EXECUTIVE SUMMARY

"ADAPTING TO CLIMATE CHANGE THROUGH INTEGRATED WATER MANAGEMENT IN PANAMA"

Located in the Central American isthmus, Panama is considered a highly vulnerable country to climate change impacts. Panama experiences a series of extreme weather events including intense and protracted rainfalls, windstorms, floods, droughts, wildfires, earthquakes, landslides, tropical cyclones, tsunamis and ENSO/El Niño-La Niña events. In parallel, Panama is considered one of the countries with the largest water resources, approximately 35,000m3 of renewable freshwater resources per capita. This abundance scenario is relative, since it hides a series of regional and seasonal limitations, specifically those limitations associated to the area known as the "Arco Seco", the most arid region of the country. The relative water abundance scenario (current and future) has not escaped the existence of serious conflicts due to competition for water use that have a tendency to worsen, in quantity and intensity. The Chiriquí Viejo river watershed currently represents one of the areas with higher conflict level among the different groups of water users for hydropower generation and agricultural livestock production.

This relative water abundance scenario and increasing conflicts it's aggravated by climate variability and extreme weather events, mainly droughts and floods, where users and authorities have a lack of means and information to face them timely and effectively. According to statistical and meteorological records, since year 2004 there has been an increase in frequency of extreme events in the country, and the hydro meteorological are the ones that have affected more different ecosystems, as well as the most vulnerable population in several priority watersheds at the national level.

Water security is now recognized as a global security challenge. It has also been recognized that water, food, energy and climate form a nexus. The impact of climate change on water security is accepted as an important issue. Climate change is disrupting the global water cycle and will increase the frequency and severity of disasters. The Intergovernmental Panel on Climate Change (IPCC) 5th Assessment predicts more frequent and more severe droughts, floods and storms, intensified glacier melting and sea level rise, all of which will cause and contribute to increasing numbers of disasters worldwide and Panama is not the exception.

Panamá is probably one of the best examples at the global scale of a water driven country. Water management is key for the country's socioeconomic and environmental operation. It's key for the operation of the canal, backbone of nation´s economy, which sustains logistics, transportation and financial services, pillars of the national economy. Potential complementary sectors such as power and tourism, are also directly related to water management, both for using the resources and ecosystem services (water supply, scenic beauty, recreational uses, others). From this perspective, water resource management is the base of the country's economic, social and environmental sustainability. Water management in Panama takes place based on an integrated water resources management approach and watershed approach, without taking into consideration neither the climate change dimension nor risk management, which have, in the case of the Republic of Panama, a hydro-meteorological origin.

The people of Panama need access to accurate information and sound advice on how best to respond to this challenge, through adaptation and mitigation efforts. This Adaptation Program Proposal, based on water management to advance towards climate change adaptation, seeks to fulfill this need and serve as a national baseline to systematically address, monitor and evaluate adaptation to climate change at the national and local scales.

This Adaptation Program aims to address this condition by situating water management at the center of the adaptation efforts, promoting climate resilience and vulnerability reduction through enhancing food and energy security, based on an integrated water resources management approach that highlights the water-energy-food-climate change adaptation nexus. To do this, the Program will focus efforts in two river watersheds -Chiriquí Viejo and Santa María-; both prioritized in light of its water resources, its importance for energy and food production at a national scale, and the existence of unsolved conflicts among water users. Concrete adaptation measures will be implemented through climate proof water management, productive initiatives based on the climate smart agriculture approach in prioritized sites accordingly to social and climate vulnerability. Complementary actions include: fully operational EWSs, analysis to promote renewable energy and EBA activities and financial sources to fund the initiatives; an adaptation knowledge platform based in development of adaptation skills in different sectors, systematization of lessons learned in adaptation projects, and a national system for climate data to monitor hydro meteorological activity as well as the effectiveness of adaptation efforts.

The overall objective of this programme is to establish climate resilience water management to enhance food and energy security at the national level, through an integrated and community based approach in the Chiriqui Viejo and Santa Maria Watersheds. Specifically, the programme will be addressing the following objectives: a) Increasing climate change and variability adaptation capacity in agriculture, livestock and energy production sectors; b) establishing climate resilient water management instruments with integrated and community based approach; c) strengthening local national capacity for monitoring and decision making to reduce and respond to risks associated to climate change; and d) raising awareness and establish a knowledge exchange platform to respond to and to mitigate impacts of climate related events.

