be assessed.
3. Adaptive capacity. The adaptive capacity will be estimated through indicators that reflect the availability of resources that people, and their organizations have to adapt to climate change.

Table 2: Criteria and indicators for the selection of project sites.

| Dimension | Criteria | Suggested proxy indicators |
|---|---|---|
| 1. Current and potential impact of climate change | Availability of ecosystem services | Cubic meters of water per person (and change between 2000 and 2050) |
| 2. Degradation of ecosystems | Remaining ecosystems | Proportion of forest cover |
| | Degradation processes | Number of hot spots or fires |
| | Consequences of ecosystem degradation | Frequency of flooding |
| 3. Adaptive capacity | Basic needs | Index of Unsatisfied Basic Needs - Poverty |
| | Access to technical assistance, credits and other resources | Proportion of water management organizations receiving technical assistance or loans<br>Proportion of the Economically Active Population (EAP) employed in non-agricultural activities |
| | Access to information | Road density and telecommunication coverage |
| | Labour force | Demographic dependency ratio (relationship between population of working age and dependent population) |

*Step 3 – Selection of target catchments:* The third step is to select a single catchment for each country based on the vulnerability score and the relevance of the catchment for the country. Relevance can be estimated in two respects.

1. Opportunity will be estimated through the representativeness of the catchment at national level (defined by the institutional diversity and the presence / diversity of livelihoods) and the possible complementarity with other initiatives ongoing or implemented in the catchment.

~~2.~~ Institutional capacity at the local level:~~-~~factors related to institutional presence in the area, presence of NGOs, presence of incentives schemes, and social and productive organizations will be taken into account for the final selection.

Table 1: Criteria and indicators for the selection of project sites.

| Dimension | Criteria | Suggested proxy indicators |
|---|---|---|
| 1. Opportunity | Representatively at national level | Institutional diversity<br>Presence / diversity of livelihoods |
| | Complementarity with other initiatives | Existence of complementary initiatives<br>Existence of overlapping initiatives or duplication of efforts |

[62] If it becomes necessary to estimate the potential impact of climate change based on the results of existing studies, it will be assumed that, within each country, the territories included in the Dry Corridor or Arid Zones have a similar exposure to the processes of climate change (frequency of extreme climatic events, increase in temperature, changes in precipitation patterns).

| **Dimension** | **Criteria** | **Suggested proxy indicators** |
|---|---|---|
| 2. Institutional capacity at the local level | | |
| | Governance | Administrative authorities, mechanisms, process and institutions in place, especially to manage water and other key resources for adaptation |
| | | Presence and strength of key actors as community organizations, microfinance institutions, etc. |

*Step 4 – Fine scale selection of intervention sites:* The final step is to identify and map the exact sites within each targeted catchment for on-the-ground implementation of project activities. Detailed criteria for site-specific interventions is being refined by a group of consultants as part of the full feasibility study.

**Annex 4 – Theory of change**

**Summary**
The Theory of Change for the proposed project is outlined below. The underlying problems and barriers, as identified through stakeholder engagement and literature review, are mapped in a problem tree analysis (Figure 1). The proposed solutions to these problems through the project's outcomes and activities are presented in Figure 2. The overall Theory of Change for the project is summarised in Figure 3.

**Baseline problems**
- Poverty is widespread in the region and is particularly prevalent in rural areas.
- Agriculture, which is central to the rural economies, is extremely sensitive to climate impacts such as droughts.
- Most of the forest cover in the region has already been lost. The remaining forested areas are vital for the supply of ecosystem goods and services, in particular water provisioning.
- Forest remnants are being degraded by unsustainable wood harvesting (especially for firewood), fires and bark beetle infestations in pine forests. In addition, further deforestation is occurring through clearing for cattle ranching and crops. Tree cover is also being lost through the conversion of agroforestry systems to other land uses.
- Water resources in many parts of the region are negatively impacted by: i) over-extraction; ii) surface water and aquifer contamination; iii) limited sewerage treatment; and iv) modification of the physical structure of water courses.
- Water security is also threatened by the inefficient use of water for human consumption and economic activities.

**Climate change problem**
- Central America's Dry Corridor is one of the world's most vulnerable tropical regions to climate change. The region's climate has been observed and is predicted to change in the following ways:
    - increased temperatures;
    - shortening of the rain seasons and increased intensity of the midsummer drought;
    - increased frequency and severity of droughts, as a result of increasingly frequent and intense El Niño events;
    - increased frequency and severity of extreme rainfall events; and
    - expansion in the extent of the Dry Corridor and the Dominican Republic's Arid Zones.
- These changes in the climate are predicted to lead to:
    - decreased harvests, food insecurity and migration from rural areas;
    - declines in the areas suitable for growing important crops such as beans and coffee;
    - increased frequency of wildfires;
    - increased occurrence and extent of southern pine beetle outbreaks in natural pine forests; and
    - increased flooding and reduced aquifer recharge because of extreme rainfall events.

**Solution**
The project will implement an innovative ecosystem-based adaptation (EbA) approach to build the climate resilience of vulnerable communities in the Dry Corridor of Central America and the Arid Zones of the Dominican Republic. This will be done: i) at the landscape level, through the protection and restoration of forests, wetlands and agroforestry systems; and ii) at the community level, by promoting the adoption of water- and energy-efficient technologies. The project will also facilitate policy revisions, as well as establish financial mechanisms and economic incentives for the ongoing implementation of adaptation interventions.

**Barriers to climate change adaptation**
The proposed project will address the following barriers to climate change adaptation in the region:
- Limited knowledge and understanding of climate change impacts among decision-makers.
- Limited knowledge and understanding of Ecosystem-based Adaptation (EbA) and other adaptation measures among decision-makers and communities.

- Insufficient implementation of existing policies on climate change adaptation and limited integration of EbA and other adaptation measures into sectoral policies.
- Limited technical capacity within governments and local communities to implement EbA and other adaptation measures.
- Limited knowledge and technical capacity to adopt technologies and approaches for efficient water use.
- Limited access to financial resources for the implementation of EbA and water-efficient technologies in the private sector.
- Limited access to credit for adaptation interventions among vulnerable populations.
- Absence or limited development of economic incentives for investment in EbA.

For a full description of these barriers, see the Pre-Feasibility Study (Annex 9).

**Project activities to overcome barriers and catalyse transformational change in the way decision-makers and local communities manage catchment areas and water demand**

- Increasing the technical capacity of local government, commercial farmers and rural communities to implement EbA and other adaptation measures.
- Increasing the capacity of financial institutions to offer products and services for EbA.
- Disseminating knowledge and awareness of climate change adaptation across the region and integrating adaptation into local and national policies.

**Constraints beyond the scope of the project**

Factors beyond the scope of the project but which could potentially impact the project are:

- political instability;
- inequality (income, access to education, access to land);
- limited capacity of governments to provide basic services; and
- public safety.

**Figure 1. Problem Tree – Climate change strategies in the Dry Corridor and Arid Zones of the Dominican Republic**

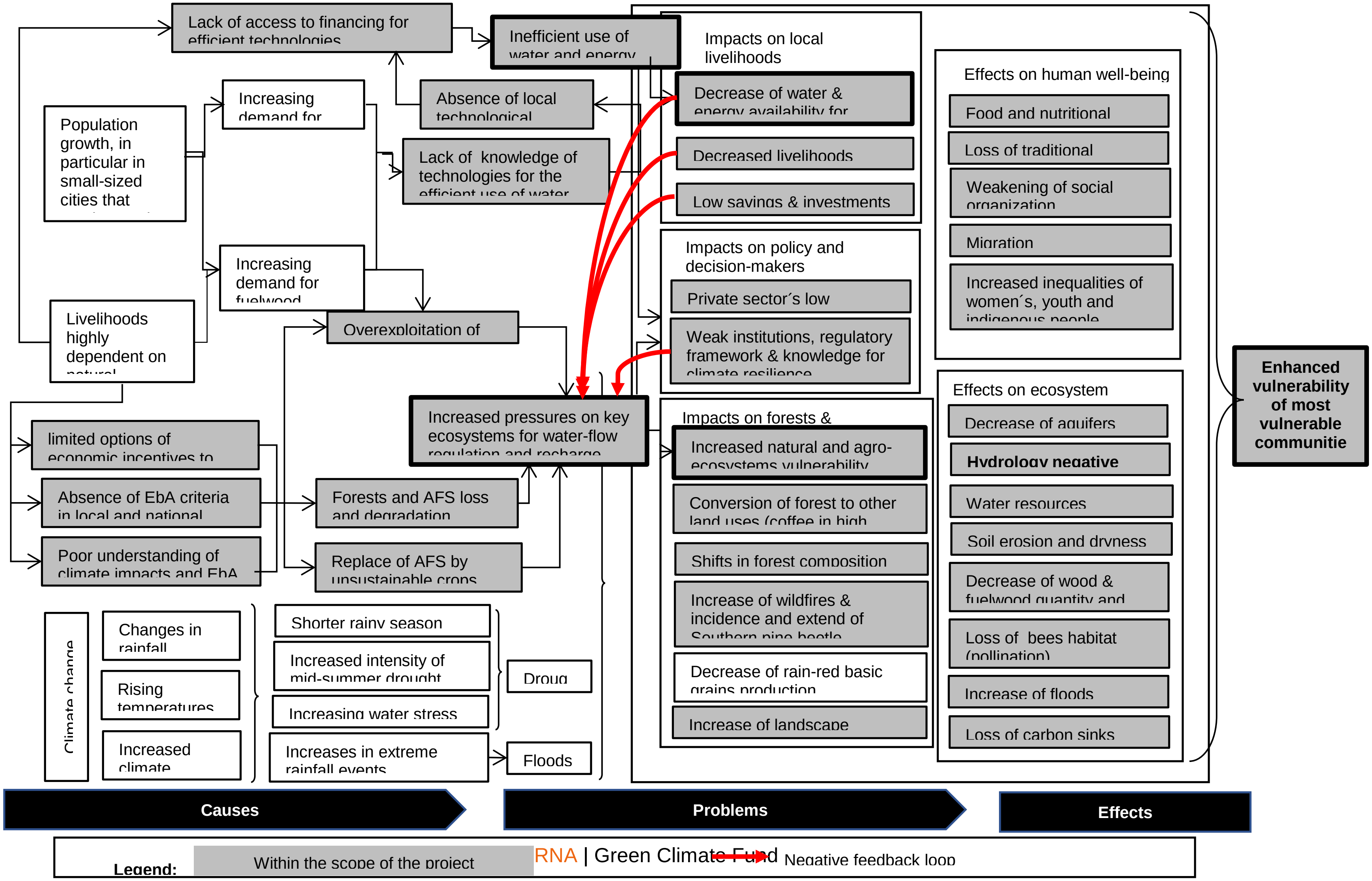
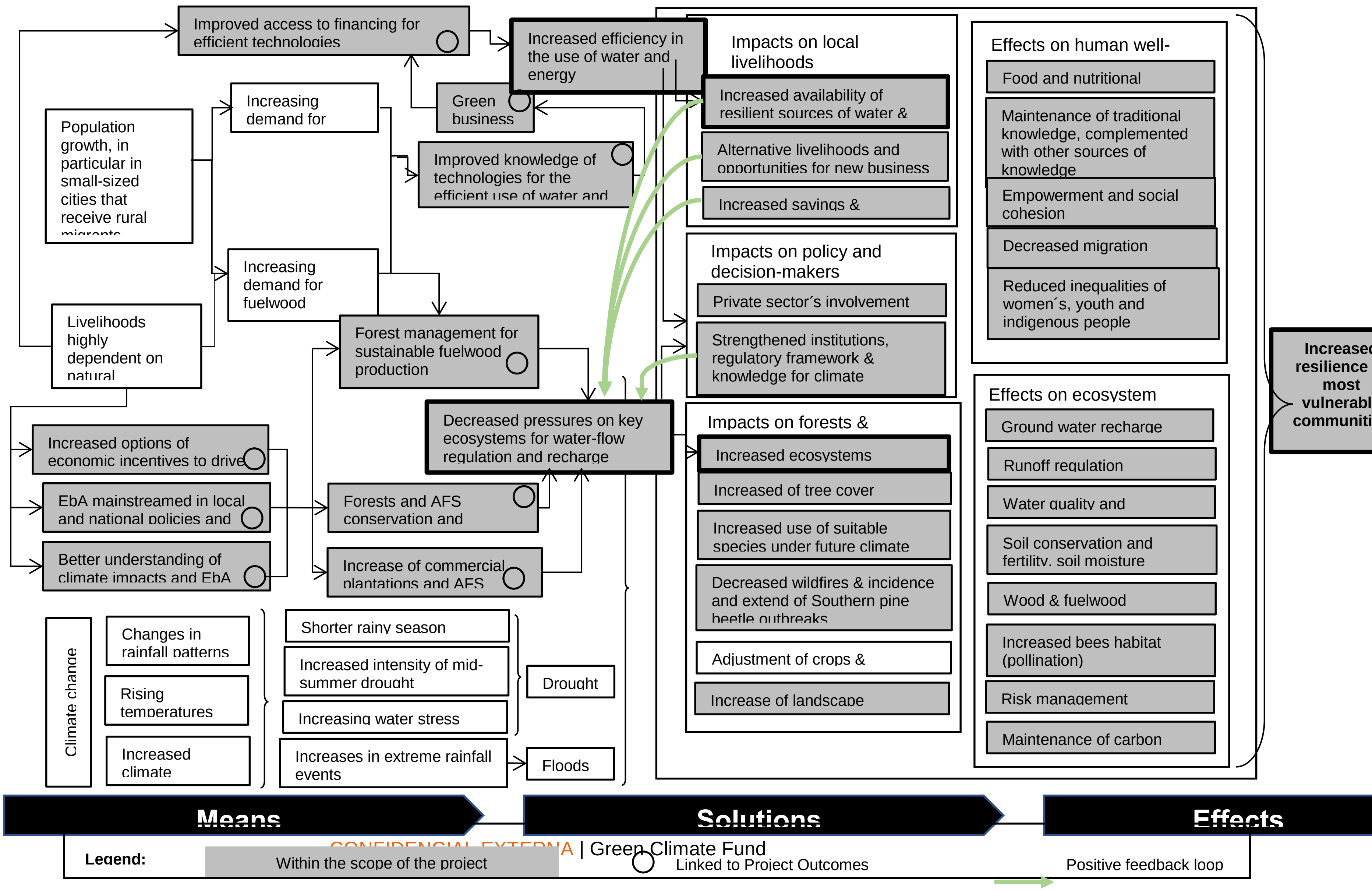


**Figure 2. Solution Tree – Climate change strategies in the Dry Corridor and Arid Zones of the Dominican Republic**



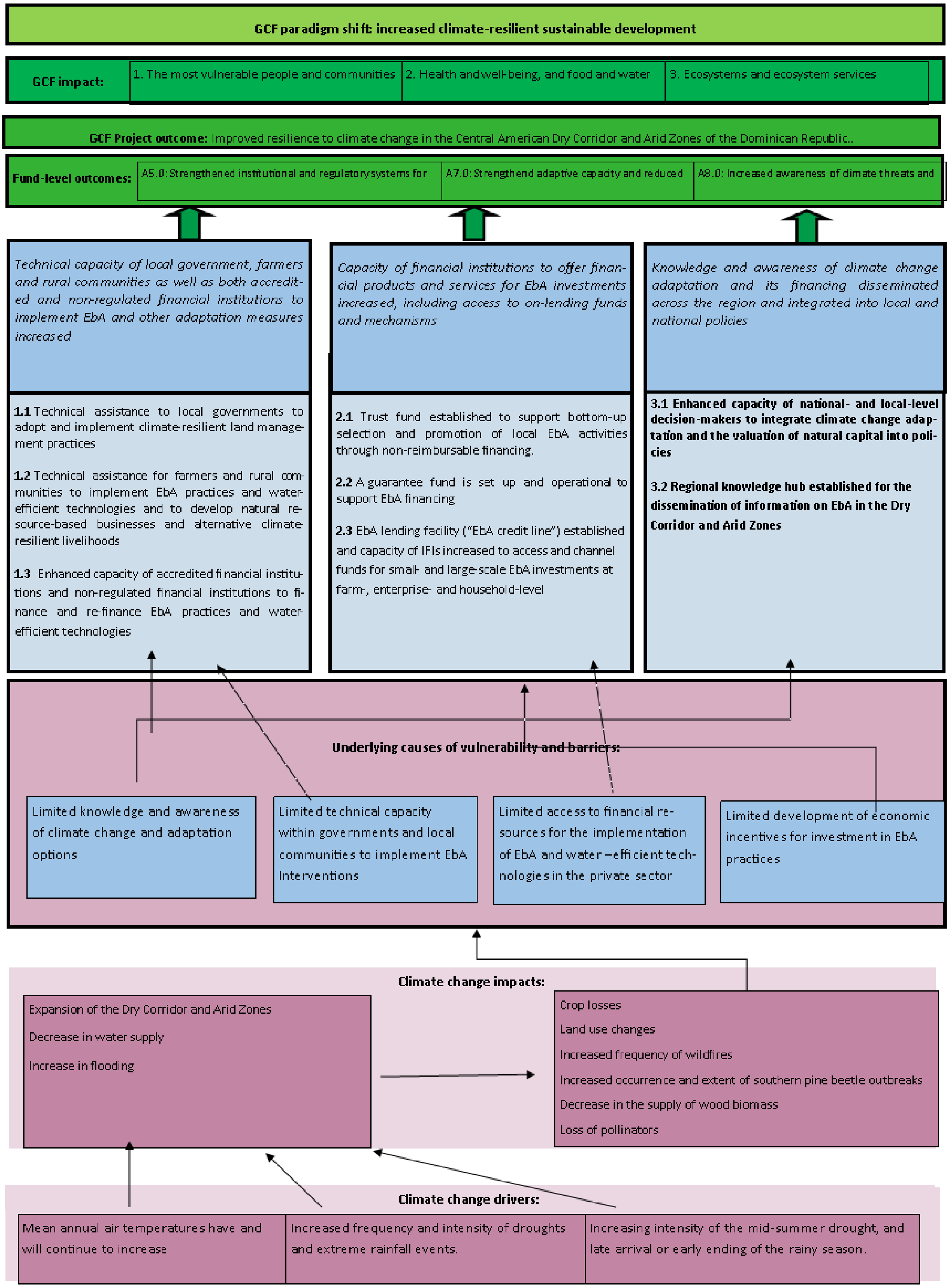


Figure 3. Theory of change

**Annex 5 – Logic framework**

The logic framework for the proposed project is provided below.

| OUTCOME | OUTPUT | INPUTS/ACTIVITIES |
|---|---|---|
| **Component 1: Creation of local and national capacities** | | |
| 1. Technical capacity of local government, farmers and rural communities as well as both accredited and non-regulated financial institutions to implement EbA and other adaptation measures increased<br><br>*# of local governments implementing EBA or other adaptation measures*<br><br>*# of Communities implementing EBA or other adaptation measures*<br><br>*# accredited financial institutions and non-regulated financial institutions implementing EBA or other adaptation measures* | 1.1. Technical assistance to local governments to adopt and implement climate-resilient land management practices. | 1.1.1. Conduct integrated biophysical, social and economic assessments in catchment areas of the climate vulnerability, risks and opportunities of existing and potential land uses to inform climate-resilient land use plans.<br>1.1.2. Develop climate-resilient land use plans in the 7 target catchments to integrate EbA measures through a participatory process with municipal authorities, local communities and other stakeholders.<br>1.1.3. Facilitate access to finance by sharing information of the financial mechanisms to be implemented under Component 2. |
| | 1.2. Technical assistance for farmers and rural communities to implement EbA practices and water-efficient technologies and to develop natural resource-based businesses and alternative climate-resilient livelihoods | 1.2.1. Provide technical assistance (TA) to adopt and implement Ecosystem-based Adaptation practices, including:<br>• TA[63] for the conservation and restoration of at least 18,000 ha of forested areas and existing agroforestry systems.<br>• TA for the establishment of new plantations of native species and agroforestry systems across at least 9,000 ha.<br>• TA for the development of sustainable fuelwood sources in at least 9,000 ha, to be combined with technical assistance for the adoption of energy efficient technologies that reduce fuelwood demand.<br>• TA for the development of private agreements with commercial plantation, medium- and large-scale livestock owners and coffee growers for forest restoration and sustainable land management.<br><br>1.2.2. Provide technical assistance (TA) to adopt water-efficient technologies, including:<br>• Develop protocols for the adoption of water-efficient technologies by households (e.g. rainwater harvesting systems), by communities (e.g. water intakes) and by small-holder and commercial farmers (e.g. (drip irrigation, solar water pumping)[64].<br>• Develop protocols for the adoption of energy-efficient technologies that reduce fuelwood demand, (e.g. efficient charcoal kilns, fuelwood drying).<br>• Provide training for the adoption of the water- and energy-efficient technologies.<br><br>1.2.3. Provide Technical assistance to develop natural resource-based businesses and alternative climate-resilient livelihoods, including:<br>• Provide training to communities for the development of natural-resource based businesses that: i) support the implementation and maintenance of EbA interventions and water-efficient technologies; and ii) capitalise on ecosystem goods and services enhanced through EbA, e.g. ecotourism (where suitable) and non-timber forest products.<br>• Facilitate access to finance to establish natural-resource based businesses by sharing information of the financial mechanisms to be implemented under Component 2. |
| | 1.3. Enhanced capacity of accredited financial | 1.3.1. Provide technical assistance to accredited financial institutions to manage local ad-hoc committees for FOGESIA financing, obtain |