The proposed adaptation programme is fully aligned with public policy priorities defined by the national government, particularly the National Integrated Water Resources Management Plan 2010-2030 (PNGIRH by its acronym in Spanish). At the national level, the convergence in time of the current Adaptation Program with efforts to move forward with a National Plan for Water Security, an Energy Plan 2015-2050, and the National Pact for Agriculture, offers a unique momentum for developing synergies opportunities between mitigation and adaptation agendas, for conservation and restoration of ecosystem services relevant to the population and agriculture, through the proposed Adaptation Program.

The Programme includes globally accepted adaptation practices and methods such as the ecosystem based adaptation, vulnerability analysis and non-regret adaptation measures to promote concrete adaptation activity in particularly vulnerable geographical areas of the country; fully operational EWSs; irrigation projects, among other concrete adaptation actions. In parallel, by addressing the water-food-energy-climate change nexus, the Program aims to provide knowledge to improve the decision making process to grant water rights based on climate data, helping to strengthen water governance in areas with unsolved social conflicts among users.

Based in the previous statements, the Ministry of Environment of Panama, Panamá´s designated authority to the Adaptation Fund, endorses the Concept Note for the full scale programme proposal "Adapting to climate change through integrated water management in Panamá", presented by Fundación Natura, National Implementing Entity of Panamá.

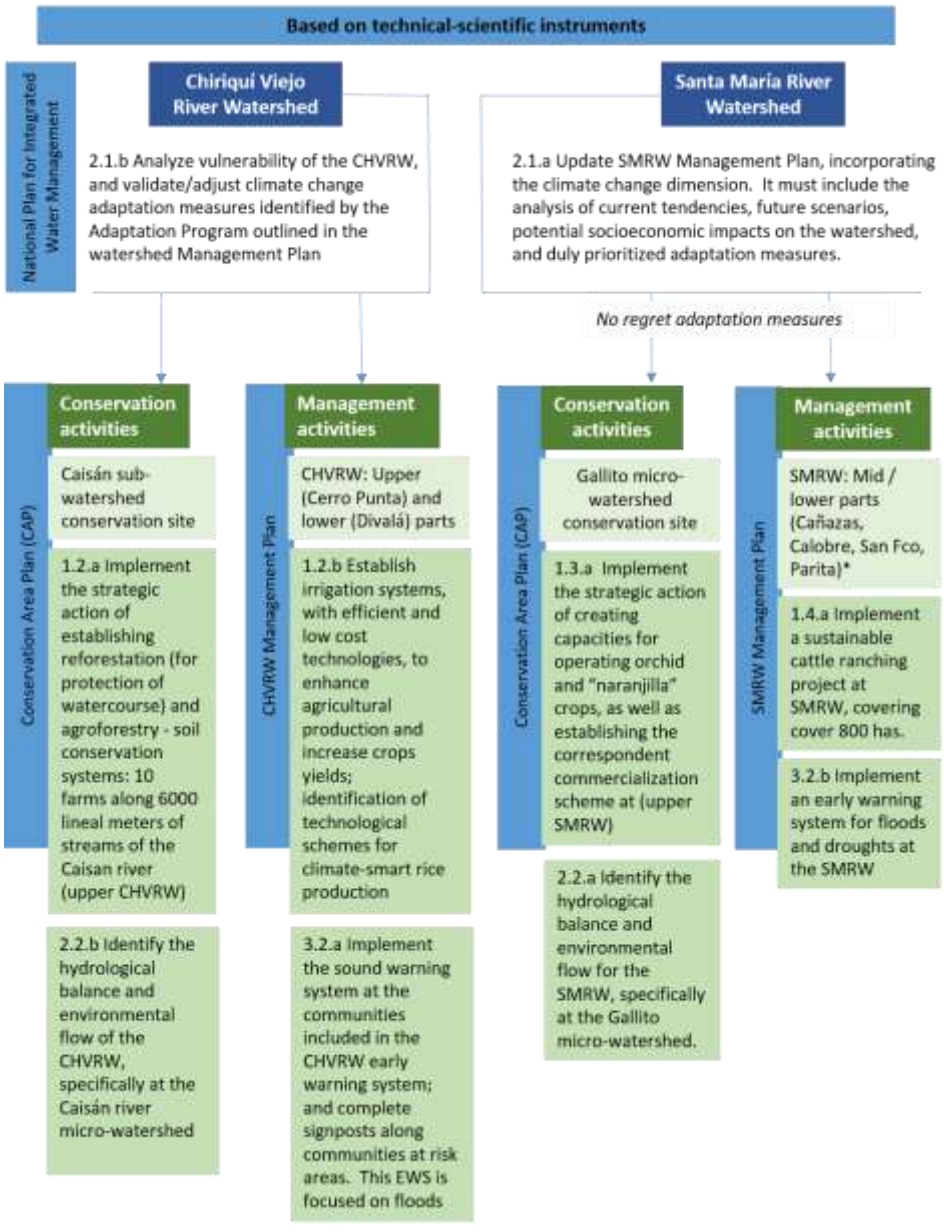
The proposal presents an Integrated Approach to Climate Change Adaptation by:

1. Implementing an "inter-sectorial" approach, as opposed to interventions solely designed from one sector perspective. This is what we have named as the "water-food-energy-climate nexus approach", which is being implemented in the country for the first time at a national scale.
2. The programme aims to deliver results, in parallel, at the national / local / sectorial scale. In this regard, projects/activities included in the programme that will be implemented at a local scale -watershed or sub-watershed- have been designed ensuring that "knowledge products" will be generated to support adaptation knowledge expansion and facilitate replication in other geographical areas of the country. Examples of national scale deliverables are: a new national map for agriculture and livestock production based in climate and water management data (2.3. b); technical document with recommendations to improve the water concession processes, considering climate change data (2.2a, b). Local scale products include installation and operation of EWS (3.2.b), irrigation systems (1.2.b), agroforestry systems (1.2.a), among others. Sectorial scale products generated include, for example, promotion of the Microfinance for ecosystem based adaptation approach, a brand new concept to Panamanian financial sector (1.5).
3. The programme is based in a complementary/synergy approach, providing in the ground implementation linkages/opportunities to 3 current national scale planning processes: the water security national plan; national energy programme and national pact for the agriculture sector. Using the climate change dimension debate, the programme will serve as a "think tank" to promote/discuss synergies among these processes, wich are being conducted currently, mainly with a sectorial perspective.
4. The progamme presents a balanced menu of capital/technology/equipment intensive processes (National System of Climate Data 3.1 a, 3.3); on the ground adaptation activity (for ex: EWSs 3.2.b and EBA measures 1.2); influencing long term/national scale public policy (recommendations to update water granting process for hydropower generation by producing technical documents based on climate dimension (2.2); new national zoning map for agriculture production (2.3.b), among others.

For the reasons mentioned above, the proposed Adaptation Programme for Panama is conceived as a transformational process for the country, that will strengthen adaptive capacity at all levels, contributing to the popularization of adaptation knowledge and installing adaptation measures at a larger scale, which is currently nonexistent, due to a logic of isolated/sectorial projects

Interventions with national and sub-national level impact and reach

Interventions with local level impact and reach



GLOSSARY

ICCDD	International Convention to Combat Drought and Desertification
ANAM	National Authority for the Environment
CAC	Central American Agricultural Council
CATHALAC	Water Center for the Humid Tropics of Latin America and The Caribbean
CATIE	Tropical Agricultural Research and Higher Education Center
CEPAL	Economic Commission for Latin America and the Caribbean
CHVRW	Chiriquí Viejo River Watershed
CIAT	International Center for Tropical Agriculture
CREHO	Ramsar Regional Center for Training and Research on Wetlands
ENSO	El Niño - Southern Oscillation
ETESA	Electric Transmission Company
EWS	Early Warning Systems
FAO	The United Nations Food and Agriculture Organization
GDP	Gross Domestic Product
IADB	Inter-American Development Bank
IDIAP	Institute for Agriculture and Livestock Research of Panama
IIAC	Inter-American Institute of Agricultural Cooperation
IICA	Inter-American Agricultural Cooperation Institute
INEC	National Institute for Statistics and Census
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management

LAC	Latin American Countries
LMGP	Land Management General Plan
MEbA	Microfinance for Ecosystem-based Adaptation
MIDA	Ministry of Agriculture Development
NTU	Nephelometric Turbidity Unit
PNGIRD	National Policy for Integrated Disaster Risks Management
PNGIRH	Republic of Panama's National Integrated Water Resources Management Plan 2010-2030
RGIS	Rice Grow Intensive System
SINAP	National System of Protected Areas
SINAPROC	National Civil Protection System
SMRW	Santa María River Watershed

Amended in November 2013

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Full scale programme
Country/ies:	Panama
Title of Project/Programme:	"Adapting to climate change through integrated water management in Panama"
Type of Implementing Entity:	NIE
Implementing Entity:	Fundación Natura
Executing Entity/ies:	Ministry of Environment; Ministry of Agriculture; ETESA
Amount of Financing Requested:	US$9,952,121

Project / Programme Background and Context:

a) Provide brief information on the problem the proposed project/programme is aiming to solve.