[63] Including the evaluation of the areas to be restored to ensure they are ecologically adequate, the development of protocols with information on how to establish nurseries, which species to select, how to prepare the land and how to transplant seedlings and where to establish firebreaks. It will also include the provision of extension services for the implementation of the protocols and training and awareness raising to facilitate access to incentives.
[64] This component will use lessons learned from past and ongoing initiatives that have tested energy and water-efficient technologies in the region.

| OUTCOME | OUTPUT | INPUTS/ACTIVITIES |
|---|---|---|
| | institutions and non-regulated financial institutions to finance and re-finance EbA practices and water-efficient technologies | access to the guarantee fund and the management of EbA credit lines<br>1.3.2. Provide technical assistance to financial institutions (accredited and non-accredited, where applicable) to replicate best practices as identified in CAMBio II, ARECA and MEbA II on last-mile EbA financing processes.<br>1.3.3. Leverage and replicate the capacity of IFIs (incl. commercial banks) to promote and finance large-scale EbA projects as well as small-scale EbA interventions in rural communities. This will include capacity building for financial intermediaries on the concepts, financial methodology, and tools to provide products and services oriented to EbA technologies. |
| **Component 2: Financing EbA activities at different levels** | | |
| 2. Capacity of financial institutions to offer financial products and services for EbA investments increased, including access to on-lending funds and mechanisms.<br><br>*# of bottom-up EbA solutions financed*<br><br>*# of financial institutions offering EbA credit lines*<br><br>*# of on-the-ground EbA solutions financed via EbA credit lines for adaptation measures* | 2.1. Trust fund established to support bottom-up selection and promotion of local EbA activities through non-reimbursable financing[65]. | 2.1.1. Establish a trust fund and the institutional framework for its management.<br>2.1.2. Create a framework for IFIs to access the trust fund and channel financing from the trust fund to micro, small, medium and large enterprises and rural communities.<br>2.1.3. Provide the funding for the establishment of the trust fund.<br>2.1.4. Manage the trust fund. |
| | 2.2. A guarantee fund is set up and operational to support EbA financing. | 2.2.1 Provide technical support for the set-up and management of the fund.<br>2.2.2 Create a framework for accredited IFIs to access the guarantee fund.<br>2.2.3 Provide the funding for the set-up of the guarantee fund.<br>2.2.4 Manage the guarantee fund. |
| | 2.3. EbA lending facility ("EbA credit line") established and capacity of IFIs increased to access and channel funds for small- and large-scale EbA investments at farm-, enterprise- and household-level. | 2.3.1. Set-up a dedicated EbA credit line at CABEI to be disbursed to accredited financial institutions for the financing of EbA investments.<br>2.3.2. Support the development of EbA-oriented finance products and services based on regional and national capacities.<br>2.3.3. Support channeling of reimbursable financing through IFI's to agricultural producers, enterprises and rural communities.<br>2.3.4. Provide the means to support IFI's to scale up finance products for EbA and water-efficient technologies. This will include: i) EbA protocols for private and government extension efforts; ii) monitoring systems on EbA cost effectiveness; and iii) materials for private investors and local governments on alternative financing schemes for EbA initiatives, opportunities for access to financing and technical assistance and business opportunities. Potential activities that could receive credit are listed in the Pre-Feasibility Study (Section 10). |
| **Component 3: EbA mainstreaming and knowledge sharing** | | |
| 3. Knowledge and awareness of climate change adaptation and its financing disseminated across the region and integrated into local and national policies. | 3.1. Enhanced capacity of national- and local-level decision-makers to integrate climate change adaptation and the valuation of natural capital into policies. | 3.1.1. Build an evidence base, utilising both in-country research and findings from comparable ecological zones in other countries, to clearly demonstrate the value and effectiveness of proposed adaptation activities to policy-makers.<br>3.1.2. Develop or adjust a methodology to value ecosystems and their services to develop an accounts profile of natural capital so that it is integrated into development plans in the Dry Corridor.<br>3.1.3. Provide local governments (where changes can be more readily accepted and rapidly applied) with guidelines and training to make policy changes, including protocols and criteria for implementation of economic incentives for the maintenance and restoration of forests and water supply (e.g. water funds, payments for environmental services). |

[65] The exact arrangements for the financing structure will be determined during the development of the Funding Proposal.

| OUTCOME | OUTPUT | INPUTS/ACTIVITIES |
| --- | --- | --- |
| *# of national policies that integrate climate change impacts, EbA and efficient technologies as well as adaptation benefits* | | 3.1.4. Organise national workshops to disseminate the evidence resulting from local government experiences to promote the integration of climate resilience in national policies and actions.<br>3.1.5. Provide technical guidelines and training to relevant line ministries for the development/adjustment of policies to incorporate EbA and incentives for EbA.<br>3.1.6. Monitor the mainstreaming of EbA into national policies. |
| | 3.2. Regional knowledge hub established for the dissemination of operational information on EbA in the Dry Corridor and Arid Zones. | 3.2.1. Document and disseminate best practices and lessons learned from the project, to support decision-making related to EbA implementation.<br>3.2.2. Develop knowledge products such as management standards and procedures, opportunities for access to financing and technical assistance, business opportunities, technical guidelines for the assessment of ecosystem services and their contribution to human well-being.<br>3.2.3. Provide training and awareness raising on climate change impacts and the role of EbA to support political and technical decision-making for climate resilience in the Dry Corridor and Arid Zones.<br>3.2.4. Assist knowledge broker organisations and champions in developing, revising and disseminating information products to support the adoption of EbA and other resilient practices. |

**Annex 6. Countries ownership**

The proposed project will contribute to the achievement of international, regional and national targets on climate change adaptation. At international level, the project will contribute to the achievement of the Sustainable Development Goals (SDGs). The project's main contributions will be to SDG 6 – Clean water and sanitation, SDG 11 – Sustainable cities and communities, and SDG 13 – Climate action and SDG 15 – Life on land. In addition, the project will contribute to the achievement of SDG 1 – Poverty reduction, SDG 7 – Affordable and clean energy, SDG 8 – Decent work and economic growth, SDG 9 – Industry innovation and infrastructure, and SDG 10 – Reduced inequalities.

At a regional level, the project is aligned with the following policies, strategies and programmes of the Central American Integration System (SICA):

- Regional Strategy for the Conservation and Sustainable Use of Biodiversity in Mesoamerica[66]
- Regional Agro-environmental and Health Strategy of Central America 2009–2024 (ERAS)[67]
- Central American Strategy for Rural Development (ECADERT)[68]
- Regional Climate Change Strategy (ERCC)[69]
- Strategy and Plan for the Integrated Management of Water Resources in Central America (ECGIRH)[70]
- Regional Environmental Strategy Framework 2015–2020 (ERAM)[71]
- Regional Strategic Program for Forest Ecosystems Management (Perfor)[72]
- Regional Policy for Integrated Disaster Risk Management (PCGIR)[73]
- Regional Strategy for Sustainable and Climate-adapted Agriculture for the SICA region (EASAC)[74]

At national levels, the proposed project is aligned with the countries' priorities for climate change adaptation, as expressed in their government policies, strategies and Nationally Determined Contributions (NDCs).

- In Guatemala, the Dry Corridor departments are identified as priority areas for adaptation in its NDC. The proposed project will also contribute to the following priorities established in the NDC: i) sustainable management of renewable natural resources, risk management and adaptation to climate change; and ii) creation of incentives for the restoration of degraded areas. In addition, the project is aligned with Guatemala's adaptation planning framework, including the: i) National Policy for Climate Change; ii) National Action Plan for Climate Change Adaptation and Mitigation; iii) catchment management plans; iv) Framework Law for Regulating Vulnerability Reduction, Mandatory Adaptation to the Effects of Climate Change and the Mitigation of Greenhouse Gases; v), National Biodiversity Policy; vi) Environmental Education Policy; vii) the Gender Policy; and viii) identification of public policy instruments that promote climate change adaptation in the Dry Corridor. Furthermore, the project will contribute to the improvement and sustainability of forest management policy instruments, such as the: i) Law on the Promotion of the Establishment, Recovery, Restoration, Management, Production and Protection of Forests (PROBOSQUE); ii)

[66] CCAD, 2003. Estrategia Regional para la Conservación y Uso Sostenible de la Biodiversidad en Mesoamérica. Available at: http://www.sica.int/download/?9032
[67] COMISCA, CCAD & CAC. 2008. Estrategia Regional Agroambiental y de Salud de Centroamérica 2009-2024. Available at: http://www.sica.int/download/?23679
[68] CAC, 2010. Estrategia Centroamericana de Desarrollo Rural Territorial 2010 - 2030 (ECADERT). CAC, SICA, San José. Available at: http://www.sica.int/download/?80566
[69] CCAD, 2010. Estrategia Regional de Cambio Climático (ERCC). Available at: http://www.sica.int/download/?96568
[70] CCAD, 2010. Estrategia y Plan para la Gestión Integrada de Recursos Hídricos en Centroamérica (ECGIRH). Available at: http://www.sica.int/download/?79057
[71] CCAD, 2014. Estrategia Regional Ambiental Marco 2015 – 2020 (ERAM). Available at: http://www.sica.int/download/?94463
[72] CCAD & CAC, 2014. Programa Estratégico Regional para el Manejo de los Ecosistemas Forestales (Perfor): región de Centroamérica y República Dominicana. Available at: http://www.sica.int/download/?96569
[73] CEPREDENAC, 2011. Política Centroamericana de Gestión Integral de Riesgo de Desastres (PCGIR). Available at: http://www.sica.int/download/?80568
[74] CAC, 2017. Estrategia Agricultura Sostenible Adaptada al Clima para la región del SICA (2018-2030). Available at: http://apps.iica.int/observatorio-girsa/Content/Archivos/Publicaciones/Archivos/10112017_EstrategiaASAC-CAC.pdf

Forest Incentive Program (PINFOR); iii) Incentive Program for Small-scale Possessors of Forest or Agro-Forest Land (PINPEP); and iv) National Strategy for Forest Landscape Restoration[75].

- In El Salvador, the proposed project is aligned with the: i) Climate Change Framework Law; ii) National Climate Change Plan, and iii) Law on Territorial Planning and Development, which regulates land use change and compliance with national actions and contributions to adaptation and mitigation. The project will contribute to the NDC objective of building resilience to the adverse effects of climate change and transitioning to a low-carbon development pathway. In particular, the project will contribute to the NDC priorities of i) reviewing regulatory, institutional and policy instruments for water resources management; ii) updating agriculture, livestock and forestry policies; and iii) diversifying agricultural and economic activities in the eastern part of the country.

- In Honduras, the project will contribute to the implementation of the National Adaptation Plan and it is aligned with the priority sectors identified in the National Climate Change Strategy, including water resources, risk management, forests and biodiversity.

- In Nicaragua, the intervention is aligned with the National Strategy of Adaptation to Climate Change. It will contribute to implement its priorities regarding management of biodiversity for productive purposes and to the implementation of the integrated water management approach.

- In Costa Rica, the NDC adaptation priorities are i) climate change and risk management; ii) the conservation, management and rehabilitation of ecosystems; and iii) the design and implementation of adaptation and mitigation measures. The proposed project is aligned with these adaptation priorities. In addition, the project is aligned with the National Strategy on Climate Change, and the Green and Inclusive Development Program, which promotes sustainable production systems in underdeveloped rural areas that are vulnerable to climate change. The project will also contribute to the development of synergies between climate change adaptation and reduction of emissions from deforestation. Moreover, the project will consolidate the financial mechanisms developed in the country, such as: i) payment for environmental services(PES); ii) forest certification; iii) the forest credit program; iv) tax incentives for the protection, reforestation and management of forests; and v) the program of environmental benefits for the promotion of agricultural activities.

- In Panama, the proposed GCF project will contribute to the: i) implementation of climate change policy in priority sectors, including agriculture, livestock, forests and water resources; ii) new forest legislation, including reforestation of degraded areas with national funding and international support; iii) promotion of forest management and the international trade to reduce carbon emissions; and iv) integration of reforestation and ecosystem restoration into agricultural systems.

- In the Dominican Republic the NDC adaptation priorities include integrated catchment management, efficient use of natural resources and risk management. The proposed project will contribute to the implementation of the National Adaptation Action Plan (PANA-RD) and the Economic Development Plan Compatible with Climate Change (DECCC), as well as to the formulation and implementation of the National Strategy to Strengthen Human Resources and Skills for Advancing Green Development with Low Emissions and Climate Resilience.

In addition to the above national priorities, the proposed project will contribute to the forest restoration commitments that all the participating countries have made under Initiative 20x20. These commitments are as follows: El Salvador, Honduras, Nicaragua and Panama – 1 million hectares each, Guatemala – 1.2 million hectares, and Costa Rica – 2.7 million hectares.

[75] The National Forest Institute (INAB) has already defined the requirements to develop forest management plans and access to incentives for different purposes, including forest plantations, the management of natural forests for the protection and provision of environmental services, as well as the production and restoration of degraded forest lands and agroforestry systems.

**Annex 7 – Consultation processes**

There has been extensive consultation with regional and national stakeholders for the development of the proposed project, as outlined below.

**Meetings of the Council of Ministers of the Central American Commission on Environment and Development (CCAD)**
The CCAD has ratified the request to UN Environment to lead the preparation of the project proposal on six different occasions:

- 48th Extraordinary Meeting of the Council of Ministers, San Pedro Sula, Honduras, 27 April 2016, Agreement N°13.
- 52nd Extraordinary Meeting of the Council of Ministers, Puntarenas, Costa Rica, 7 June 2017. Agreement N°9.
- 57th Ordinary Meeting of the Council of Ministers, Roatán, Honduras, 29 June 2017. Agreement N°9.
- 59th Ordinary Meeting of the Council of Ministers, Panama, 8 August 2017.
- 54th Extraordinary Meeting of the Council of Ministers, Santo Domingo, Dominican Republic, 19 June 2018
- 61st Ordinary Meeting of the Council of Ministers, Placencia, Belize, 2 August 2018.

**Initial consultation meetings (June–July 2016)**
Six national consultation meetings took place in the participating countries during June and the first week of July 2016 to identify priorities to be included in the project proposal. The dates and participants are listed in the table below.

Table 1. List of participants in the national consultation workshops.

| Country | Name | Institution | E-mail address |
|---|---|---|---|
| Costa Rica<br>17 June 2016 | Roberto Flores | MAG | rflores@mag.go.cr |
| | Lorena Jiménez | MAG | ljimenez@mag.go.cr |
| | Manuel Jiménez | SE-CAC | manuel.jimenez@iica.int |
| | Ligia Córdoba | SE-CAC | ligia.cordoba@iica.int |
| | Oscar Vásquez | MAG | ovasquez@mag.go.cr; magdrch@mag.go.cr |
| | Mariano Espinoza | SINAC | mariano.espinoza@sinac.go.cr |
| | Leonardo Cascante | DA | lcascante@da.go.cr |
| | Patricia Campos | MINAE | pcampos@minae.go.cr |
| | Eduardo J. Somarriba Chávez | CATIE | esomarri@catie.ac.cr |
| | Carolina Reyes | Fundecooperación | creyes@fundecooperacion.org |
| | Julio Calderon | CAC | |
| | Ligia Cordoba | CAC | ligia.cordoba@iica.int |
| | Dennis Sanchez | FAOCR | Dennis.Sanchez@fao.org |
| | Marta Villegas Murillo | FAOCR | Marta.VillegasMurillo@fao.org |
| Dominican Republic<br>2 June 2016 | Juan Mancebo | MA | juan.mancebo@agricultura.gob.do |
| | Dominga Zorrilla | MA | digna.zorrilla@agricultura.gob.do |
| | Ronny Sepulveda | | ingronnyabreu@gmail.com |
| | Nathalie Gomez | MA | nathalie.gomez@ambiente.gob.do |
| | Yamir Antonio Encarnación Bello | | yamirencarnacion@gmail.com |
| | Fatima Espinal | FAODO | Fatima.Espinal@fao.org |
| | Daniel Velerio | FAODO | Daniel.Valerio@fao.org |
| El Salvador<br>13 June 2016 | Luis Napoleón Torres Berríos | MAG | luis.torres@mag.gob.sv |
| | Manuel Sosa | MAG | manuel.sosa@mag.gob.sv |
| | Carol Simonson | Fundemas | carol.simonson@fundemas.org |
| | Luis Torres | MAG | luis.torres@mag.gob.sv |
| | Patricia Alfaro | MAG | patricia.alfaro@mag.gob.sv |

| Country | Name | Institution | E-mail address |
|---|---|---|---|
| | Juan Fuentes | MAG | juan.fuentes@mag.gob.sv |
| | Walter Gonzalez | MARN | wgonzalez@marn.gob.sv |
| | Jorge Quezada | MARN | jquezada@marn.gob.sv |
| | Sol Muñoz | MARN | smunoz@marn.gob.sv |
| | Doris Gamero | MARN | medioambiente@marn.gob.sv |
| | Javier Magaña | MARN | jmagana@marn.gob.sv |
| | Carlos Ghiringhello | MARN | crghiringhello@rree.gob.sv |
| | Lilian Vega | Banco de Gobierno Agropecuario | presidencia@bfa.gob.sv |
| | Julio Sánchez | | |
| | Mario Lobo | MAG | mario.lobo@mag.gob.sv |
| | Sandra Gutierrez Poizat | MARN | sgutierrez@marn.gob.sv |
| | Manuel Sosa | MAG | manuel.sosa@mag.gob.sv |
| | Jesus Constanza | FAO | jesus.constanza@fao.org |
| | Ricardo Iraheta | MAG | ricardo.iraheta@mag.gob.sv |
| | Judith Odipa | Banco de Fomento Agropecuario | judith.odepa@bfa.gob.sv |
| | Jesus Constanza | FAOSV | Jesus.Constanza@fao.org |
| | Emilia Barraza | FAOSV | Emilia.Barraza@fao.org |
| Guatemala<br>20 June 2016 | Edwin Rojas | MAGA | cambioclimaticomaga2@yahoo.com |
| | Miriam Monterroso | MAGA | guatemalalegalservices@hotmail.com |
| | Francis Ernesto Moscoso | MARN | femoscoso@marn.gob.gt |
| | Ing. Mario Mejía Clara | | cambioclimaticomaga3@yahoo.com |
| | Ing. Saúl Pérez Arana | MARN | sperez@marn.gob.gt |
| | Juan Carlos Díaz | MARN | jcdiaz@marn.gob.gt |
| | Martín Perez | ICC | mperez@icc.org.gt |
| | Adriana Rodriguez | FAO Guatemala | adriana.rodriguezrodriguez@fao.org |
| | Ogden Rodas | FAOGT | Ogden.Rodas@fao.org |
| | Adriana Rodriguez | FAOGT | Adriana.RodriguezRodriguez@fao.org |
| Honduras<br>6 June 2016 | Ricardo Peña | SAG | rpenaramirez@yahoo.com |
| | Luis Alfredo Rivas | | lrivas.serna@gmail.com |
| | Miguel Ernesto Briceño Torres | | bricenotorres@yahoo.com |
| | Vicenta del Carmen Cartagena Gómez | | cartagenacar@gmail.com |
| | Sandra Rivera | PESIC | srivera@pesic.org |
| | German Flores | FAOHN | German.Flores@fao.org |
| | Bonifacio Sanchez | FAOHN | Bonifacio.Sanchez@fao.org |
| Panamá<br>6 July 2016 | Juan Manuel Ríos | MIDA | juan01manuelrios@yahoo.es |
| | Virgilio Salazar | MIDA | virgilios2732@gmail.com |
| | Noel Trejos | MIAMBIENTE Panamá | natrejos@miambiente.gob.pa |
| | Lorena Vanegas | MIAMBIENTE Panamá | lvanegas@miambiente.gob.pa |
| | Edecer Cedeño | MIAMBIENTE Panamá | elcedeno@miambiente.gob.pa |
| | Ana Posas | FAOPA | Ana.Posas@fao.org |

During the national workshops a focal point for the proposal development was selected for each country and the CCAD, as listed in the table below.