The Republic of Panama is home to 3.5 million people, a world famous canal and a modern financial sector that contributes to the country's strong economic performance. At the same time, despite boasting the highest per capita income in Central America, rural poverty in Panama is quite high; in 2003, 54 percent of non-indigenous rural residents were poor, and 22 percent were extremely poor. Barriers to poverty alleviation include limited economic opportunities, a deteriorated natural resource base, an inequitable land tenure system, lack of access to microfinance and structural constraints that impede competition in the agriculture sector. Panama is classified as a developing country with a per capita income Gross Domestic Product (GDP) of US $7155 (2009). Widespread poverty and inequality have negative spillover effects on the environment.

Panama is considered to be one of the most biologically diverse countries in the world, and more than 12 percent of Panama's landmass is protected. Nonetheless, poverty pressures have driven many to exploit the natural resources of the Mesoamerican Biological Corridor[1] in harmful ways. In addition, deforestation is a growing concern, as

[1] The Mesoamerican Biological Corridor (MBC) is one of the largest bioregional conservation programs in the world. The core idea behind this program is the creation of a series of protected wildlife corridors stretching from southern Mexico to eastern Panama to protect over 769,000 km2 of land. It became an official initiative in 1997 during a presidential summit, describing it as "a territorial planning system consisting of natural protected areas under a special regime whereby core, buffer, multiple use and corridor zones are organized and consolidated in order to provide an array of environmental goods and products to the Central American and global societies, offering spaces for social harmonization to promote investments in the conservation and sustainable use of natural resources".

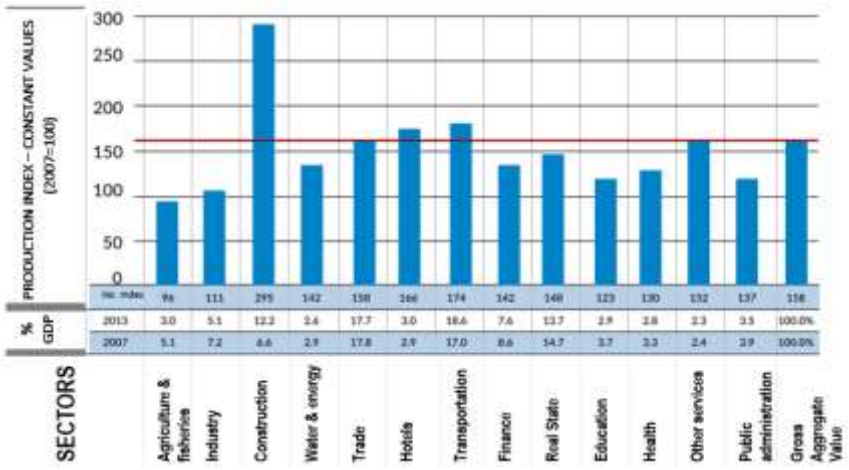
forests cover 40 percent of Panama's territory. Panama ranks 14th among countries most exposed to multiple hazards based on land area. Panama has 15 percent of its total area exposed and 12.5 percent of its total population vulnerable to two or more hazards. In addition, Panama ranks 35th among countries with the highest percentage of total population considered at a relatively high mortality risk from multiple hazards. Climate change threatens to increase vulnerability of both human and ecological systems in Panama. The agriculture, water resources, forestry, coastal zone management and health sectors will be particularly impacted. More frequent and intense storms, floods, and droughts are causing huge economic losses and affecting the livelihoods of the poorest and most marginalized members of society in particular[2].

Panama's economic growth has been one of the largest ones in Latin America for the past decade, with an average GDP growth above 8 percent between 2006 and 2012. Compared to other countries of the region, Panama had a relatively favorable development during the global financial crisis with 3.2 percent growth in 2009. However, in 2010 the economy went back to its own pace with 7.6 percent growth, for a GDP expansion of 10.6 percent in 2011, 10.5 percent in 2012, 7.9 percent in 2013 and 6.2 percent in 2014, for a GDP of B/.35,642.2 million and approximated growth of 6 percent in 2015. This strong economic growth has represented an improvement in social indicators. Poverty rate went down from 48.5 percent in 2002 to 27 percent in 2011, while extreme poverty went down from 21 percent to 11 percent during the same period. However, inequality remains relatively high in Panama (Gini's coefficient of 0.53 in 2011) and also some challenges for public provision of social services, remain.

Panama has a diversified economy, with no activity exceeding 25 percent of total participation. This diversification is considered as one the strengths of the Panamanian economy. However, there are some sectors that have always shown more dynamism in Panama: logistics, transportation, storage, communications and construction, as shown in the next figure.

[2] World Bank. Climate Change Knowledge Portal. Panama Dashboard.

Figure 1. Structure and sectorial growth of Gross Aggregate Value. Period 2007-2013
(in percentage of growth indicators at constant values. 2007=100)



Source: General Comptroller of the Republic of Panama. INEC.

Traditionally, service activities have remained close to 75 percent of the GDP. In this composite, the logistics sector has a significant weight, because of trade activities associated to the Panama Canal. Based on work productivity of specific sectors of the Panamanian economy, the power, gas and water supply which represents a productivity 88 percent higher than the total average, shapes itself as a potential sector for boosting the multiplying effect for generating future economic growth engines.

According to the Government's Strategic Plan 2015-2019, the main driving elements of the economy in the short term will likely be associated to the operation of the Canal's third set of locks, the expansion and extension of tourism activities and the development of food and agriculture activities. The Plan indicates that for the 2007 to 2013 period the activities in primary and secondary sectors (agriculture, livestocking, silviculture and fishing, and manufacturing industries) have significantly reduced their already small input to the GDP: from 16 percent to 11 percent if we look at them as a whole. The decrease in participation, seen both in agriculture and in industry, has been much more noticeable in the primary sector (excluding mines and pits); therefore it is the only economy sector with cuts in value generation in absolute terms. In 2014 "only the GDP of agriculture, livestocking, hunting and silviculture went down, due to climate adverse effects and because of a lower demand at the international market of some export fruits such as pineapple".

The World Bank Analysis for the Country Diagnostic in 2015 identified five policy priorities that Panama may consider to sustain its recent track record on growth, poverty reduction

and shared prosperity. Growth prospects for Panama are good in the near term with projections for 2014-2019 around 6 percent based on sustaining high levels of investment. However, a number of potential impediments are emerging and could slow growth over the medium to long term if left unaddressed. First, infrastructure, specifically energy, is creating bottlenecks to growth. Second, weaknesses in education and a shortage of skilled labor may be limiting growth and concerns about quality and high drop-out rates from secondary education have been identified as challenges in the education sector. Third, weak public sector institutions may slow down growth, notably if the challenges of transparency, pockets of low efficiency, and weaknesses in the regulatory framework remain unaddressed. In terms of building an inclusive society, the analysis shows that the indigenous have benefited least from Panama's excellent growth performance. Therefore, addressing the challenge of their inclusion has been identified as a fourth priority area. Finally, water management has emerged as fifth priority area. As climate change could lead to increased variability in rainfall, careful water management will decide the sustainability of the successful operation of the Panama Canal as a major pillar of economic activity.[3] (Underlining added)

According to the Republic of Panama's National Integrated Water Resources Management Plan 2010-2030 (from now on, the PNGIRH by its acronym in Spanish), in Panama the main activities for water use are: human intake (606.62 hm^3), hydroelectric power generation (50,000 hm^3), Panama Canal lockage's (2,580 hm^3), agricultural and livestock production (105 hm^3), industrial production (2.2 hm3) and touristic recreation (1.3 hm^3). According to water balances of 2008 in 10 of the country's priority watersheds located in the Pacific (excluding the Panama Canal watershed which has daily balances), only one watershed (Anton's river watershed) would show water shortfall, while the other watersheds would present a situation that ranges from equilibrium to water abundance. This abundance scenario is relative, since the "relative resources abundance hides a series of regional and seasonal limitations, specifically those limitations associated to the Arco Seco (the most arid region of the country) watersheds".[4]

The National Plan for Integrated Water Resources Management of the Republic of Panama 2010-2030 estimated the future water demand in the country, based on current uses. Water demand was projected for the next twenty years, at priority watersheds, taking into consideration a series of water demand scenarios coming from diverse socioeconomic scenarios, which represent the different development courses the country may face in the upcoming years (continuism, sustainability, implosion). The scenario showing greater growth in water resources use is sustainability, mainly because of an increase in water demand for hydropower, associated to a more efficient power generation (that takes advantage of the country's hydroelectric potential). To a national scale, the water resource availability assumes that the requirements of several sectors shall be satisfied with the current water supply in the country. Demand estimation in the sustainability scenario shows greater water demands at the Chiriquí Viejo and Chiriquí rivers, presenting the highest percentages of the total general water that has been granted in concession (31.35% and 15.27 percent respectively). It is important to point