Table 2. Focal points for the development of the proposal.

| Country | Name | Institution | E-mail address |
|---|---|---|---|
| CCAD | Salvador Nieto | CCAD | snieto@sica.int |
| Costa Rica | Mariano Espinosa and Patricia Campos | Ministerio de Ambiente y Energía (MINAE) | mariano.espinoza@sinac.go.cr<br>pcampos@minaet.go.cr; |

| | | | |
|---|---|---|---|
| Dominican Republic | Pedro Brito, Nathalie Gomez | Ministerio de Medio Ambiente y Recursos Naturales (MARN) | pedro.garcia@ambiente.gob.do nathalie.gomez@ambiente.gob.do |
| El Salvador | Javier Magaña | Ministerio de Medio Ambiente y Recursos Naturales (MARN) | jmagana@marn.gob.sv |
| Guatemala | Saul Perez | Ministerio de Ambiente y Recursos Naturales (MARN) | saul_perez_arana@yahoo.com |
| Honduras | Luis Rivas | Ministerio de Energía, Recursos Naturales, Ambiente y Minas (MiAmbiente) | lrivas.serna@gmail.com |
| Panama | Noel Trejos | Ministerio de Ambiente (MiAmbiente) | natrejos@miambiente.gob.pa |

Nicaragua was incorporated into the process at a later stage, therefore no specific workshop was held in the country. The stakeholders consulted in Nicaragua are listed in the table below.

Table 3. Stakeholders consulted in Nicaragua.

| **Country** | **Name** | **Institution** | **e-mail** |
|---|---|---|---|
| Nicaragua | José Milán | MARENA | jmilanperez@gmail.com |
| | Ana Marcia Zeledón | MAG | anamarcia.zeledon@magfor.gob.ni |
| | José Ramón Rivas | MAG | ramon.rivas@magfor.gob.ni |

**Second round of consultations (October-November 2017)**

On 13 October 2017, the Executive Secretariat of CCAD circulated a first draft of the concept note among the participating countries for comments and suggestions. Comments were received from the focal points (see Table 9 below) until 27 October 2017. On 1 November 2017 a video-conference was held to discuss the document, preceded by bilateral preparatory meetings with the focal points listed below.

Table 4. Focal points for the review of the first draft of the concept note.

| **Country** | **Name** | **Institution** | **e-mail** |
|---|---|---|---|
| CCAD | Salvador Nieto | CCAD | snieto@sica.int |
| Guatemala | Juan Carlos Díaz | Ministerio de Ambiente y Recursos Naturales (MARN) | jcdiaz@marn.gob.gt |
| El Salvador | Jorge Quezada | Ministerio de Medio Ambiente y Recursos Naturales (MARN) | jequezada@marn.gob.sv |
| Honduras | Luis Rivas | Ministerio de Energía, Recursos Naturales, Ambiente y Minas (MiAmbiente) | lrivas.serna@gmail.com |
| Nicaragua | José Milán | Ministerio del Ambiente y los Recursos Naturales de Nicaragua (MARENA) | jmilanperez@gmail.com |
| Costa Rica | Sonia Lobo | Ministerio de Ambiente y Energía (MINAE) | sonia.lobo@sinac.go.cr |
| Panamá | René López | Ministerio de Ambiente (MiAmbiente) | rlopez@miambiente.gob.pa |
| Dominican Republic | Rosa Otero | Ministerio de Medio Ambiente y Recursos Naturales | rosa.otero@ambiente.gob.do |

**Contributions from the regional workshop "Climate solutions through technology and financing in Central America"**

A regional workshop on "Climate solutions through technology and financing in Central America[76]", organised by UN Environment, CTCN and the Central American Bank for Economic Integration (CABEI), was held in Panama City from 18 to 19 October 2017.

The concept note incorporates contributions from representatives of governmental and non-governmental organisations of the region collected during the workshop, in particular during the panel on "Water security and flood prevention", which was moderated by Ana Lily Mejía from BCIE. These contributions concerned: i) experiences on economic incentives in the region, including Water Funds; ii) governance and local participation mechanisms for watershed management; and iii) opportunities to improve municipal and national regulatory frameworks, and to diversify sources of funding.

**Structured dialogue with GCF.**

A meeting about this proposal was held during the GCFstructured dialogue meeting that took place in Bogotá, Colombia, on March 7$^{th}$, 2018. The objective of this meeting was to receive feedback from the GCF on the concept note sent on February 4th, 2018 and discuss on the way forward. This meeting had the participation of the following stakeholders:

| Country | Name | Institution | e-mail |
|---|---|---|---|
| CCAD | Salvador Nieto | CCAD | snieto@sica.int |
| Guatemala | Juan Carlos Díaz | Ministerio de Ambiente y Recursos Naturales (MARN) | jcdiaz@marn.gob.gt |
| El Salvador | Antonio Cañas Calderón | UNFCCC Focal Point, Ministry of Environment and Natural Resources | acanas@marn.gob.sv |
| Honduras | Rosibel Martínez<br><br>Roberto Portillo | Ministerio de Energía, Recursos Naturales, Ambiente y Minas (MiAmbiente)<br><br>Climate Change National Observatory for Climate Change and Sustainable Development | rmarriagamiambiente@gmail.com |
| Nicaragua | Javier Gutiérrez | Ministry of Environment and Natural Resources | |
| Costa Rica | Norma Patricia Campos Mesén | Ministry of Energy & Environment | pcampos5714@gmail.com |
| Panamá | Elba Cortés | Ministerio de Ambiente (MiAmbiente) | ecortes@miambiente.gob.pa |
| Dominican Republic | Pedro García Brito | Ministry of Environment and Natural Resources | pgarcia222@gmail.com |
| Professional staff from institutions involved in this proposal | | | |
| | Horacio Leiva | CABEI | hleiva@**bcie**.org |
| | Miguel Méndez | CABEI | mmendez@bcie.org |
| | Norma Palma | CABEI | npalma@bcie.org |
| | Elena Pita | UN ENVIRONMENT | epita@un.org |
| | Gustavo Máñez | UN ENVIRONMENT | gmanez@un.org |
| | Javier Manzanares | GCF | jmanzanares@gcfund.org |

[76] For more information see http://www.cambioclimatico-regatta.org/index.php/en/workshops/category/2017-taller-regional-soluciones-climaticas-a-traves-de-tecnologia-y-financiamiento-en-centroamerica

| Country | Name | Institution | e-mail |
|---|---|---|---|
| | Patrick Van Laake | GCF | plaake@gcfund.org |
| | Carmen Argüello | GCF | carguello@gcfund.org |

During this meeting, there was an analysis of the proposal-which had been shared on February 4th, 2018- by Mr. Patrick Van Laake Senior Ecosystems Management Specialist of the GCF. Country representatives also had the chance to provide comments during this meeting. The technical comments were incorporated into the current version of this proposal, it is important to highlight: the significant national ownership and political support at the highest level of this initiative, as well as its potential to promote regional integration; the potential of the initiative to transform an endemic underdevelopment into an opportunity to recover ecosystems and for the revitalization of the region and, the combination of political instruments and financial mechanisms as a driver for innovation.

**International Central American Dry Corridor Symposium**

An international symposium was carried out on oct. 23rd, 2018, which aimed at presenting state of the art technical information about climate change impacts, current threats of climate change in the region, innovative technical solutions, and innovative finances. This symposium also served as a meeting for high government representatives (including ministers and vice ministers of the environment of Central America), who participated in a panel and provided specific support to the proposal.

The high-level government officials participating were:

| Country | Name | Post |
|---|---|---|
| El Salvador | Ms. Lina Pohl | Ministra, Ministerio de Medio Ambiente y Recursos Naturales |
| Dominican Republic | Ms. Patricia Abreu | Viceministra de Cooperación Internacional, Ministerio de Medio Ambiente y Recursos Naturales |
| Guatemala | Mr. Alfonso Alonzo | Ministro, Ministerio de Ambiente y Recursos Naturales |
| Honduras | Mr. Elvis Rodas | Viceministro, Secretaría de Recursos Naturales y Ambiente |
| Panamá | Mr. Emilio Sempris | Ministro, Ministerio de Ambiente |

**Bilateral meetings in December 2018**

During December 2018, a group of consultants have had bilateral meetings to gather preliminary information about the pre-selected areas, for example: agricultural systems, environmental characteristics, population, presence of development projects, major stakeholders, etc. the consultants also have begun planning the area selection workshop: calendar, institutional participation, methodology. The consultants have also gathered initial information about availability of information generated by projects on climatic resilience. Below a table of staff consulted so far as of Jan. 15th, 2019

| **Country** | **Name** | **Institution** | **Position** |
|---|---|---|---|
| Guatemala | Vanessa Franco | MARN | Director of Catchments and Strategic Programs |
| Guatemala | Astrid Gabriela Castellanos | | Chief department of Degradation, Desertification and Drought |
| Guatemala | Francisco Ávila | | Official of the department of Degradation, Desertification and Drought |
| Guatemala | Laura Melo | WFP | Resident Representative |
| Guatemala | Irma Palma | | Official |
| Guatemala | Lena Schubmann | | Official |
| Guatemala | Juan Antonio Fernández | USAC | Professor, Agrarian conflicts expert |
| Guatemala | Silvel Elías | | Professor, Dry Corridor expert |
| Guatemala | Columba Sagastume | Consultant | Agriculture and gender expert |
| Nicaragua | José Antonio Milán | MARENA | Adviser to the Ministry |
| Nicaragua | Germán Quesada | Centro Humboldt | Consultant expert in territorial management |
| Nicaragua | Carlos Landero | PRODEP | Cadaster Technical Director |
| Nicaragua | José Luis Rojas | PGR | National Environmental Attorney |
| Nicaragua | José Uvence López | Indigenous community of Mozonte | Community President |
| Nicaragua | Consuelo de Jesús Rivera | Municipality of Mozonte | Majoress |
| Costa Rica | Sonia Lobo Valverde | SINAC | Sustainable use of Wildlife |
| Costa Rica | José Joaquín Calvo Domingo | SINAC | Climate change focal point |

In the other four countries, consultations are planned for the first trimester of 2019.

# Annex 8 – Pre-feasibility Study

## 1. Introduction

This Pre-Feasibility Study provides a preliminary assessment of the feasibility of the proposed project. First, the geographical delimitation of the Dry Corridor is outlined in Sub-section 2. Thereafter, the population and livelihoods of the region are discussed. In Sub-section 4, the baseline problems are analysed. This is followed by an assessment of the climate change trends and impacts for the region. In Sub-section 6, the climate change vulnerability of people in the region is considered. In the following sub-section, the problem that the project will address is outlined, as well as the proposed solution. In Sub-section 8, the barriers to achieving the solution are analysed. Thereafter, selected past and ongoing projects, programmes and initiatives that are relevant to the proposed project are listed. This is followed by an analysis of the potential interventions in Sub-section 10 and a description of the financial elements of the project in Sub-section 11.

## 2. Geographical delimitation

The Central American region known as the Dry Corridor covers much of the Pacific slope of Guatemala, Honduras, El Salvador and Nicaragua, as well as smaller areas in Costa Rica (Guanacaste) and Panama. The term Dry Corridor – which includes semi-arid and sub-humid ecosystems – emerged in recent years, drawing attention to the increasing frequency and intensity of dry periods that affect the region, which are related to the El Niño Southern Oscillation (ENSO). There are various approaches to the geographical delimitation of the Dry Corridor[77,78,79]. When defined as areas that have a dry season of at least four months[80], the Dry Corridor includes 64% of Central America's municipalities. Similar climatic conditions are found in in the arid and semi-arid areas (hereafter Arid Zones) in the western part of the Dominican Republic, on the northern and southern slopes of the Cordillera Central (See map in Annex 1).

## 3. Population and livelihoods

The Dry Corridor is the most densely populated region of Central America[81], with a population of 10.5 million people in an area of ~530,500 square kilometres (FAO 2017). The Arid Zones of the Dominican Republic cover ~17% of the national territory (~8,050 square kilometres)[82,83] and have a population of ~1.2 million people, which is 12% of the total population[84].

Central America's urban population has increased in absolute and relative terms in recent decades, while the rural population has grown much less and declined in certain cases. Across the region the growth of small-sized cities is particularly notable, more so than the growth of capitals and large cities. In the Dry Corridor small, emerging urban centres receive temporary or permanent rural migrants and play an important role because they connect large cities with towns and rural communities.

Nearly 60% of people in the Dry Corridor live in poverty, with the most severe poverty found in Nicaragua, Honduras, El Salvador and Guatemala. In the Dominican Republic, the southwestern provinces, which are categorised as arid and semi-arid zones, have the highest poverty rates in the

[77] IICA, 2014. Corredor Seco Centroamericano (Web mapping app). Available at: http://www.arcgis.com/apps/SocialMedia/index.html?appid=1f5588691fb34c8a8d1d1aa326c2670f
[78] van der Zee et al. (2012) Estudio de caracterización del Corredor Seco Centroamericano, tomo I, FAO. Available at: http://reliefweb.int/sites/reliefweb.int/files/resources/tomo_i_corredor_seco.pdf
[79] Ramírez cited by CCAD 2010
[80] UNESCO, 2010. Atlas de zonas áridas de América Latina y el Caribe. Available at: http://documentos.dga.cl/PHI847.pdf.
[81] FAO (2016) Base de Datos Principal AQUASTAT.
[82] Ministry of Environment and Natural Resources of the Dominican Republic, 2012
[83] Izzo et al., 2010. A new climatic map of the Dominican Republic based on the Thornthwaite Classification. Phys Geogr 31: 455–472.
[84] As estimated in 2017. Thomas Brinkhoff: City Population, http://www.citypopulation.de

country. Across the Dry Corridor and the Arid Zones, poverty is most prevalent in rural areas. Indigenous peoples are prominent in parts of the region, especially in Guatemala where they represent ~40% of the population[85], and they are typically most affected by poverty. As a result of this widespread poverty, rural communities in the region have limited capacity to adapt to the impacts of climate change.

Most rural people in the Dry Corridor and the Arid Zones depend on agriculture for their livelihoods. Coffee, and sugarcane are the most important export crops, with maize and beans being the main staple crops[86]. Agriculture is practised on both small and large scales. Smallholder farmers grow crops for subsistence and sale, while large commercial farms mainly produce crops for export. Livestock raising is important in some areas and is practised both in a semi-intensive and extensive manner. Within a catchment area, agricultural activities are typically arranged by altitude in the following way. Lowlands with fertile soils are used, often with irrigation, for intensive mechanised agriculture. Here, sugarcane, soybeans, peanuts, sorghum and sesame are produced, along with semi-intensive livestock raising. On the lower mountain slopes (up to 700 m), small- and medium-scale farmers produce basic grains (i.e. maize, beans and sorghum) and livestock. At higher altitudes (700–2000 m), coffee is grown, along with basic grains for subsistence and on occasion fruits and vegetables. Above 2000 m, there are coffee plantations and, in general, the best quality coffee is grown at these relatively high altitudes. In addition to agriculture, plantation forestry supports the livelihoods of local communities in certain parts. Timber is still harvested from natural forests in some areas, mainly in Honduras[87]. Since agriculture and forestry are greatly affected by local climatic conditions, the livelihoods of rural people in the Dry Corridor and Arid Zones are extremely sensitive to climate change.

Smallholder farmers in El Salvador, Guatemala, Honduras, and Nicaragua depend on the cultivation of maize and/or beans for their subsistence. Both these crops also play an important cultural role in the region. Maize and beans are particularly important for many indigenous peoples, for example in Guatemala indigenous peoples make up 40% of the population but represent 60% of maize and bean producers[88]. Smallholder farmers often cultivate maize and beans on sloping terrain with erosion-prone soils, which makes them vulnerable to land degradation and extreme rainfall events. Low maize and bean yields and the degradation of natural resources are major determinants of poverty, labour migration and food insecurity among smallholder farmers in the region[89].

Firewood is the most commonly used cooking fuel in rural areas, in particular in Guatemala, Honduras, and Nicaragua. The scarcity of firewood as a result of the unsustainable management of forest and agroforestry systems is therefore related to food insecurity, since nutrition can be limited by a lack of cooking fuel.

A recent study by the World Food Programme[90] highlights the following aspects of migration and poverty in the Dry Corridor areas of Guatemala, Honduras and El Salvador (Figure 1):

- The Dry Corridor is generally characterised by high levels of unemployment, limited and seasonal labour demands and low and irregularly paid wages.
- Adverse climatic conditions in the Dry Corridor affect food security by curbing productivity on commercial and subsistence farms, and by limiting employment opportunities in agriculture.
- There is a direct link between food insecurity and migration from the region.

[85] Government of Guatemala, 2012. Caracterización estadística República de Guatemala. Available at: https://www.ine.gob.gt/sistema/uploads/2014/02/26/5eTCcFlHErnaNVeUmm3iabXHaKgXtw0C.pdf
[86] Imbach et al., 2017. Climate change, ecosystems and smallholder agriculture in Central America: an introduction to the special issue. Climatic Change. 141:1–12
[87] van der Zee et al., 2012. Estudio de caracterización del Corredor Seco Centroamericano, tomo I, FAO. Available at: http://reliefweb.int/sites/reliefweb.int/files/resources/tomo_i_corredor_seco.pdf
[88] van der Zee et al. (2012) Estudio de caracterización del Corredor Seco Centroamericano, tomo I, FAO. Available at: http://reliefweb.int/sites/reliefweb.int/files/resources/tomo_i_corredor_seco.pdf
[89] Schmidt et al. (2012) Tortillas on the roaster: Central American maize-bean systems and the changing climate. Catholic Relief Services, CIAT, CIMMYT. Available at: www.crs.org/sites/default/files/tools-research/tortillas-on-the-roaster-full-report_0.pdf
[90] World Food Programme, 2017. Food security and emigration: Why people flee and the impact on family members in El Salvador, Guatemala and Honduras.

- Young people and other vulnerable populations are the most likely to emigrate from food insecure regions in Central America.
- In El Salvador the high levels of violence in many parts of the country is a major cause of emigration.