[3] The World Bank Analysis for the Country Diagnostic in 2015.
[4] National Plan for Integrated Water Resources Management of the Republic of Panama 2010-2030.

out that these two watersheds have characteristics which make them suitable for hydroelectric development, therefore the high percentage of granted volume (…). The sectorial analysis considers that, the main watersheds for the agricultural sector are those of the Santa Maria and Grande rivers, given the importance of the irrigation system in both. For the agro-industrial sector, the highest granted water volume corresponds to the Chiriquí Viejo watershed, with 77.4 percent out of the total granted at the national level for this sector. This watershed also had the highest concession volumes for hydroelectric (32.94 percent) and agriculture and livestock sectors (10.57 percent), compared to other studied watersheds (underlining added).

The relative water abundance scenario (current and future) has not escaped the existence of serious conflicts due to water use that have a tendency to worsen, in quantity and intensity. In Panama, the most common conflicts for water use and availability are those that take place between one or more users going to the same sources without the corresponding permits; inappropriate planning, management and distribution of watershed concessions; access ban to communities -by property owners- at water catchment sources; construction of dams for hydroelectric projects which can affect resource availability downstream from the dams. During the last years, there have been conflicts because of water use, especially regarding water resources availability, enough to satisfy drinking water, agricultural use and hydroelectric generation demands. The Chiriquí Viejo river watershed currently represents one of the areas with higher conflict level among the different groups of water users for hydropower generation and agricultural livestock production.

This relative water abundance scenario and increasing conflicts it's aggravated by climate variability and extreme weather events, mainly droughts and floods, where users and authorities have a lack of means and information in order to face them timely and effectively. According to statistical and meteorological records since year 2004, there has been an increase in frequency of extreme events in the country, and the hydro meteorological are the ones that have affected more different ecosystems, as well as the most vulnerable population in several priority watersheds at the national level.

The country experiences a series of extreme weather events including intense and protracted rainfalls, windstorms, floods, droughts, wildfires and ENSO/El Niño-La Niña events. Between 1982 and 2008, Panama was struck by 32 natural disaster events, with total economic damages totaling an estimated US $86 million. In addition, loss of human lives during these events totaled 249. Given the expected variability in precipitation, it is crucial to improve water storage capacity to utilize excess water from wet years. Increased periods of high temperatures might produce recurrent heat waves that could create severe health impacts including the proliferation of diverse pathogens, increased dehydration and other respiratory diseases. After 2015 the threat of climatic variability begins to be the principle driving force behind the risk of an increased tendency of greater extreme events. This would require integrated assessments and development planning that closely integrate disaster risk planning and climate change adaptation, in particular for food security, energy access, and sustainable development. The poorest populations, included vulnerable indigenous populations, will not, and indeed, cannot adapt if this will

require looking beyond their immediate food security needs. Thus, the potential impacts of climate change on Panama most vulnerable population should be prioritized (World Bank. Climate Change Knowledge Portal. Panama Dashboard).

The Ministry of Environment (former National Authority for the Environment-ANAM) is working on small scale climate change adaptation and mitigation measures, which should be scaled-up to better prepare vulnerable groups and sectors for higher rainfall and longer dry seasons. To achieve this, there is a need to better integrate national disaster risk management into water resource management planning in priority watersheds. Enhanced information and decision support capacity across key sectors along with improved early warning and monitoring systems is required to build the ability to forecast and plan for a future in which the occurrence of extreme events could be the new norm.

Given its central role in the economic engine of Panama, as well as being a key component for other growth sectors and the livelihoods of the poor, adequate water resources management emerges as a vital priority area under sustainability. Water resources management has been also prioritized as a key issue in Panama´s GEO Report 2014. Water resources management through an integrated watershed approach is also one of the current five strategic guidelines of the Ministry of Environment of Panama.

The water-energy-food-climate change adaptation nexus in Panama. According to Global Water Partnership, Panama is considered as one of the countries in the world with ultimate water resources, more than 50.000 m3 per capita. Panama not only has the Interoceanic Canal, but also has a theoretical renewable energy capacity of approximately 30 times its current annual power generation[5].