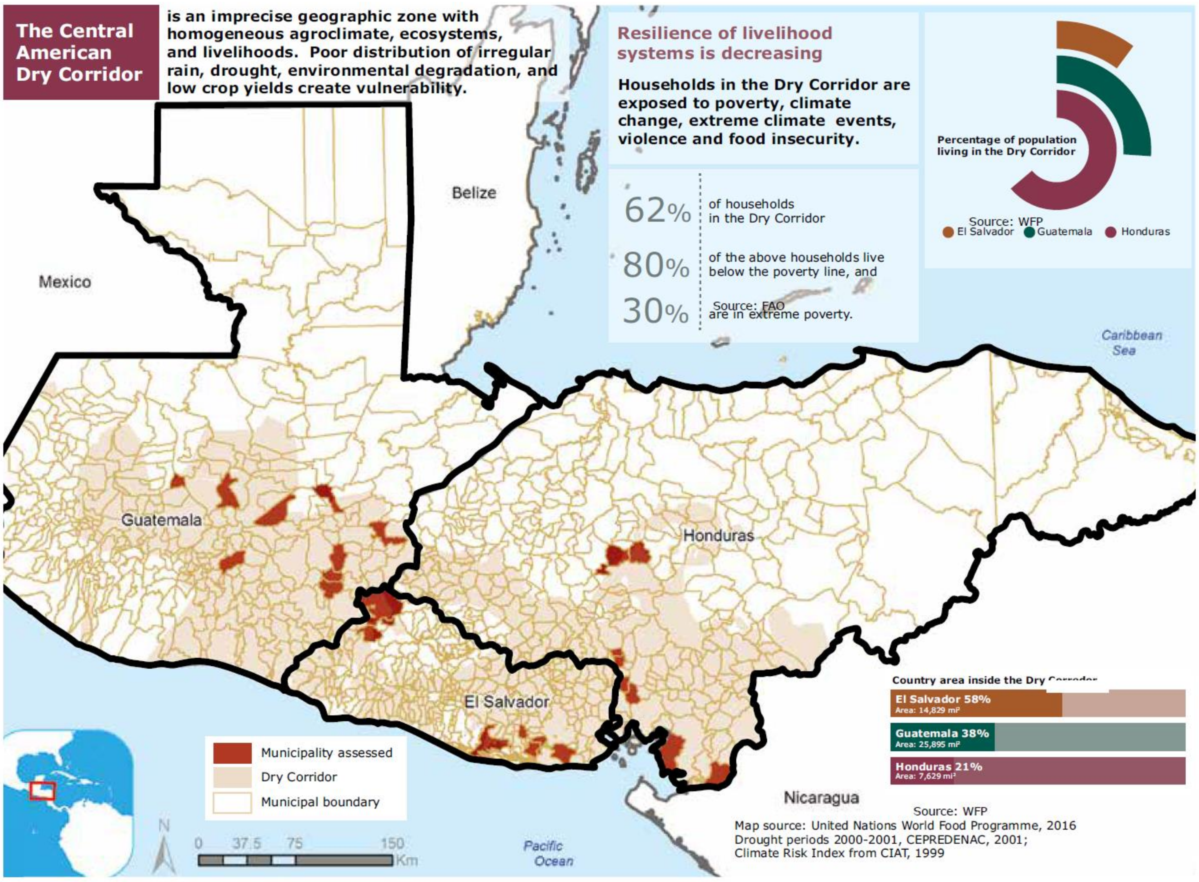



Figure 1. The resilience of livelihoods in the Dry Corridor areas of Guatemala, Honduras and El Salvador is decreasing as a result of poverty, climate change, extreme climate events, violence and food insecurity. Source: World Food Programme, 2017[91].

## 4. Baseline problems

Catchment areas in the Dry Corridor and the Dominican Republic's Arid Zones provide ecosystem services that are vital for the basic needs and livelihoods of rural people. Tree cover in the catchments maintain water yield and reduce flood risk. The dry forests and pine forests, as well as agroforestry systems (mainly shade-grown coffee), in the upper catchments are particularly important for water yield. Riverine forests and wetlands at lower altitudes also play an important role in the provision of clean water. However, much of the forest cover in the region has been lost as a result of deforestation through land use change. Only 5–22% of the forest cover remains across the different ecoregions in the Dry Corridor and Arid Zones (Olson & Dinerstein 2002). Currently, the main threat to these forest remnants is degradation, mostly as a result of unsustainable harvesting of wood (especially for firewood), fires and bark beetle infestations in pine forests.

Further deforestation is also occurring in certain upper catchments to create space for cattle ranching and crops. Cattle ranching is a popular investment for smallholders with access to remittances from family members who have migrated. The loss of tree cover as a result of the conversion of agroforestry

[91] World Food Programme, 2017. Food security and emigration: Why people flee and the impact on family members in El Salvador, Guatemala and Honduras.

systems to other land uses (e.g. pasture, urban areas, non-agroforestry crops) also threatens ecosystem services. For example, in El Salvador mixed agroforestry systems are decreasing in size near urban areas[92]. However, in certain areas of the Dry Corridor and the Dominican Republic, there is a shift to forest regrowth, which is attributed to the abandonment of marginal agricultural and cattle ranching areas[93,94].

Forest cover in the water recharge zones of catchments is essential for water supply to local communities, since they often depend mainly on wells fed by local sources and not on transfers from adjacent catchments which may have greater water availability. By regulating run-off and water quality, forest cover maintains ground water at the required level and reduces flood risk during the rain season (Calder et al. 2007; Balvanera et al. 2011).

In addition to water catchment degradation, water resources in many parts of the region are impacted on negatively by: i) overexploitation; ii) surface water and aquifer contamination by various economic activities; iii) limited sewerage treatment; and iv) modification of the physical structure of water courses[95]. On the coasts, the climate change impacts of floods, erosion and saline intrusion threaten food and water security, especially where there is over-exploitation of water resources[96,97]. The degradation of coastal wetlands, which regulate water flow, exacerbates these impacts[98]. This results in reduced water availability and quality[99] and increased health risks[100]. Water security is also threatened by the inefficient use of water for human consumption and economic activities. This is because of limited information and technical capacity for the adoption of water-efficient technologies and approaches.

Water demand is greatest on the Pacific side of Central America (which includes the Dry Corridor) but the water supply on the Pacific side is lower than in the rest of the region. Agriculture is the greatest water user in the region, except in Panama, where it is exceeded by the municipal sector[101]. Cash crops, such as sugar cane, on commercial farms in the Dry Corridor are often irrigated, but most staple food crops are entirely rainfall dependent, especially in the case of smallholder farmers.

## 5. Climate change trends and impacts

The climate of the Dry Corridor is characterised by minor fluctuations in temperature and a bimodal annual rainfall distribution. The rain season lasts from May to October, with the most precipitation occurring in May and June, followed by a less pronounced wet period in September and October. The rain season is interrupted by a dry period in July and August, which is known as the midsummer drought and locally as the canícula or veranillo. Rainfed agriculture on the Pacific side of Central America

[92] Blackman et al., 2008. Land Cover Change in Mixed Agroforestry: shade coffee in El Salvador. Washington DC.
[93] Redo DJ, Grau HR, Aide TM, Clark ML (2012) Asymmetric forest transition driven by the interaction of socioeconomic development and environmental heterogeneity in Central America. PNAS 109:8839–44.
[94] Álvarez-Berríos N, Redo D, Aide T, et al (2013) Land Change in the Greater Antilles between 2001 and 2010. Land 2:81–107.
[95] Global Water Partnership Centroamérica, 2017. La situación de los recursos hídricos en Centroamérica: Hacia una gestión integrada.
[96] Ewel KC (2010). Appreciating tropical coastal wetlands from a landscape perspective. Frontiers in Ecology and the Environment, 8(1), 20–26
[97] Barbier EB, Hacker SD, Kennedy C, et al (2011) The value of estuarine and coastal ecosystem services. Ecological Monographs, 81(2), 169–193.
[98] Murdiyarso D, Kauffman JB, Warren M, et al (2012) Tropical wetlands for climate change adaptation and mitigation science and policy imperatives with special reference to Indonesia. Cifor.
[99] Moreno-Mateos, D, Power ME, Comín FA, Yockteng R. (2012). Structural and functional loss in restored wetland ecosystems. PLoS Biology, 10(1).
[100] GWP (Global Water Partnership) Centroamérica (2017a). La situación de los recursos hídricos en Centroamérica: Hacia una gestión integrada. http://www.gwp.org/globalassets/global/gwp-cam_files/situacion-de-los-recursos-hidricos_fin.pdf
[101] ECLAC (2011) The economics of climate change in the Caribbean: Summary report 2011. https://www.cepal.org/publicaciones/xml/9/45509/LCARL.299.pdf

depends on the onset, length and temporal distribution of the rains☐, therefore current and projected changes in rainfall are critical for determining the climate change vulnerability of smallholder farmers.

Central America's Dry Corridor is one of the world's most vulnerable tropical regions to climate change[102]. The Global Climate Risk Index places Honduras, Nicaragua, Guatemala, the Dominican Republic and El Salvador among the fifteen most vulnerable countries in the world to climate events (positions 1, 4, 9, 11 and 15, respectively)[103]. The region's climate has been observed and is predicted to change in the following ways. Temperatures are increasing significantly across the region, climate variability is increasing and precipitation patterns are changing (Figures 2, 3, 4 and 5). In most parts of the Dry Corridor, rain seasons are shortening and the intensity of midsummer droughts[104] is increasing[105]. Droughts that extend over a year or more are also becoming increasingly frequent and severe, mainly because of the increasing frequency and intensity of El Niño events[106]. Concurrently, extreme rainfall events are increasing in frequency and severity because of changes in La Niña, which forms part of the El Niño Southern Oscillation (ENSO) cycle that strongly influences the region's climate. Overall, the Dry Corridor and the Dominican Republic's Arid Zones are predicted to expand because of climate change-related increases in temperatures and drought frequency. Currently, the Dry Corridor encompasses ~64% of the municipalities in Central America's municipalities; it is expected to extend to ~82% by 2050.

[102] IPCC (2014). Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
[103] Kreft et al., 2016. Global Climate Risk Index 2017. Who suffers most from extreme weather events? Weather-related loss events in 2015 and 1996 to 2015. Bonn: Germanwatch e.V.
[104] The rain season in the Dry Corridor lasts from May to October, interrupted in August by a period of lower precipitation known as the midsummer drought, *canícula* or *veranillo*.
[105] Rauscher et al., 2008. Extension and intensification of the Meso-American mid-summer drought in the twenty-first century. Climate Dynamics 31: 551-571.
[106] Cai et al., 2015. ENSO and greenhouse warming. Nature Climate Change, 5: 849.

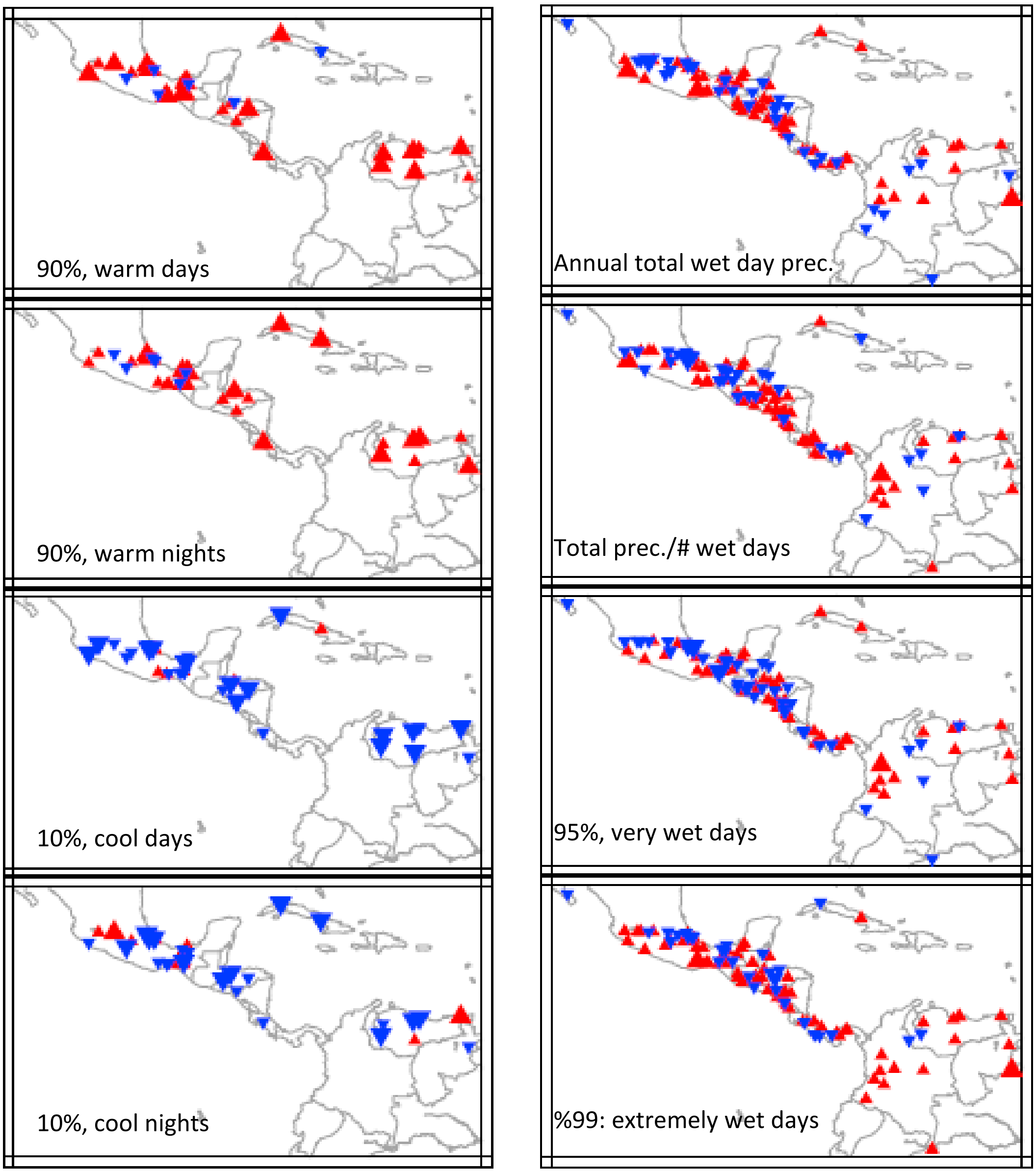



Figure 2. Trends of climate variables in Central America between 1961 and 2003. Red triangles indicate positive trends and blue triangles indicate negative trends (large ones, significant trends; small ones, nonsignificant trends). Percentages indicate the proportion of days that the given variable was in the stated percentile (Aguilar et al. 2005). High consistency is observed in temperature changes and in the increase of extremely and very wet days (related to extreme rainfall events and heavy rains), while there is high variability in changes in precipitation patterns.

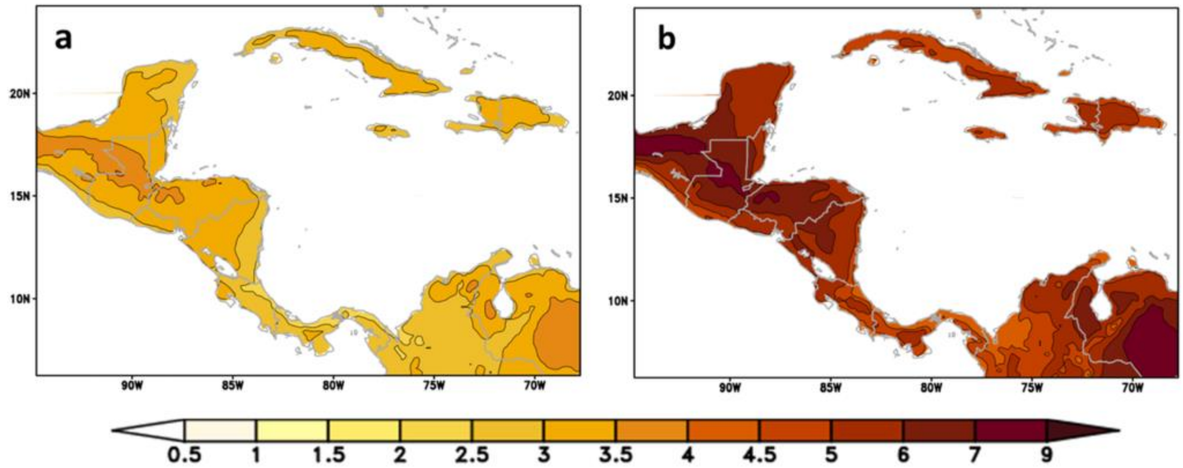



Figure 3. Difference between the baseline (1961–1990) and the future (2071–2100) annual mean temperature (°C) simulated by the Eta-HadGEM2 model for a) RCP4.5 and b) RCP8.5 scenarios[107].

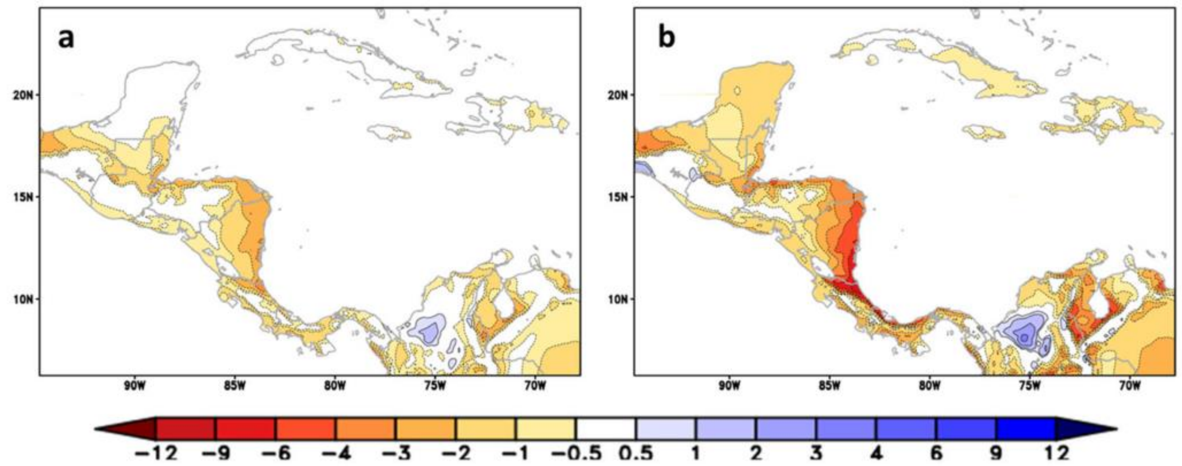



Figure 4. Difference between the baseline (1961–1990) and the future (2070–2100) annual mean precipitation (mm/day) simulated by the Eta-HadGEM2 model for a) RCP4.5 and b) RCP8.5 scenarios[108].

[107] Lyra, A., Imbach, P., Rodriguez, D., Chou, S.C., Georgiou, S. and Garofolo, L., 2017. Projections of climate change impacts on central America tropical rainforest. Climatic Change, 141(1), pp.93-105.
[108] Lyra, A., Imbach, P., Rodriguez, D., Chou, S.C., Georgiou, S. and Garofolo, L., 2017. Projections of climate change impacts on central America tropical rainforest. Climatic Change, 141(1), pp.93-105.

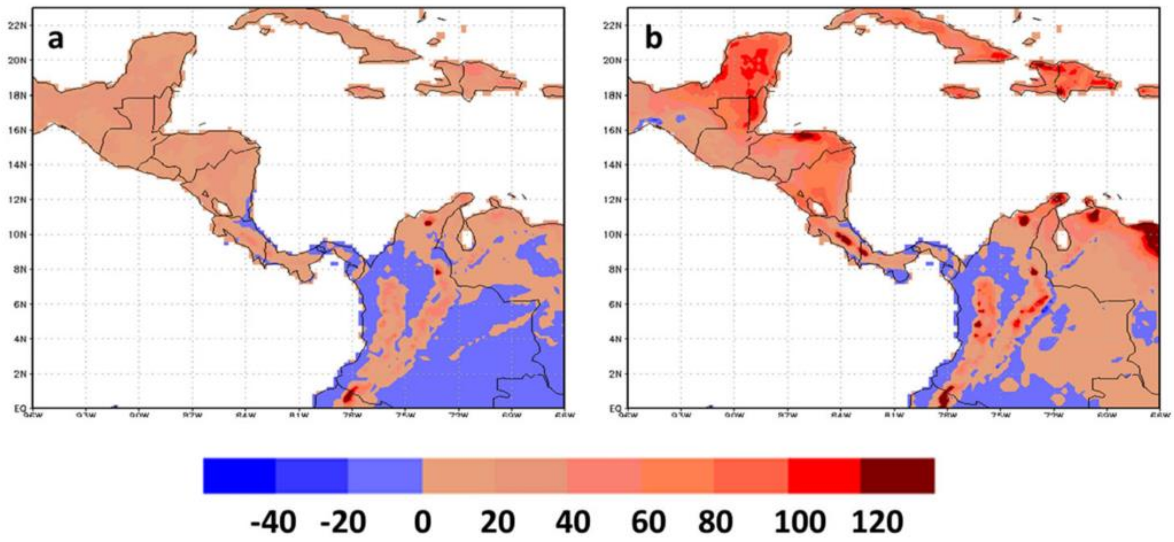



Figure 5. Difference between the baseline (1961–1990) and the future (2070–2100) dry spells (days) projected by the Eta-HadGEM2 simulations for the a) RCP4.5 and b) RCP8.5 scenarios[109].

Rising temperatures and changes in precipitation patterns are related to the increasing intensity of the mid-summer drought[110],[111] and the late arrival or early ending of the rain season. Models that simulate the responses of crops and ecosystems to future climate conditions in the region under different emission scenarios show the trends discussed below.

*Projected changes in climate suitability for different crops.*

The projected changes vary among crops and countries. The total areas climatically suitable for growing plantain, beans and coffee are likely to decline across all the countries in the region, because of increased temperatures in low altitude areas (Figure 6). Cool highland areas may become more suitable for these sensitive crops but in many cases these areas are already occupied by cities or are intended for other uses, such as protected areas for water recharge. Maize (a C4 plant[112]), cassava, upland rice and sugarcane could gain climatic suitability in all countries (Figure 7) but the models used do not consider droughts or other extreme events (if considered, the projected increase in suitability for maize would be much lower). El Salvador and Nicaragua are projected to experience the greatest declines in suitability, but increases are predicted for mountainous areas in Guatemala, Honduras, and Costa Rica[113] (EcoCrop model[114], scenario A1B).

[109] Lyra, A., Imbach, P., Rodriguez, D., Chou, S.C., Georgiou, S. and Garofolo, L., 2017. Projections of climate change impacts on central America tropical rainforest. Climatic Change, 141(1), pp.93-105.
[110] Maurer E, Roby N, Stewart-Frey I, Bacon C (2017) Projected twenty-first-century changes in the Central American mid-summer drought using statistically downscaled climate projections. Regional Environmental Change, doi 10.1007/s10113-017-1177-6
[111] Rauscher S, Giorgi F, Diffenbaugh N, Seth A (2008) Extension and intensification of the Meso-American mid-summer drought in the twenty-first century. Climate Dynamics 31, 551-571.
[112] Plants that use the C4 photosynthesis pathway benefit less from increased atmospheric $CO_2$ concentration than C3 plants but are generally more drought tolerant.
[113] Bouroncle C, Imbach P, Rodríguez-Sánchez B, et al. (2017) Mapping climate change adaptive capacity and vulnerability of smallholder agricultural livelihoods in Central America: ranking and descriptive approaches to support adaptation strategies. Climatic Change 141, 123–137.
[114] EcoCrop is a model that quantifies current and future suitability ranges for different crops, based on temperature and precipitation variables and physiological characteristics of the crops.

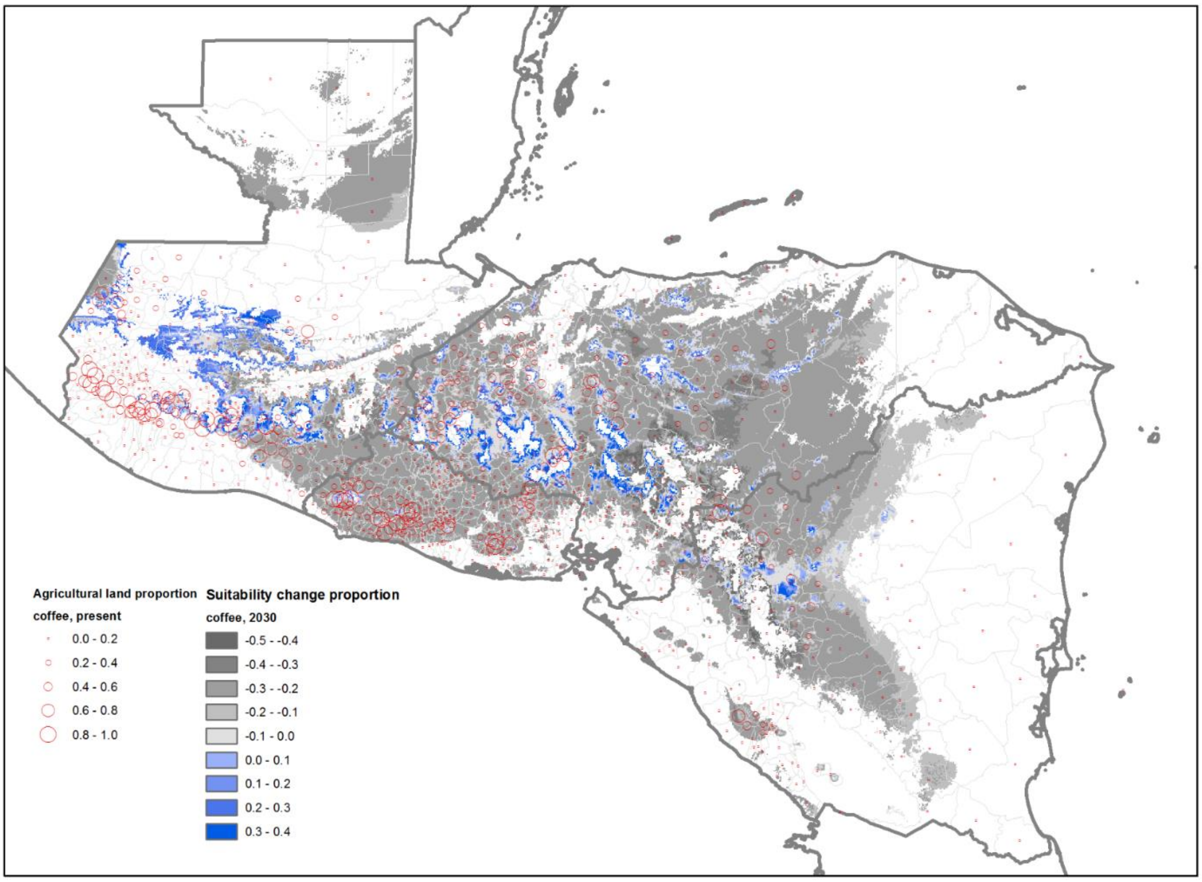



Figure 6. The proportion of agricultural land in municipalities of Guatemala, El Salvador, Honduras and Nicaragua under coffee cultivation according to the most recent national agricultural censuses (red circles), and changes in climatic suitability projected for the 2020–2049 (2030) period under the A1B emission scenario (grey areas indicate losses, blue areas are gains). The baseline period was 1960-2000. Source: Bouroncle et al. (2017)[115].

[115] Bouroncle C, Imbach P, Rodríguez-Sánchez B, et al. (2017) Mapping climate change adaptive capacity and vulnerability of smallholder agricultural livelihoods in Central America: ranking and descriptive approaches to support adaptation strategies. Climatic Change 141, 123–137.

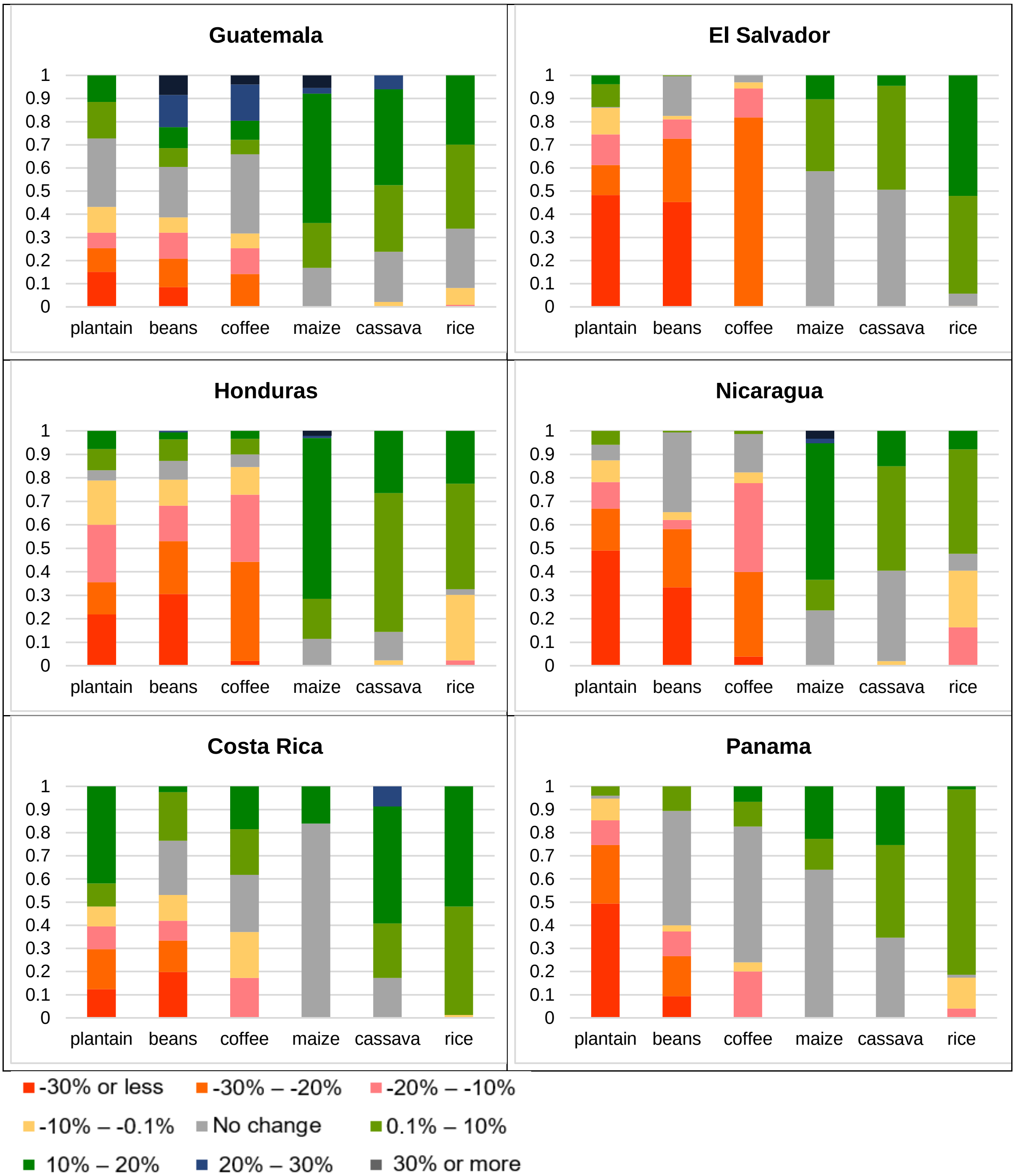



Figure 7. Expected changes in climatic suitability for cash and subsistence crops in Central American countries projected for the 2020–2949 (2030) period under the A1B emission scenario, based on EcoCrop model simulations. The baseline period was 1960-2000. Expected change is expressed in terms of the proportion of municipalities affected by different degrees of climatic suitability change for different crops.

*Crop losses*
These changes in climate are increasing the losses of harvests of maize, beans, coffee and other crops that are important for food security and local employment in the Dry Corridor[116,117]. In turn, this increases the proportion of the population living under the poverty line, thus causing more emigration. This trend will continue in the medium to long-term.

*Land use changes*
Some high-altitude areas, which are vital for water recharge and regulation, will become increasingly suitable for growing coffee, beans and other crops. Agricultural expansion into these areas could, therefore, lead to land use conflicts. This situation can already be observed near several protected areas in the region.

*Increased frequency of wildfires*
Models suggest that average temperature increases and changes in precipitation patterns influence the annual frequency of wildfires by affecting the composition and seasonality of natural forests and favouring an expansion of drier ecosystem types more prone to fires[118] (MAPSS model[119], scenarios B1, A1B, and A2).

*Increased pine beetle outbreaks*
The occurrence and extent of southern pine beetle outbreaks in the natural pine forests of Honduras and Guatemala[120] are predicted to increase, with negative impacts on forestry and water supply from catchments (model PRECIS[121], scenario A2). Pine beetle outbreaks increase in intensity after wildfires.

*Loss and degradation of forest cover in the water recharge zones of catchments*
Climate change impacts exacerbate the loss and degradation of forest cover in the water recharge zones of catchments. In addition, increasing extreme rainfall events in the Dry Corridor are also causing an increase in flooding and a decrease in water storage in aquifers because of increased runoff which reduces groundwater recharge. The combined effect of increased drought periods, loss of forest cover in water recharge zones and increased runoff are expected to decrease water supply[122] (Figure 8).

*Impacts on other ecosystem services*
The loss and degradation of forest cover, exacerbated by climate change, also has negative impacts on other ecosystem services, such as pollination and the provision of firewood, that are vital for the basic needs and livelihoods of vulnerable populations.

- A decrease in the number of bee species – partly because native bees depend on forests – can reduce coffee yield by as much as 88%[123].

[116] Hannah L, Donatti C, Harvey C, et al. (2017) Regional modeling of climate change impacts on smallholder agriculture and ecosystems in Central America. Climatic Change 141, 29-45.
[117] Schmidt A, Eitzinger A, Sonder K, Sain G (2012) Tortillas on the roaster: Central American maize-bean systems and the changing climate. Catholic Relief Services, CIAT, CIMMYT. www.crs.org/sites/default/files/tools-research/tortillas-on-the-roaster-full-report_0.pdf
[118] Imbach P, Molina L, Locatelli B, et al. (2012) Modeling potential equilibrium states of vegetation and terrestrial water cycle of Mesoamerica under climate change scenarios. Journal of Hydrometeorology 13, 665-680.
[119] MAPSS is a model that simulates the long-term average water balance and potential vegetation, in average climate conditions, based on water and energy constraints.
[120] Rivera Rojas et al., 2010. Cambio climático y eventos epidémicos del gorgojo descortezador del pino Dendroctonus frontalis en Honduras. Forest Systems, 19: 70-76.
[121] PRECIS is a climate model used to build high-resolution climate change scenarios at regional scale
[122] Imbach P, Locatelli B, Zamora J, et al. (2015) Impacts of climate change on ecosystem hydrological services of Central America: water availability. In Chiabai A (ed) Climate change impacts on tropical forests in Central America: An ecosystem service perspective. Routledge: Abingdon UK.
[123] Imbach P, Fung E, Hannah L, et al. (2017) Coupling of pollination services and coffee suitability under climate change. Proceedings of the National Academy of Sciences.

- The supply of woody biomass in Central America's dry forests is predicted to decline by the end of the century[124]. The provision of woody biomass is an important ecosystem service in the region, since firewood is a major source of cooking fuel, especially in Guatemala, Honduras and Nicaragua.

[124] Imbach P, Molina L, Locatelli B, et al. (2012) Modeling potential equilibrium states of vegetation and terrestrial water cycle of Mesoamerica under climate change scenarios. Journal of Hydrometeorology 13, 665-680.

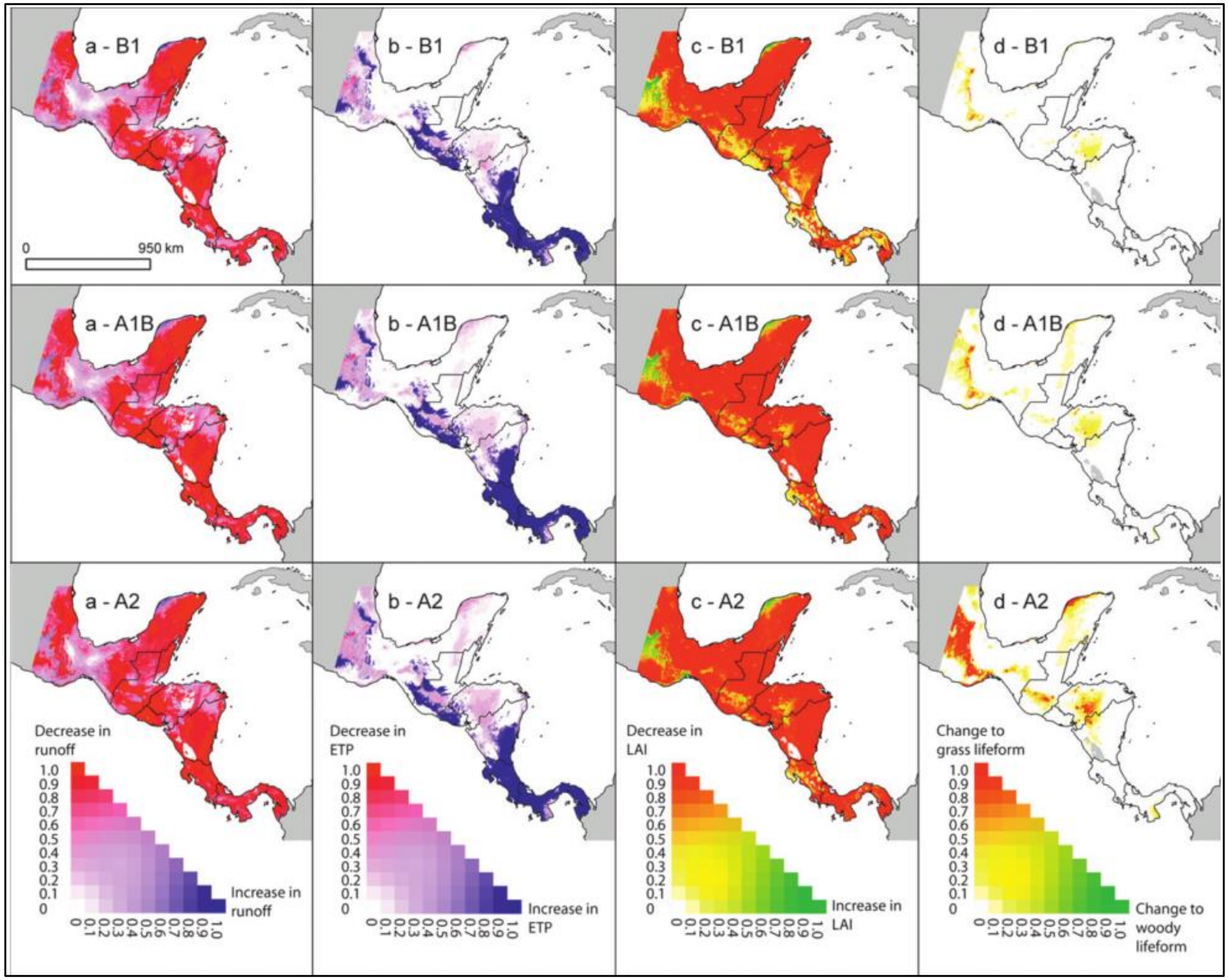



Figure 8. Fraction of simulations for low (B1), moderate (A1B), and high (A2) emission scenarios showing at least (a) 20% change in runoff, (b) 20% in evapotranspiration, (c) 20% in LAI, or (d) change in dominant vegetation type. The horizontal (vertical) axis of the colour map is the fraction of scenarios showing an increase (decrease) in runoff, evapotranspiration, or LAI, or a change from grass to shrub/tree (tree/shrub to grass). Legend values show mean range value for each colour class. Source: Imbach et al. (2012)

## 6. Climate change vulnerability

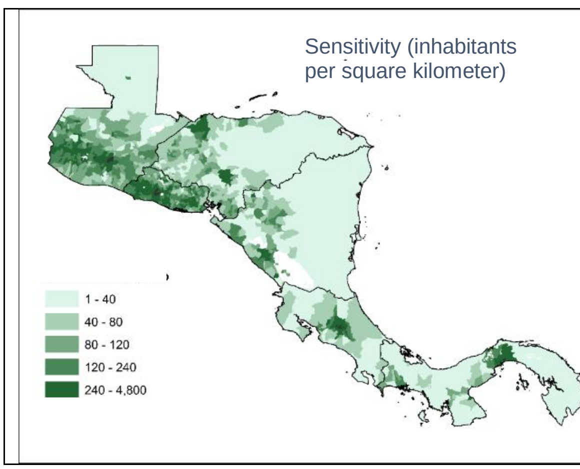
The application of the vulnerability analysis according to the scheme of the AR4, allows identifying areas of greater vulnerability for the provision of drinking water as a proxy for water availability in the region. Considering the expected changes in the temperature and precipitation patterns indicated in the previous section, the vulnerability analysis of drinking water in Central America indicates the following:

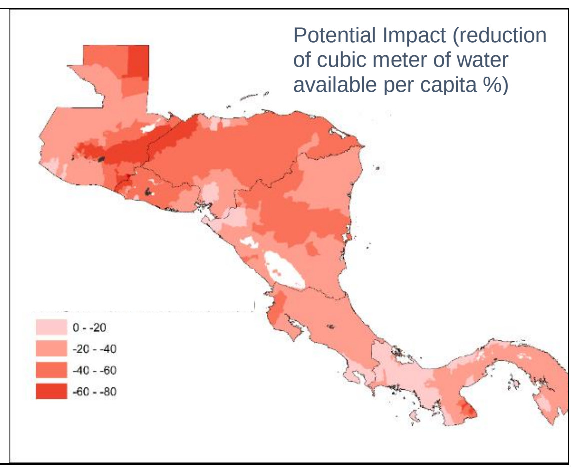
- Sensitivity: The greater the density of people in a municipality, the greater their sensitivity to changes in the availability of water for human consumption. The highest population density, historically, is on the Pacific coast (Figure 9, left, above).