The country has a traditional agricultural and livestock sector, with a contribution to the GDP of 2.0 percent to 1.2 percent during the last years. It is estimated that the population is growing faster than agricultural production, which real value was $688.8 million in 2007 and $683.5 million in 2011. This means that, during this period, there was an increase of the annual average of 0.5 percent; while the Panamanian population grew an annual average of 1.8. This unequal growth between agricultural and livestock production, and population has a direct impact in food security. Consequently, the country increases dependency on imports, and becomes more sensitive to external factors such as scarcity and international inflation, and particularly to weather variations. About 250,000 people are dedicated to agricultural and livestock production in the country.

Regarding energy matters, the country's maximum demand is 1,612 megawatts, while the system has an installed capacity over 2,811,179 megawatts. According to data from the National Energy Secretariat, each year is necessary to add 100 MW of power in order to satisfy the increasing power demand in the country. This represents an investment of

[5] IADB. Blogs IADB.org. What is the renewable energy potential in Mexico and Central America? http://blogs.iadb.org/cambioclimatico/2014/11/13/cual-es-el-potencial-de-la-energia-renovable-en-mexico-y-centroamerica/

approximately $400 million a year. Panama's power matrix depends on oil products by 40 percent, and on renewable energies by 60 percent, mostly hydroelectric. From the environmental standpoint, this scenario of a 5 percent annual demand growth, coexists with a large scale hydroelectric development situation which has caused unsolved water use conflicts (confronting users' groups demanding human rights, access to water, autonomy and equality matters). The water sector has been impacted by very long droughts, which frequencies and intensities would be affected by variability and climate change projections. Droughts, combined with other factors, recently resulted in power rationing situations.

Water is necessary for food production. In Panama, irrigated agriculture land represents only 4.9 percent compared to the total country's area; the rest of farming lands in Panama are irrigated by rainwater. But changes in precipitation patterns and increasing food demand trigger increased irrigation needs. This, combined with urbanization expansion, is rising pressure on water sources, particularly in rural areas. Water is also necessary for power generation. Hydroelectric power provides 58 percent of the country's power demand, and it is believed that some hydroelectric potential has not been developed yet. Energy is necessary for food production; harvest, transportation, processing, packing and commerce use significant power resources. At the same time, energy is necessary for access to water sources: for example, energy is necessary for water distribution and irrigation.

One of the greatest challenges for reaching sustainability in agriculture is to ensure the sector adapts to climate change and contributes to its mitigation. Water is a key resource for this purpose, thus it is necessary to focus efforts towards adaptation of agriculture to climate change. This could be possible through the integral management and rational use of water resources based on strong scientific principles and respecting the laws, traditions and culture of communities dedicated to agriculture. Increases in annual average temperature and reductions in precipitation expected for year 2030 due to the effects of climate change will have significant impacts on agriculture all over the country. As a consequence, it is probable that areas suitable for crops sustaining agriculture exports and peasant's food security will change in the future. Some areas will gain productive suitability for certain crops, and others will lose it. The capacity of a rural population to adapt to these changes, either positive or negative, depends on their access to basic services, including water security, access to information, resources for innovation and capacity to maintain healthy ecosystems.

Besides the water-energy-food interactions, because of the characteristics of its economy, the Republic of Panama has an additional level of dependence on water resources.

Water, Panamá's fuel. According to the abovementioned, The World Bank Analysis for the Country Diagnostic in 2015 states that, "successful Canal operations depend on the availability of adequate water supply all year round. The risk of lacking water availability in critical months is evident: the peak of Canal traffic coincides with the lowest rainfall period. Droughts threaten the consistent water supply for the Canal operations, such as

the risk posed by the drought of this year to limit the size of ships passing through. At the same time, big storms threaten to flood its infrastructure, as has famously occurred in an unprecedented closure in December 2010."

Climate change could lead to increased variability in rainfall, thereby affecting Canal operations. First, climate change may result in changes in rainfall, which according to the recent Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (2014) cites a trend of increasing precipitation over most of Panama. Fabrega et al (2013) analyzed the projected hydroclimatic patterns for Panama, where the study projects an increase in precipitation over all four regions of Panama for the 2075-2099 period: Bocas del Toro, Veraguas, Panama Canal and Darien. Future precipitation appears to increase for all regions by at least 5 percent, with the exception of some areas at Bocas del Toro region. Increments greater than 15 percent were projected for the most populated areas in Panama, located next to the Canal. However, another predicted change is higher variability, including increased occurrence of extreme weather events. Overall, climate change-induced weather extremes could lead to costly slowdowns that would actually make the Canal a less-efficient shipping route and cause a ripple of delays.