- Potential impact: The combination of the projected changes in temperature and precipitation and the current population distribution indicate that the amount of water available for human consumption in all the municipalities of the region is decreasing. These changes can reach 80% in the Dry Corridor in Guatemala, and 60% in the Dry Corridor of El Salvador, Honduras, and Costa Rica (Figure 9, right, above).

- Adaptive capacity: The adaptation of the rural sector to changes in water supply has different conditions. The index (see diagram, Figure 9, left, centre) provides an approximation of which municipalities would have greater capacities to adapt. In each country, five levels of adaptive capacity were considered, with a similar number of municipalities in each category (Figure 9, right, center).

- Vulnerability: The combination of the Potential Impact of climate on water availability (projection) and Adaptive Capacity (current) indicates in which municipalities the provision of drinking water in the rural sector would be most vulnerable. There are different vulnerability groups. The most critical are those subject to the greatest Potential Impact and with the lowest Adaptive Capacity (e.g., Dry Corridor in Guatemala, El Salvador and Honduras).




Adaptive Capacity Index

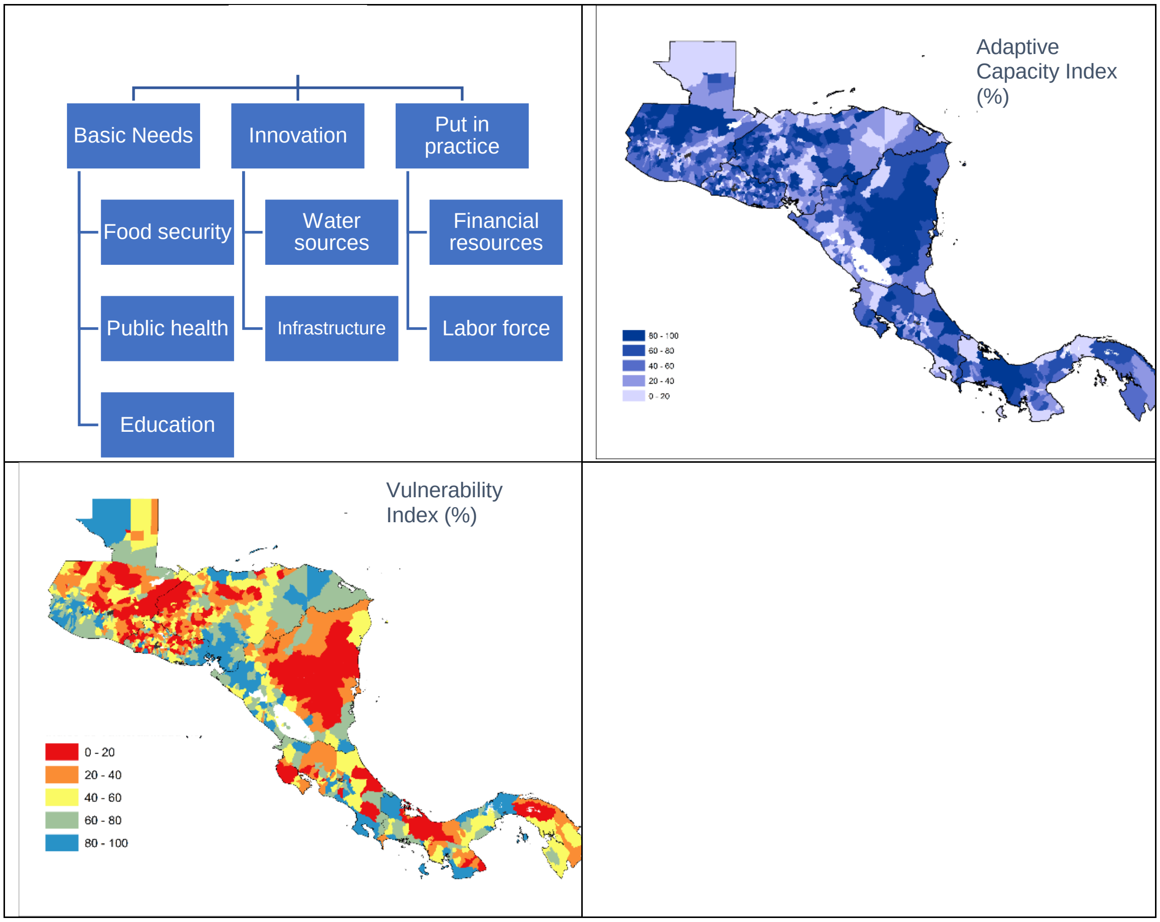



Figure 9. Vulnerability of drinking water supply in rural areas of Central America, 2050 period, RCP 4.5. Source: Bouroncle et al. 2015)

## 7. Problem to be addressed and proposed solution

*Problem to be addressed*

The proposed GCF project will address the climate change impacts of increasing temperatures, droughts and extreme rainfall events that threaten the basic needs and livelihoods of vulnerable populations in Central America's Dry Corridor and the Dominican Republic's Arid Zones.

*Proposed solution*

The project will implement an innovative ecosystem-based adaptation (EbA) approach to build the climate resilience of vulnerable communities in the Dry Corridor of Central America and the Arid Zones of the Dominican Republic. This will be done: i) at the landscape level, through the protection and restoration of forests, wetlands and agroforestry systems; and ii) at the community level, by promoting the adoption of water- and energy-efficient technologies. The restoration of ecosystems through EbA will improve water security under future climate conditions by improving hydrological flow and the infiltration of rainwater into groundwater reserves, while the use of innovative and efficient technologies will reduce the demand for water. The project will also facilitate policy revisions, as well as establish financial mechanisms for the ongoing implementation of adaptation interventions. The upscaling and sustainability of EbA interventions will be facilitated by the promotion of natural resource-based businesses and alternative climate-resilient livelihoods at the community level. The knowledge generated through these activities will be assembled within a regional knowledge hub and disseminated across the region to inform decision-making.

Ecosystem-based Adaptation (EbA): The Convention on Biological Diversity defines EbA is defined as the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change[125]. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt. This approach includes large-scale measures to restore and maintain ecosystem services, such as the restoration and conservation of forested land. EbA is a low-risk approach because it focuses on building a climate-resilient natural capital base that maintains or improves the provision of goods and services and livelihood security.

Some examples of adaptation effectiveness of selected EbA practices are presented below: (translated from Martínez-Rodríguez et al, 2017[126])

**Agroforestry systems in basic grains (Quesungual)**

The shade provided by this agroforestry system helps to regulate temperatures and improves the productivity of the system, especially during the establishment phase of crops (Vandenbeldt and Williams 1992[127]). This is very important in semi-arid zones that are also facing the increase in temperature and reduction of the crops. In the future scenario of warmer environmental conditions, the shade of the perennial trees of this system could compensate for the decreases in yields, caused by excess heat in open areas and, in addition, contribute to minimize water stress (CATIE CESTA 2006). In addition, the Quesungual has shown resilience to extreme weather events. In the case of extreme rainfall, permanent soil cover makes the impact of gout less, and soil compaction is reduce (Gamboa et al 2009).

In times of drought, producers who implemented the Quesungual agroforestry system in Honduras resisted long periods. without rain, compared to those who had not implemented this system, who suffered major damages (FAO 2005). The potential of the Quesungual system to maintain moisture in the soil is particularly important in long periods of drought as a result of the El Niño phenomenon, which they bring as consequence the loss of the crops. The soil cover and the incorporation of organic matter through the Quesungual also reduce the loss of soil by erosion, especially in sloping terrain.

Agroforestry systems in coffee

The shade has effects on the microclimate of the coffee plantation, affecting the quantity and quality of light that enters the system, moderating the temperature of the air, the soil and the foliar area (leaves of the coffee tree); improving the soil moisture Cannavo et al 2011, IICA 1988, Lin 2007, Lopez-Bravo 2012, Villareyna Acuña 2016a) and has a positive effect due to the impact of rain under the canopy (Avelino 2013, Thériez 2015, in Villareyna Acuña 2016a).

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[125] EbA definition from the CBD, as cited in: IUCN, 2008. Position Paper on Ecosystem-based Adaptation. Available at: https://cmsdata.iucn.org/downloads/iucn_position_paper_eba_september_09.pdf

[126] Martínez-Rodríguez, M.R., Viguera, B., Donatti, C.I., Harvey, C.A., Alpízar, F. 2017. Cómo enfrentar el cambio climático desde la agricultura: Prácticas de Adaptación basadas en Ecosistemas. Materiales de fortalecimiento de capacidades técnicas del proyecto CASCADA (Conservación Internacional-CATIE). 44 pp.

The solar radiation reaching the coffee tree is considerably reduced depending on the shade density and the type of crown of the trees used (eg perennial vs. deciduous) (Beer et al 1988, Siles et al 2010, Lin 2007 in Villareyna Acuña 2016a). The high temperatures of the air (maximum of temperature), of the leaves of the coffee trees and of the ground, diminish within the system under shade; while air humidity (relative humidity) tends to increase (Lin 2007, López Bravo et al 2012, in Villareyna 2016) and stay longer (Fassbender 1987, Vis 1986), which is particularly important in future drought scenarios. These microclimatic conditions can help to regulate the fruitful load of coffee trees, thus avoiding very marked variations in production from one year to the next. Said regulation of the fruitful load can also avoid excessive presence of fungal diseases (plants are more susceptible to pathogens with high fruitful loads).

In the event of extreme rainfall, shade trees help protect the soil from laminar erosion and conserve its fertility through the organic matter they give to the system; they also help to prevent landslides related to the erosion of the soil mass, through the subjection provided by the deep roots that go from one horizon to another in the agroecosystem (Villareyna Acuña 2016a), although this effect requires more studies. The shade canopy intercepts the rain and can reduce its intensity and surface runoff under canopy (Villareyna Acuña 2016a) especially in case of low intensity rainfall (<5mm). This point is controversial, because the leaves of the shade trees accumulate rainwater and form larger droplets, which, when they overflow from the leaf (in more abundant rains), can have a greater impact on the leaves of the trees. coffee trees The kinetic energy of the drops (determined by the size and velocity of the drop) depends on the height of the canopy and the species of trees (Avelino 2013, Theriez 2015). In this sense, the laurel (*Cordia alliodora*), for example, increases the kinetic energy of the drops, compared with full sun (Cerdán 2012, Theriez 2015, Villareyna Acuña 2016b), causing greater erosion. Other tree species, such as Inga edulis, and Inga densiflora, on the other hand, tend to decrease the kinetic energy of the drops, possibly due to their type of glass that intercepts more rain and distributes it throughout the branches

**Windbreaks**

n the current climate change scenario that the region lives, it is imminent that extreme winds and hurricanes with strong winds are more frequent. Due to its design, the fundamental function of the windbreak is the reduction of the speed of the winds that manage to cross the curtain, being its main adaptive function. In addition, part of the winds are diverted, so that animals and crops are protected from possible extreme winds. Additionally, windbreaks affect the wind temperature, making them cooler in very hot and more temperate places in very cold places (Beer et al 2004) which is important to deal with the extreme temperatures that are projected in Central America.

**Live fences**

Live fences can lower the soil temperature due to the greater humidity retention where they are located (Casa et al, 1993, McNaughton 1988, Norton 1988), which is relevant in the context of erratic rainfall that we face. Additionally, it is expected that the air temperature in a plot surrounded by live fences will be more stable than without it (Méndez et al 2000). The relative humidity of the nearby plots increases with the presence of live fences, reducing the evapotranspiration rate of crops (Norton 1988), this effect decreases as you move away from the living fence. The lower rate of evapotranspiration translates into greater conservation of water in the plant, avoiding water stress (Méndez et al 2000). Finally, although its main objective is not the same as that of a windbreak, live fences can also protect moderately from extreme wind.

Water and energy-efficient technologies: Large-scale measures to restore and maintain ecosystem services for climate change adaptation will be complemented with measures that promote efficient consumption of water and energy. Interventions such as small reservoirs for rainwater collection, rooftop rainwater harvesting, and drip irrigation systems will be implemented to maximise water use efficiency and water supply. In addition, measures such as firewood drying, efficient charcoal production and efficient biomass stoves will be implemented to enhance access to energy from biomass. This is important for reducing pressure on forest remnants in catchments, since fuelwood harvesting is a major cause of forest degradation, as well as for food security which is related to biomass cooking fuel in the impoverished parts of the Dry Corridor.

*Intervention sites*

The project will be implemented across seven target catchment areas. One catchment area will be selected in each of the participating countries. Criteria for the selection of intervention sites are provided in Annex 3.

## 8. Barriers to climate change adaptation

The proposed project will address the following barriers to climate change adaptation in the region.

*Limited knowledge and understanding of climate change impacts among decision-makers.*

Decision-makers in Central America and the Dominican Republic often have limited knowledge and understanding of climate change impacts. The most important knowledge gaps that decision-makers have about climate change impacts on smallholder farmers are: i) water availability; ii) areas susceptible to extreme weather events; iii) locations of smallholder farmers; iv) projected changes in temperature and rainfall; v) expected impacts on crop yields; and vi) adaptation strategies[128]. These knowledge gaps impede the mainstreaming of climate change adaptation into the policies and plans of the different sectors.

*Limited knowledge and understanding of EbA and other adaptation measures among decision-makers and communities.*

Decision-makers and communities in the Dry Corridor and Arid Zones frequently have limited knowledge and understanding of EbA, and of adaptation measures such as water- and energy-efficient technologies. They have limited access to information and understanding of the value of ecosystem services, in particular because of the large scales at which many ecosystem services are generated. As a result, they have limited understanding of climate change adaptation options based on ecosystem services, and of complementary water- and energy-efficient technologies.

*Insufficient implementation of existing policies on climate change adaptation and limited integration of EbA and other adaptation measures into sectoral policies.*

All countries in the region have made significant progress in climate change policy at the national level. Climate change adaptation is a priority in the NDCs of all seven participating countries (see Annex 6). National policies also indirectly support EbA, e.g. conservation policies, and the need to restore, conserve and sustainably manage the Dry Corridor and Arid Zone forests, wetlands and agroforestry systems is widely recognised. However, institutions at both national and local level have insufficient knowledge and technical capacity to implement existing policies. Furthermore, there is limited integration of EbA and water- and energy-efficient approaches into sectoral policies.

[128] Donatti et al., 2017. What Information Do Policy Makers Need to Develop Climate Adaptation Plans for Smallholder Farmers? The Case of Central America and Mexico. Climatic Change 141: 107–21.

*Limited technical capacity within governments and local communities to implement EbA and other adaptation measures.*
Governments have gradually reduced public budgets for the provision of extension services that could promote EbA. As a result, communities receive limited support, training and technical assistance to implement climate-resilient practices at landscape, community or household level.

*Limited knowledge and technical capacity to adopt technologies and approaches for efficient water use.* Technologies that support efficient water use have been implemented successfully in the region, but these cases have not been well documented. As a result, there is a lack of information on water management and improved technologies both for policy makers at the local level and for water users[129]. In the agricultural sector specifically, successful water-efficient technologies are known in large commercial farming (e.g. drip irrigation of sugarcane and oil palms), but knowledge of water-efficient technologies is less widespread among smallholder farmers.

*Limited access to financial resources for the implementation of EbA and water-efficient technologies in the private sector.*
Private sector investors, credit agencies and financial institutions have limited evidence of the benefits of EbA and other adaptation measures. In addition, valuations by these institutions do not take into account important long-term benefits of EbA, for example the increased longevity of coffee plantations in shaded agroforestry systems. Therefore, these institutions have limited opportunity to assess the commercial viability of natural resource-based businesses and to develop related financial services and products. While there is some experience at small scale (microfinancing), financing investments at landscape scale remains challenging (see Section C.2. of the Concept Note for further information). For these reasons, commercial farms, smallholder farmers and other private sector players have limited access to financing to implement EbA and water-efficient technologies.

*Limited access to credit for adaptation interventions among vulnerable populations.*
Smallholder farmers and rural households require credit to cover the initial costs of implementing EbA and water-efficient technologies. However, the high risk of such credit to financing institutions limits the availability of credit to vulnerable communities[130]. This is because individuals and small businesses with low collateral and small farm sizes are excluded from loans as a result of conservative banking practices[131].

*Absence or limited development of economic incentives for investment in EbA.*
Although some water funds and schemes for payment for environmental services (PES) exist in the participating countries, the majority of these funds and schemes operate at limited and local scales[132,133]. Barriers to the implementation of such economic incentives include lack of enabling strategic, legal and institutional frameworks and lack of transparent monitoring arrangements[134].

### 9. Selected past and ongoing projects, programmes and initiatives

[129] Martinez Guzman, Manuel Antonio. 2013. Global Water Patnership, FAO Tecnologías Para El Uso Sostenible Del Agua. Tegucigalpa: FAO.
[130] UN Environment, Microfinance for ecosystem-based adaptation (MEbA). http://unepmeba.org/en/
[131] Wenner et al., 2007. Inter-American Development Bank Sustainable Development Department Best practices series Managing Credit Risk in Rural Financial Institutions in Latin America. Banco Interamericano de Desarrollo.
[132] Grima et al., 2016. Payment for Ecosystem Services (PES) in Latin America: Analysing the performance of 40 case studies. Ecosyst Serv 17:24–32.
[133] Ureña, V.A., 2016. Integración del componente de Incentivos Económicos Ambientales en la Ruta Verde del Canal. Latin American and Caribbean Carbon Forum (LACCF).
[134] Richards & Jenkins, 2007. Potential and challenges of payments for ecosystem services from tropical forests. For. Brief. 16:1–8.

The proposed project will build on the lessons learned and use best practices from relevant past and ongoing projects, programmes and initiatives in the region. A selection of these are listed below.

*Output 1.1: Technical assistance to local governments to adopt and implement climate-resilient land management practices.* This output will seek complementarity with other forest management interventions in the participating countries, in particular other ongoing GEF and Adaptation Fund projects and GCF proposals.

*Output 1.2. Technical assistance for farmers and rural communities to adopt and implement Ecosystem based Adaptation practices and water efficient technologies and to develop natural resource-based businesses and alternative climate-resilient livelihoods.* This component will use lessons learned and best practices from other projects that have tested energy and water-efficient technologies in the region.

*Outcome 2: Capacity of financial institutions to offer financial products and services for EbA investments increased, including access to on-lending funds and mechanisms.* The activities under this outcome will apply lessons learned from previous experiences in Central America and other regions, in particular from CABEI (CAMBio II and ARECA), UN environment (MEbA II) and IDB (EcoMicro)..

*Output 3.1. Enhanced capacity of national- and local-level decision-makers to integrate climate change adaptation and the valuation of natural capital into policies.*
This output will be based on best practices and lessons learned from ongoing experiences such as: i) the “incentivo forestal” in Guatemala; ii) incentives in the framework of the “Alianza por el millón” in Panama; iii) PES (payment for environmental services) experiences in Costa Rica; iv) the Water Fund of the city of Quito in Ecuador[135]; and v) the water funds established in the capital cities of Guatemala, Costa Rica and the Dominican Republic[136].

*Output 3.2 Regional knowledge hub established for the dissemination of operational information on EbA in the Dry Corridor and Arid Zones.*
This output will seek complementarity and apply lessons learned from existing knowledge management experiences. In particular, the hub will strengthen and operate in close liaison with existing knowledge networks:

- at the regional level, e.g. UN Environment-REGATTA;
- at national level, e.g. Environmental Observatory of the Ministry of Environment and Natural Resources, MARN, El Salvador; and
- at the local level, e.g. Copan Chorti Commonwealth climate and early warning system network, Guatemala.

Lastly, the proposed project will be aligned with the forest restoration commitments made by all the participating countries under Initiative 20x20[137].

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[135] This Fund receives contributions from public sources, private organizations and NGOs that are channelled through a mercantile trust legally established as a patrimonial fund of increasing endowment. An independent finance manager invests the capital and the revenues are used to carry out concrete actions (e.g. restoration and conservation of water sources, management, improvement of infrastructure).
[136] http://waterfunds.org/
[137] http://www.wri.org/our-work/project/initiative-20x20

**10. Analysis of potential interventions**

This sub-section describes selected EbA and other adaptation measures to be implemented by the proposed project in the Central American Dry Corridor and Arid Zones of the Dominican Republic.

*Ecosystem-based Adaptation measures*

*a) Ecological restoration*

Ecological restoration can be defined as the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. The process intends to restore functions (not necessarily the original state or species composition). Although the classic unit for ecological restoration is an ecosystem, the spatial scale can be expanded to a landscape or catchment. At this scale, ecological restoration considers a mosaic of interacting ecosystems, including natural forests and wetlands, as well as plantations, agroforestry systems and other agricultural systems[138],[139],[140]. In the context of the proposed project, ecological restoration includes:

- Passive restoration: The simplest approach is to cease the damaging activity. For example, excluding livestock from riparian areas with fences allows riparian forests to recover through secondary succession. Another example is the recovery of the hydrological flow of estuaries through the removal of sediment to induce the natural regeneration of mangroves.

- Active restoration: This includes different mechanisms to facilitate ecological succession or the establishment of tree cover in areas important for the provision of ecosystem services, such water recharges areas. Examples include seeding and planting trees (including fruit trees) and fire management for natural forests. Another example is the transition from full-sun coffee cultivation to shade-grown coffee.

Benefits of ecological restoration include:
- Reduced soil erosion as a result of the binding action of roots as well as increased canopy cover;
- Increased infiltration of rainwater into soils, relative to degraded soil, thereby increasing water security under climate change conditions;
- Increased generation of useful or commercially valuable products such as timber and multiple non-timber forest products, thereby improving household income and food security;
- Carbon sequestration and storage through increased tree cover and soil conservation;
- Reduced vulnerability to climate-related hazards, particularly landslides; and
- Enhanced biodiversity and improved landscape aesthetics, thereby supporting the development of ecotourism businesses.

Further adaptation measures presented in this sub-section involve ecological restoration in production systems (sustainable forest management, agroforestry systems), inputs for restoration projects (mixed nurseries) or specific restoration practices (firebreaks).

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[138] Clewell AF, Aronson J (2007) Ecological restoration: principles, values and structure of an emerging profession. Island Press.
[139] Chazdon RL, Brancalion PHS, Lamb D, et al (2017) A Policy-Driven Knowledge Agenda for Global Forest and Landscape Restoration. Conserv Lett 10:125–132.
[140] Rey Benayas et al., 2009. Enhancement of biodiversity and ecosystem services by ecological restoration: a meta-analysis. Science 325:1121–4.

*b) Sustainable forest management including reforestation with native species*

Sustainable forest management can be defined as the process of managing a forest to produce a continuous flow of forest products (such as firewood and timber) and services (such as water and biodiversity conservation), without undue reduction of the forest's inherent values and future productivity and without undue undesirable effects on the physical and social environment.

In the context of the proposed project, this measure includes practices in natural forests and plantations such as:

- Forest management plans for areas that are important for the provision of ecosystem services (such as riparian forests) in accordance with national laws, plans, and practices
- Reduced-impact logging
- Protection against fires
- Mixed plantations with native species, including
  - fast growing species of commercial value such as *Cedrela odorata* (cedro, Spanish cedar), *Cordia alliodora* (laurel, salmwood, Spanish elm) and *Schizolobium parahyba* (gallinazo, Brazilian fern tree)
  - slow growing species for precious hardwood production such as cocobolo (*Dalbergia* sp.) and ronrón (*Astronium graveolens*).
- The sustainable production of firewood in natural forests will be based on the management of native species with resprouting capacity (mainly *Quercus* spp.) and plantations of species that provide firewood and other goods. A good example is *Gliricidia sepium.* This species fixes nitrogen in the soil, is easily propagated, grows quickly and provides fodder.
- In the region, there is substantial experience in community forest management, including the definition of criteria for the ecological, environmental and economic sustainability of community forests.

Benefits of sustainable forest management include:

- Raw materials (wood, firewood, and others)
- Freshwater (flow regulation, purification, quality)
- Local climate regulation (resilience to drought and climate variability) and maintenance of air quality
- Carbon sequestration and storage through increased tree cover and soil conservation
- Buffering the impacts of extreme events
- Wastewater treatment (wetland restoration)
- Erosion prevention and maintenance of soil fertility
- Pollination
- Biological control
- Habitat for species
- Genetic diversity
- Tourism

*c) Agroforestry systems*

Agroforestry is defined as an integrated approach to the production of trees and non-tree crops or animals on a single piece of land. Agroforestry can improve the resilience of agricultural production to current climate variability, as well as to long-term climate change through the use of trees for intensification, diversification and buffering of farming systems. Agroforestry systems include silvopastoral systems, i.e. trees in pastures. In the context of the proposed project, agroforestry systems to protect water recharge zones refer mainly to shade-grown coffee. In some countries, e.g. El Salvador, shade-grown coffee is the main (or only) type of tree cover in the water recharges zones of catchments.

Given the diversity of landscapes in the Dry Corridor and Arid Zones, this measure can also include other improved agroforestry practices that are appropriate for the provision of ecosystem services and livelihoods, such as the: i) renewal of coffee plantations with coffee varieties resistant to novel climate conditions, pests and diseases; ii) inclusion of fruit trees for income diversification; or iii) inclusion of shade trees species with commercial value, such as *Cordia alliodora*.

The most common silvopastoral system in the region is dispersed trees in pastures. Such trees provide important products (shade, fodder, firewood, wood, fruits) and environmental functions. Silvopastoral systems will be considered as part of the suite of adaptation actions in the proposed project but will not be promoted in the areas most critical for regulating water flow, since they provide less soil protection than other agroforestry systems.

The benefits of agroforestry include[141]:

- Improved soil binding by roots, thereby preventing erosion and maintaining topsoil under erratic, intense rainfall;
- Increased provision of food – even under conditions such as drought – thereby increasing food security;
- Increased soil fertility as a result of nutrient-rich leaf litter and nitrogen fixation;
- Increased availability of fodder, which enhances the resilience of animal husbandry; and
- Increased incomes through product diversification (e.g., firewood, wood, and fodder), certification, and payments / compensation for ecosystem services.

*Opportunities for small natural resource-based businesses*

*a) Nurseries*

Nurseries are agronomic facilities at which plants are germinated and cultivated and where they grow under controlled conditions of light and moisture. Mixed nurseries that produce a range plant species allow for the diversification of income streams through the sale of high-quality timber trees, fruit trees (such as avocado) or climate resilient native species for reforestation or restoration activities.

Benefits from mixed nurseries include:

- Rehabilitating the forest ecosystem where the nursery is established decreases the pressure on timber resources, contributes to recover soil fertility and to retain moisture.
- Mixed nurseries are an opportunity for natural resource-based businesses in combination with restoration, sustainable forest management, and agroforestry systems

*b) Firebreaks*

Firebreaks prevent forest fires from spreading before they damage ecosystems, croplands or infrastructure. To establish a firebreak, a band of vegetation between 4 and 6 m wide is cleared and soil is removed until the mineral layer of soil is reached. Firebreaks are commonly used for ecosystem restoration, conservation and sustainable forest management. In Guatemala and

[141] The World Bank Group, CIAT, CATIE (2014) Climate-Smart Agriculture in Costa Rica.

Honduras, firebreaks are used to manage pine beetle outbreaks. Firebreaks provide the following benefits:

- Firebreaks protect infrastructure and agricultural and ecosystem services; hence their benefit is related to their effectiveness at providing protection. For example, a 400 m long firebreak is sufficient to protect 1 ha of forest. The cost of establishing a 1000 m long and 6 m wide firebreak, equivalent to the perimeter of an area no larger than 6.25 ha, is US$ 825. Of these costs, 67% are for local labour and 15% for training.
- Firebreak establishment could provide temporary income generating opportunities, in addition to the benefits of enhanced ecosystem services under climate change conditions.

*c) Efficient biomass stoves*

Various models of efficient biomass stoves are made from local materials, use less biomass (firewood) than traditional stoves and decrease the negative health impacts of smoke in kitchens. While there is a long history of improved cookstove programmes in Central America, many of these initiatives have not been adopted in a sustained way. The main reasons for this are the poor performance of cookstoves in the field, the absence of quality standards for improved cookstoves, and the lack of attention to the needs of end users. The evaluation of previous programmes is important for the proper design of cookstove programmes and the selection of technical, financial and social criteria[142],[143].

The benefits of efficient biomass stoves include:
- Maintenance of soil fertility. (The charcoal obtained serves to restore the soil, increasing plant productivity.)
- Reduced greenhouse gas emissions. (The efficient combustion of the gasifier reduces the $CO_2$ emissions by 3 tons per family per year)
- Reduced consumption of firewood, which promotes the conservation of forest resources
- Health benefits. People who cook indoors with wood in an unventilated or partially ventilated space, gain significant health benefits from using efficient biomass stoves.
- Economic efficiency. Where firewood is being harvested faster than it is being grown, the use of more efficient stoves to reduce demand for wood to sustainable levels is usually more economically viable than planting new trees.

*d) Firewood drying and efficient charcoal production*

The use of solar ovens for firewood drying and half-orange ovens for efficient charcoal production increases the quality of the firewood and charcoal. Half-orange ovens, built with bricks, provide more efficient and economical carbonization than the traditional method, which involves pits dug in the ground. Experience in Nicaragua shows that dry firewood and quality charcoal can be part of profitable value chains[144].

These technologies provide the following benefits:
- Half-orange ovens increase charcoal yield by 10% and produce higher quality charcoal. In addition, the working conditions of the charcoal producers are improved by decreased smoke

[142] Soluciones Prácticas (2015) Fogones mejorados para ahorrar biomasa y cuidar la salud humana.
[143] Lambe F, Ochieng C (2015) Improved cookstoves in Central America: health impacts and uptake. Stockholm Environment Institute.
[144] https://www.catie.ac.cr/prcc/wp-content/uploads/2015/04/3-finnfor-ii-catie.pdf

and risk of burns. In Nicaragua, half-orange ovens tested by communities produced 564 metric tons of charcoal per year.

- Dry firewood produces less smoke, suffers fewer biological attacks during storage, and is cheaper to transport than wet firewood. As a result, it can be sold at higher prices.
- The collection of wood for drying and the production of charcoal allows for control of its origin to ensure compliance with forest management plans.

*e) Small reservoirs for rainwater collection*

Rainwater can be collected in two ways: i) with micro-catchments on the ground to divert or slow runoff so that water can be stored; ii) by collecting water from rivers or streams.

The benefits of this measure include:

- Freshwater provision
- Soil formation and retention
- Carbon capture through increased tree cover (under irrigation) and soil conservation.
- Water for agriculture and localised ecosystem restoration. A 500 $m^3$ reservoir can meet the water needs of 80 animals or up to 2500 $m^2$ of vegetable crops during a dry period.

*f) Rooftop rainwater harvesting*

This basic technology involves collecting rainwater from rooftops and diverting it to a storage reservoir (tank) for later use. Benefits of rooftop rainwater harvesting include:

- Freshwater provision
- Decreased time spent on water collection. The availability of water within the household implies an average saving of 30% of women's time (INCAP, 2016), which can represent between four and five hours a day depending on the place (PAHO, 2010).

*g) Solar photovoltaic water pumping systems for community water supply and irrigation*

This relatively simple, reliable, cost competitive, and low maintenance technology converts sunlight into electricity to pump water[145],[146]. There is a good match between seasonal sunlight availability and seasonal water needs (dry season) in the region.

Benefits of this technology include:

- Freshwater provision
- Reduced greenhouse gas emissions, since it decreases dependence on diesel, gas or coal-based electricity.
- Cost savings. The price of photovoltaic modules has decreased by over 80% in the last decade, while prices for competing gasoline or diesel fuels have risen by over 250%.

*h) Drip irrigation*

[145] Foster R, Cota A (2014) Solar Water Pumping Advances and Comparative Economics. https://www.researchgate.net/publication/259932006_Solar_Water_Pumping_Advances_and_Comparative_Economics
[146] Chandel SS, Naik MN, Chandel R (2015) Review of solar photovoltaic water pumping system technology for irrigation and community drinking water supplies. Renewable and Sustainable Energy Reviews 49: 1084 – 1099.

This technology involves dripping water onto the soil at very low rates to irrigate crops. Drip irrigation reduces water consumption and loss of soil and nutrients. Simplified systems that use local supplies can have very low investment costs[147].

The benefits of drip irrigation include:

- Erosion prevention and maintenance of soil fertility.
- Increased resilience to drought as a result of efficient use of scarce water resources (decrease in water consumption by up to 70%).
- Increased quality and quantity of agricultural produce due to efficient use of fertilizers and controlled supply of nutrients with irrigation water.
- Increase in income of up to 35% due to improvements in productivity.

*i) Ceramic water filters*

This technology eliminates microbes from water. Considering the reduction in the availability of drinking water in the region and the degree of water contamination, ceramic filters are considered a complementary adaptation measure. Experience in Nicaragua showed the importance of quality control and training for local manufacturers for achieving sustainable growth in sales[148].

The benefits of ceramic water filters include:

- provision of safe drinking water;
- reduction of diarrheal diseases; and
- increase in local employment and income.

*j) Ecotourism*

Ecotourism is based on conserving and sustainably using existing ecosystem services and making them available to visitors. It mainly consists of small-scale local tourism in natural ecosystems or in agricultural areas (agrotourism) that allows visitors to appreciate nature, and the values and cultural traditions associated with it, and purchase sustainable products. Ecotourism promotes exchanges between visitors and communities and encourages environmental education and fair trade.

Ecotourism provides the following benefits:

- Promoting the conservation of natural areas and agroforestry systems while safeguarding their biological and cultural diversity.
- Local job creation
- This type of tourism is based on local resources, is low impact and offers socio-economic benefits to the populations responsible for conserving the goods or services promoted.

**11. Financial elements**

The financial elements of the project will be quantified in detail during the development of the full funding proposal.

[147] Netherlands Water Partnership (2005) Soluciones ingeniosas de agua: ejemplos de tecnologías innovadoras y económicas para pozos, bombas, almacenamiento, irrigación y tratamiento. http://www.samsamwater.com/library/Smart_Water_Solutions_-_ES.pdf
[148] http://habitat.aq.upm.es/dubai/06/bp0156.html

Project grants will be used for the: (i) establishment of economic incentives, such as payments or compensations for environmental services and water funds to promote EbA interventions; (ii) provision of technical support, such as the development of studies, protocols, capacity building activities, knowledge sharing and mainstreaming EbA into policies; iii) on-the-ground implementation of EbA interventions; and (iv) contingency funds for smallholder farmers: this fund will focus on establishing seed capital to implement water storage and management, and EbA supplies.

*Economic incentives*
GCF grant resources will be used for the establishment of economic incentives, such as payments or compensations for environmental services and water funds, to promote investments in EbA interventions that will build a climate-resilient natural resource base[149].

Payments or compensation for ecosystem services (PSE and CSE) are voluntary transactions in which well-defined ecosystem services (or land uses that can secure such services) are purchased from a provider (or suppliers) of services that ensure their continued provision. Payments reward a change that would not otherwise occur. In the proposed project, PSE and CSE will focus on incentives for the appropriate management of forest cover in areas that are important for water supply and regulation (water services at landscape scale) and to diversify income for local actors who have rights over the use of land or forest in these areas (adaptation at family level)[150]. The suppliers of services are therefore the local actors who have rights over the use of land or forest in these important areas. The *mancomunidades* act as intermediaries and will be responsible for collecting and managing payments and monitoring services or land uses that ensure ecosystem service provision. Finally, the users (who will pay for the service) will be households and farmers that irrigate.

Water funds are a type of PSE or CSE focused on the management of watersheds for the provision of water services, and where the payments or compensations are transferred to a fiduciary fund. GCF grants will be used to constitute the base of a trust fund, under the direction of a board with representation of different actors that will decide how to invest the income to support climate-resilient management practices in catchment areas.

*Technical support*
GCF grant financing will also be used for the provision of technical support including the development of climate-resilient land use plans, economic valuations of ecosystem services, capacity-building and training activities, the establishment of protocols (Component 1), provision of technical assistance to IFIs (Component 2) and EbA mainstreaming and knowledge sharing (Component 3). The transparent disbursement of these grant funds will be managed and overseen through the national NDAs based on submission of annual costed workplans.

*On-the-ground implementation of EBA*
GCF grant financing will also be used to directly implement EbA interventions on the ground. This will ensure that the benefits of large-scale EbA interventions are shown to communities and

[149] including ecological restoration of forest and wetlands remnants, the recovery or establishment of agroforestry systems, the establishment of sustainable production of wood and firewood and of mixed plantations with native species.
[150] These incentives are calculated taking into account the opportunity cost of suspending an activity that does not favour the provision of the water service (for example, excluding livestock from riparian zones to allow the regeneration of the forest), or by executing actions that improve, increase or maintain the provision of the service (for example, renew coffee plantations in existing agroforestry systems with varieties resistant to water stress). The incentives must also have positive impacts for adaptation at the family or productive system scale (such as increased production, product diversification and asset valuation). These benefits can be measured with standard financial indicators such as net present value (NPV) and internal rate of return (IRR).

decision-makers and assist in the uptake of best practices, as well as building an enhanced local evidence base for EbA.

Project loans will be administered through CABEI. GCF loan financing will be used under Component 2 to: (i) create a credit program for EbA-oriented products and services aimed at commercial banks and microfinance institutions; (ii) implement a microfinancing mechanism for the promotion of water-efficient technologies and other related economic activities; and (iii) implement the credit program at commercial scale to incentivise the adoption of new technologies for sustainable forestry, agroforestry or other related economic activities. Project loans are a complementary measure to PES and CSE.

Microcredits are loans to small-scale farmers, rural families or small urban centres with low incomes, that lack access to traditional credits from commercial banks (because of lack of guarantees or land title). Microcredits will finance mainly the adoption of water-efficient technologies at the household and community level, as well as energy-efficient technologies. Other measures, such as the adoption of agroforestry systems can also be included.

A loan programme established will be established within commercial banks to finance innovative climate-resilient approaches to sustainable forestry products and agroforestry. This credit programme for large-scale commercial private sector operations will be established, to incentivize the adoption of innovative technologies for sustainable forestry, agroforestry and other related economic activities. Technical support will be provided to commercial banks for: i) the development and implementation of the credit programme; ii) the development of EbA criteria for the private sector and government extension services; iii) a monitoring system on EbA effectiveness; and iv) the development of information packages – including availability of financial products for EbA initiatives and business opportunities – for private investors and local government entities. Finally, an incentive scheme will be developed to provide cash refunds on principal loans granted by regulated or non-regulated intermediary financial institutions (IFIs). These incentives will be targeted at loans used specifically for the implementation of interventions that meet the EbA criteria.

Table 5. Potential mechanisms to be developed

| | Economic incentives | | Financial mechanisms | | | Technical assistance |
|---|---|---|---|---|---|---|
| | Payments or compensations for environmental services | Water Funds | Grants | Small loans | Loans | |
| **EbA measures** | | | | | | |
| Ecological restoration of forest and wetland remnants | x | x | x | | | X |
| Sustainable production of timber and firewood | x | x | x | x | | X |
| Mixed plantations with native species | x | x | x | | x | X |
| Recovery or establishment of agroforestry systems | x | x | x | x | x | X |
| | | | | | | |
| **Water-efficient technologies** | | | | | | |
| Mixed nurseries | | | | x | | X |
| Firebreaks | | | | x | | |
| Efficient biomass stoves | | | | x | | X |
| Firewood drying and efficient charcoal production | | | | x | | |
| Small reservoirs for rainwater collection | | | | x | | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| Rooftop rainwater harvesting | | | | x | | X |
| Solar photovoltaic water pumping systems | | | | | x | X |
| Drip irrigation | | | | | x | X |
| Ceramic water filters | | | | x | | X |
| Ecotourism | | | | x | x | X |
| Small and medium investments to provide drinking water and basic sanitation | | x | | | x | X |

The general credit program will be executed by the Central American Bank for Economic Integration, an organization with extensive experience in microcredits and credits in the region. Loans and microcredits will be provided through CABEI's accredited intermediary financial institutions (IFIs).

## 12. Conclusion

This Pre-Feasibility Study finds that there are multiple potential options for implementing EbA in the Central American Dry Corridor and the Arid Zones of the Dominican Republic, both in terms of the technical approach to EbA and the financial and adaptation benefits to be generated.

Regarding the selection of appropriate EbA intervention sites for the project, this pre- feasibility assessment recommends that site selection considers, in addition to other factors: i) ecosystem or land use type; ii) ecosystem degradation level; and iii) land tenure system. Furthermore, the design of EbA interventions will need to consider: i) expected climate change impacts on ecosystems and species; and ii) likely land use trends and behavioural patterns in specific land tenure systems.

All the proposed EbA interventions can be categorised as 'no regret' options which are unlikely to generate any negative social, economic or environmental consequences. As a result, this assessment finds that the EbA approach is well suited to the project context and is an appropriate for the adaptation priorities of the seven participating countries. Regarding the commercial benefits to be generated by the project, potential natural resource-based businesses have been identified in this assessment.

This Pre-Feasibility Study recommends that additional analyses are undertaken to determine the most appropriate interventions to be prioritised in each intervention site, based on more detailed assessments of the options analysed in this study. In particular, the analyses undertaken thus far will be complemented by: i) detailed economic and market assessments to estimate the commercial viability of the proposed businesses, including assessment of net returns, rate of return on investment, and lifetime returns on investment; and ii) assessments of the capacity of all participating stakeholders, including national and local government, NGOs, financial institutions, academia and beneficiary communities, to participate in or lead the implementation of the project's interventions.

**Annex 9 - Environmental, Social and Economic Review Note (ESERN)**

## I. Project Overview

| **Identification** | |
|---|---|
| Project Title | Ecosystem-based Adaptation and transformational measures to increase resilience to climate change in the Central American Dry Corridor and Arid Zones of the Dominican Republic |
| Managing Division | Regional Office for Latin America and the Caribbean |
| **Type/Location** | Regional |
| **Region** | Latin America & Caribbean |
| List Countries | Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panamá & the Dominican Republic |
| Project Description | This project will address climate change impacts that threaten the basic needs and livelihoods of vulnerable populations, primarily water supply and regulation, to the vulnerable communities of the Central American Dry Corridor and Arid Zones of the Dominican Republic, and the lack of capacity and financial resources to address those impacts.<br><br>To face this problem, transformational changes are required. The proposed intervention bases these changes on the application of Ecosystem-based Adaptation and other adaptation measures that are key for building the climate resilience of communities. This will be done (i) at the landscape scale, through the maintenance and restoration of forests, wetlands, and agroforestry systems under climate change conditions, and (ii) at the community level, through fostering the adoption of water-efficient technologies, considering climate change impacts on water scarcity.<br><br>Moreover, the project will facilitate the establishment of policies, incentives, and attractive financial mechanisms to support the implementation of these measures and promote small green businesses and alternative livelihoods at community level. Finally, knowledge generated will be managed to inform decision-making. |
| Estimated duration of project: | 84 months (7 years) |
| Estimated cost of the project | 162,672,970 USD |

## II. Environmental Social and Economic Screening Determination

### A. Summary of the Safeguard Risks Triggered

| Safeguard Standard Triggered by the Project | Impact of Risk[151] (1-5) | Probability of Risk (1-5) | Significance of Risk (L, M, H) |
|---|---|---|---|
| SS 1: Biodiversity, Natural Habitat and Sustainable Management of Living Resources | 1 | 1 | L |
| SS 2: Resource Efficiency, Pollution Prevention and Management of Chemicals and Wastes | 1 | 1 | L |
| SS 3: Safety of Dams | 1 | 1 | L |
| SS 4: Involuntary resettlement | 2 | 2 | L |
| SS 5: Indigenous peoples | 2 | 1 | L |
| SS 6: Labor and working conditions | 1 | 1 | L |
| SS 7: Cultural Heritage | 1 | 1 | L |
| SS 8: Gender equity | 2 | 1 | L |
| SS 9: Economic Sustainability | 2 | 1 | L |
| Additional Safeguard questions for projects seeking GCF-funding (Section IV) | | | |

### B. ESE Screening Decision[152] .)

Low risk X Moderate risk ☐ High risk ☐ Additional information required ☐

### C. Development of ESE Review Note and Screening Decision:

Prepared by: Name: ________________________ Date: _________

Safeguard Advisor: Name: ________________________ Date: _________

Project Manager: Name: ________________________ Date: _________

### D. Recommended further action from the Safeguard Advisor:

151

152 **Low risk**: Negative impacts negligible: no further study or impact management required.
**Moderate risk**: Potential negative impacts, but less significant; few if any impacts irreversible; impact amenable to management using standard mitigation measures; limited environmental or social analysis may be required to develop a ESEMP. Straightforward application of good practice may be sufficient without additional study.
**High risk**: Potential for significant negative impacts, possibly irreversible, ESEA including a full impact assessment may be required, followed by an effective safeguard management plan.

## III. ESES Principle and Safeguard checklist

(Section III and IV should be retained in UN ENVIRONMENT)

| Precautionary Approach |
|---|
| The project will take precautionary measures even if some cause and effect relationships are not fully established scientifically and there is risk of causing harm to the people or to the environment. |
| **Human Rights Principle** |
| The project will make an effort to include any potentially affected stakeholders, in particular vulnerable and marginalized groups; from the decision making process that may affect them. |
| The project will respond to any significant concerns or disputes raised during the stakeholder engagement process. |
| The project will make an effort to avoid inequitable or discriminatory negative impacts on the quality of and access to resources or basic services, on affected populations, particularly people living in poverty or marginalized or excluded individuals or groups.[153] |

| Screening checklist | Y/N/ Maybe | Comment |
|---|---|---|
| **Safeguard Standard 1: Biodiversity, natural habitat and Sustainable Management of Living Resources** | | |
| Will the proposed project support directly or indirectly any activities that significantly convert or degrade biodiversity and habitat including modified habitat, natural habitat and critical natural habitat? | N | Not anticipated, on the contrary the project will seek to protect, restore, and increase the resilience of current ecosystems located in the implementation sites. |
| Will the proposed project likely convert or degrade habitats that are legally protected? | N | No expected impacts are to result in existing protected areas, on the contrary through the use of native species the project seeks to enhance the adaptive capacity of current ecosystems. Moreover, through the raising awareness component the |

[153] Prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or other opinion, national or social or geographical origin, property, birth or other status including as an indigenous person or as a member of a minority. References to “women and men” or similar is understood to include women and men, boys and girls, and other groups discriminated against based on their gender identities, such as transgender people and transsexuals.

| | | |
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| | | project seeks to create consciousness about climate smart practices that reduce the vulnerability of the landscapes. |
| Will the proposed project likely convert or degrade habitats that are officially proposed for protection? (e.g.; National Park, Nature Conservancy, Indigenous Community Conserved Area, (ICCA); etc.) | N | Not anticipated impacts are likely to occur. |
| Will the proposed project likely convert or degrade habitats that are identified by authoritative sources for their high conservation and biodiversity value? | N | Not anticipated impacts are likely to occur. On the contrary, one of the selection criteria for the implementation sites will be the relevance for enhancement of the ecosystems given by national authorities and other key stakeholders to ensure countries values are prioritized in terms socioecological resilience for the implementation sites. |
| Will the proposed project likely convert or degrade habitats that are recognized- including by authoritative sources and /or the national and local government entity, as protected and conserved by traditional local communities? | N | Not anticipated impacts are likely to occur. |
| Will the proposed project approach possibly not be legally permitted or inconsistent with any officially recognized management plans for the area? | N | Not anticipated, national authorities for all countries are identified as key stakeholders and therefore included from the initial project planning stage and current management plans (if applicable) are expected to be revised and adjusted to potentialize resilient land management. |
| Will the proposed project activities result in soils deterioration and land degradation? | N | On the contrary, the project seeks to improve soil quality and deter land degradation trough ecosystem-based approaches that consider restoration of degraded landscapes and agroforestry practices to increase forest cover, enhance ecosystem services and increase agricultural yield. |
| Will the proposed project interventions cause any changes to the quality or quantity of water in rivers, ponds, lakes or other wetlands? | N | No negative impacts are expected to occur. On the contrary, water security is |

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| | | at the core of the project and thus, it will strengthen water management practices through ecosystem and community-based approaches foster decision making process and funding to guarantee access to high quality water in all countries. |
| Will the proposed project possibly introduce or utilize any invasive alien species of flora and fauna, whether accidental or intentional? | N | No anticipated impacts involving invasive species are likely to occur. The project design includes ecosystem-based practices that will solely consider the use of native or existing species such as *Gliricidia sepium,* Cedrela odorata, *Cordia alliodora, Schizolobium parahyba, Dalbergia* sp, *Astronium graveolens, Cordia alliodora.* |
| **Safeguard Standard 2: Resource Efficiency, Pollution Prevention and Management of Chemicals and Wastes** | | |
| Will the proposed project likely result in the significant release of pollutants to air, water or soil? | N | Not anticipated release of pollutants to be expected. |
| Will the proposed project likely consume or cause significant consumption of water, energy or other resources through its own footprint or through the boundary of influence of the activity? | N | Not anticipated. |
| Will the proposed project likely causes significant generation of Green House Gas (GHG) emissions during and/or after the project? | N | Not anticipated production of significant Green House Gas (GHG) emissions. On the contrary through an increase of forest cover in the region larger carbon storage is expected to occur. |
| Will the proposed project likely generates wastes, including hazardous waste that cannot be reused, recycled, or disposed in an environmentally sound and safe manner? | N | Not anticipated. |
| Will the proposed project use, cause the use of, or manage the use of, storage and disposal of hazardous chemicals, including pesticides? | | |
| Will the proposed project involve the manufacturing, trade, release and/or use of hazardous materials subject to international action bans or phase-outs, such as DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Convention on Persistent Organic Pollutants or the Montreal Protocol? | N | Not anticipated. |

| | | |
|---|---|---|
| Will the proposed project require the procurement of chemical pesticides that is not a component of integrated pest management (IPM)[154] or integrated vector management (IVM)[155] approaches? | N | Not anticipated. |
| Will the proposed project require inclusion of chemical pesticides that are included in IPM or IVM but high in human toxicity? | N | Not anticipated. |
| Will the proposed project have difficulty in abiding to FAO's International Code of Conduct[156] in terms of handling, storage, application and disposal of pesticides? | N | Not anticipated. |
| Will the proposed project potentially expose the public to hazardous materials and substances and pose potentially serious risk to human health and the environment? | N | Not anticipated. |
| **Safeguard Standard 3: Safety of Dams** | | |
| Will the proposed project involve constructing a new dam(s)? | N | Dam(s) construction(s) is not considering in the design of the project. |
| Will the proposed project involve rehabilitating an existing dam(s)? | N | Dam(s) rehabilitation(s) is not considering in the design of the project. |
| Will the proposed project activities involve dam safety operations? | N | Dam(s) operation(s) is not considering in the design of the project. |
| **Safeguard Standard 4: Involuntary resettlement** | | |
| Will the proposed project likely involve full or partial physical displacement or relocation of people? | N | Not anticipated displacement of people are expected to result from the implementation of the project, |
| Will the proposed project involve involuntary restrictions on land use that deny a community the use of resources to which they have traditional or recognizable use rights? | Maybe | Restrictions on land use (if applicable) can only result from the modification of existing land and water management plans that will seek to enhance the socioecological resilience of the implementation sites. Other changes in land use or water management will result from voluntary actions as the |

154 "Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/en/

155 "IVM is a rational decision-making process for the optimal use of resources for vector control. The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. The ultimate goal is to prevent the transmission of vector-borne diseases such as malaria, dengue, Japanese encephalitis, leishmaniasis, schistosomiasis and Chagas disease." (http://www.who.int/neglected_diseases/vector_ecology/ivm_concept/en/)

156 Find more information from http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/CODE_2014Sep_ENG.pdf

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| | | projects will consider establishing agreements with the private sector, including managers of private forests, livestock owners and coffee growers interested in restoring their farms and improving access to high quality water. |
| Will the proposed project likely cause restrictions on access to land or use of resources that are sources of livelihood? | Maybe | Restrictions on land use (if applicable) can only result from the modification of existing land and water management plans that will seek to enhance the socioecological resilience of the implementation sites. Other changes in land use or water management will result from voluntary actions as the projects will consider establishing agreements with the private sector, including managers of private forests, livestock owners and coffee growers interested in restoring their farms and improving access to high quality water. |
| Will the proposed project likely cause or involve temporary/permanent loss of land? | N | Not anticipated temporary/ permanent loss of land is expected to occur. |
| Will the proposed project likely cause or involve economic displacements affecting their crops, businesses, income generation sources and assets? | N | Not expected to occur. |
| Will the proposed project likely cause or involve forced eviction? | N | Not expected to occur. |
| Will the proposed project likely affect land tenure arrangements, including communal and/or customary/traditional land tenure patterns negatively? | N | Not expected to occur. |
| **Safeguard Standard 5: Indigenous peoples**[157] | | |
| Will indigenous peoples be present in the proposed project area or area of influence? | Maybe | Considering the large prevalence of indigenous populations in the countries included in the project particularly in Guatemala and the fact that the project will target vulnerable communities including indigenous communities there is a high likelihood of indigenous |

157 Refer to the Toolkit for the application of the UN ENVIRONMENT Indigenous Peoples Policy Guidance for further information.

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| | | people present at the implementation sites. |
| Will the proposed project be located on lands and territories claimed by indigenous peoples? | Maybe | The selection of implementation sites located on lands and territories claimed by indigenous peoples will entirely depend on the feasibility criteria that will consider the enabling environment for the project including political will defined by explicit support from local governments and other key stakeholders such as indigenous communities. |
| Will the proposed project likely affect livelihoods of indigenous peoples negatively through affecting the rights, lands and territories claimed by them? | N | Not expected negative impacts are expected to occur. On the contrary, the project seeks to improve the resilience of vulnerable communities including indigenous peoples through the enhanced provision of ecosystem services, diversification of current livelihoods and access to new sources of funding. |
| Will the proposed project involve the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples? | Maybe | The selection of implementation sites located on lands and territories claimed by indigenous peoples will entirely depend on the feasibility criteria that will consider the enabling environment for the project including political will defined by explicit support from local governments and other key stakeholders such as indigenous communities. |
| Will the project negatively affects the development priorities of indigenous peoples defined by them? | N | Not expected negative impacts are expected to occur. |
| Will the project potentially affects the traditional livelihoods, physical and cultural survival of indigenous peoples? | N | Not expected negative impacts are expected to occur. |
| Will the project potentially affect the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices? | N | Not expected negative impacts are expected to occur. On the contrary, the |

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| | | project will seek to maintain traditional knowledge and practices, complemented with other types of knowledge to enhance the livelihood of the populations. |
| **Safeguard Standard 6: Labor and working conditions** | | |
| Will the proposed project involve the use of forced labor and child labor? | N | Not applicable. |
| Will the proposed project cause the increase of local or regional un-employment? | N | Not anticipated. On the contrary the project will seek to improve people's livelihood by diversifying sources of income and enabling new sources of funding through the creation of commercially viable businesses based on natural resources through the provision of training in supply and maintenance of ecosystem-based adaptation activities promoted by the project. |
| **Safeguard Standard 7: Cultural Heritage** | | |
| Will the proposed project potentially have negative impact on objects with historical, cultural, artistic, traditional or religious values and archeological sites that are internationally recognized or legally protected? | N | Not anticipated. |
| Will the proposed project rely on or profit from tangible cultural heritage (e.g., tourism)? | Maybe | The project is expected to increase forest cover, increase biodiversity, and enhance the aesthetics of current degraded landscapes, therefore assessment of new sources of funding such as ecotourism can be considered for some of the implementation sites. |
| Will the proposed project involve land clearing or excavation with the possibility of encountering previously undetected tangible cultural heritage? | N | Not anticipated. |
| Will the proposed project involve in land clearing or excavation? | N | Not anticipated. |
| **Safeguard Standard 8: Gender equity** | | |
| Will the proposed project likely have inequitable negative impacts on gender equality and/or the situation of women and girls? | N | Not anticipated. On the contrary, the project will seek to reduce gender inequity by: i) performing a gender analysis to assess gender status in the different countries to understand the |

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| | | context and adjust activities to ensure a gender responsive implementation, ii) ensuring equitable participation and engagement of men and women in the different activities included in the project design, ii) including gender sensitive actions to address labour burden challenges and reduced access to and control of key resources such as land. |
| Will the proposed project potentially discriminate against women or other groups based on gender, especially regarding participation in the design and implementation or access to opportunities and benefits? | N | Not anticipated. On the contrary, the project will seek to enhance women participation and engagement in the implementation of the ecosystem-based adaptation activities included in the project. This includes enhancing women's opportunities to gain access to new funding opportunities through the establishment of small green business based on natural resources. |
| Will the proposed project have impacts that could negatively affect women's and men's ability to use, develop and protect natural resources, taking into account different roles and positions of women and men in accessing environmental goods and services? | N | Not anticipated. The project will seek to boost both men and women's potential to make a sustainable use of natural resources and will consider their different roles and position to access environmental goods and services through a gender analysis in each of the countries to adjust the activities to the local contexts and ensure equal benefits for both. |
| **Safeguard Standard 9: Economic Sustainability** | | |
| Will the proposed project likely bring immediate or short-term net gain to the local communities or countries at the risk of generating long-term economic burden (e.g., agriculture for food vs. biofuel; mangrove vs. commercial shrimp farm in terms of fishing, forest products and protection, etc.)? | N | Not anticipated. No significant trade-offs are considered in the project design. On the contrary the project will seek to potentialize the benefits of the current ecosystem services and generate policies to encourage the |

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| | | creation of new green small business and means of funding. |
| Will the proposed project likely bring unequal economic benefits to a limited subset of the target group? | N | Not anticipated. |

## IV. Additional Safeguard Questions for Projects seeking GCF-funding

| | | | |
|---|---|---|---|
| **Community Health, Safety, and Security** | | | |
| Will there be potential risks and negative impacts to the health and safety of the Affected Communities during the project life-cycle? | | N | Not anticipated. |
| Will the proposed project involve design, construction, operation and decommissioning of the structural elements such as new buildings or structures? | | N | Not anticipated. |
| Will the proposed project involve constructing new buildings or structures that will be accessed by public? | | N | Not anticipated. |
| Will the proposed project possibly cause direct or indirect health-related risks and impacts to the Affected Communities due to the diminution or degradation of natural resources, and ecosystem services? | | N | Not anticipated. |
| Will the proposed project activities potentially cause community exposure to health issues such as water-born, water-based, water-related, vector-borne diseases, and communicable diseases? | | N | Not anticipated. |
| In case of an emergency event, will the project team, including partners, have the capacity to respond together with relevant local and national authorities? | Y | | |
| Will the proposed project need to retain workers to provide security to safeguard its personnel and property? | | N | Not anticipated. |
| **Labor and Supply Chain** | | | |
| Will UN ENVIRONMENT or the implementing/executing partner(s) involve suppliers of goods and services who may have high risk of significant safety issues related to their own workers? | | N | Not anticipated. |