In addition, adequate water management underlies the country's ability to generate hydropower for different uses. (underlining added) Hydropower generation is the most water-intensive sector in Panama, utilizing 50,000 hm^3 per year to operate. During several recent extended dry seasons, the metropolitan areas suffered from electricity rationing. It was needed to import -from the Central American Electrical Interconnection System- the equivalent of a month of energy usage for 100,000 families; given low water levels at hydroelectric dams. The growing economy and related rise in demand for hydropower is faced with limitations on hydropower investments in specific areas. This increases the need to safeguard available opportunities, such as in the Bocas del Toro region, where rainfall patterns are not predicted to increase much, and ensure that the upstream watersheds remain healthy.

Sustaining its forest, biodiversity and coastal resources is also critical for tourism and rural livelihoods. Tourism is a growing industry in Panama, which in 2010 consumed 1.3 hm^3 of water, while many of the large tourist resorts on the Pacific coast rely on groundwater resources. In 2013, tourists spent approximately US$4.5 billion in Panama, much of it linked to the forest, biodiversity and coastal resources which attract increasing numbers every year. The amount of water needed to sustain the health of Panama's ecosystems is yet unknown. When granting water resource concessions, the ANAM, now the Ministry of Environment, established 10 percent of overall water flow in watersheds as the necessary amount of water for ecological protection. Nonetheless, it recognizes that this number does not represent the true amount of water necessary for conservation. While agriculture consumes much less water and plays a smaller role in the economy (3 percent of GDP), the livelihood of the rural poor depends on it, and subsistence farmers have much less coping mechanisms in the face of extreme weather and climate risks. The National Plan for Integrated Water Resources Management identifies the direct discharge of sewage into water bodies -without prior or sufficient treatment- as the main contamination source in Panama. The second main contamination source identified is the

dumping of solid waste into water bodies. This is followed by diffuse contamination from agriculture (pesticide and fertilizer run-off) and detergent use in cities. Finally, deforestation is also listed as a source of contamination as erosion causes sedimentation and high turbidity levels on water bodies."[6]

In summary, water management its key for the country's socioeconomic and environmental operation. It's key for the operation of the canal, which sustains logistics, transportation and financial services, pillars of the national economy. Potential complementary sectors such as power and tourism, are also directly related to water management, both for using the resources and ecosystem services (water supply, scenic beauty, recreational uses, others). From this perspective, water resource management is the base of the country's economic, social and environmental sustainability. Water management in Panama takes place based on an integrated water resources management approach and watershed approach, without taking into consideration neither the climate change dimension nor risk management, which have, in the case of the Republic of Panama, a hydro-meteorological origin.

Climate change is disrupting the global water cycle and will increase the frequency and severity of disasters. The Intergovernmental Panel on Climate Change (IPCC) 5th Assessment predicts more frequent and more severe droughts, floods and storms, intensified glacier melting and sea level rise, all of which will cause and contribute to increasing numbers of disasters worldwide and Panama is not the exception.

This Adaptation Program aims to address this condition by situating water management at the center of the adaptation efforts, promoting climate resilience and vulnerability reduction through enhancing food and energy security, based on an integrated water resources management approach that highlights the water-energy-food-climate change adaptation nexus. To do this, the Program will focus efforts in two river watersheds (Chiriquí Viejo and Santa María -*see maps 1 and 2*); both prioritized in light of its water resources, its importance for energy and food production at a national scale, and the existence of unsolved conflicts among water users. Concrete adaptation measures will be implemented through climate proof water management, productive initiatives based on the climate smart agriculture approach in prioritized sites accordingly to social and climate vulnerability. Complementary actions include: to identify renewable energy potential in these areas, and an adaptation knowledge platform based in development of adaptation skills in different sectors, systematization of lessons learned in adaptation projects, and a national system for climate data to monitor hydro meteorological activity as well as the effectiveness of adaptation efforts.

At the national level, the convergence in time of the current Adaptation Program with efforts to move forward with a National Plan for Water Security, an Energy Plan 2015-2050, and the National Pact for Agriculture, offers a unique momentum for developing synergies opportunities between mitigation and adaptation agendas, for conservation and restoration of ecosystem services relevant to the population and agriculture, through the proposed Adaptation Program.

[6] Panama locking in success. A systematic country diagnostic. World Bank. January 2015.

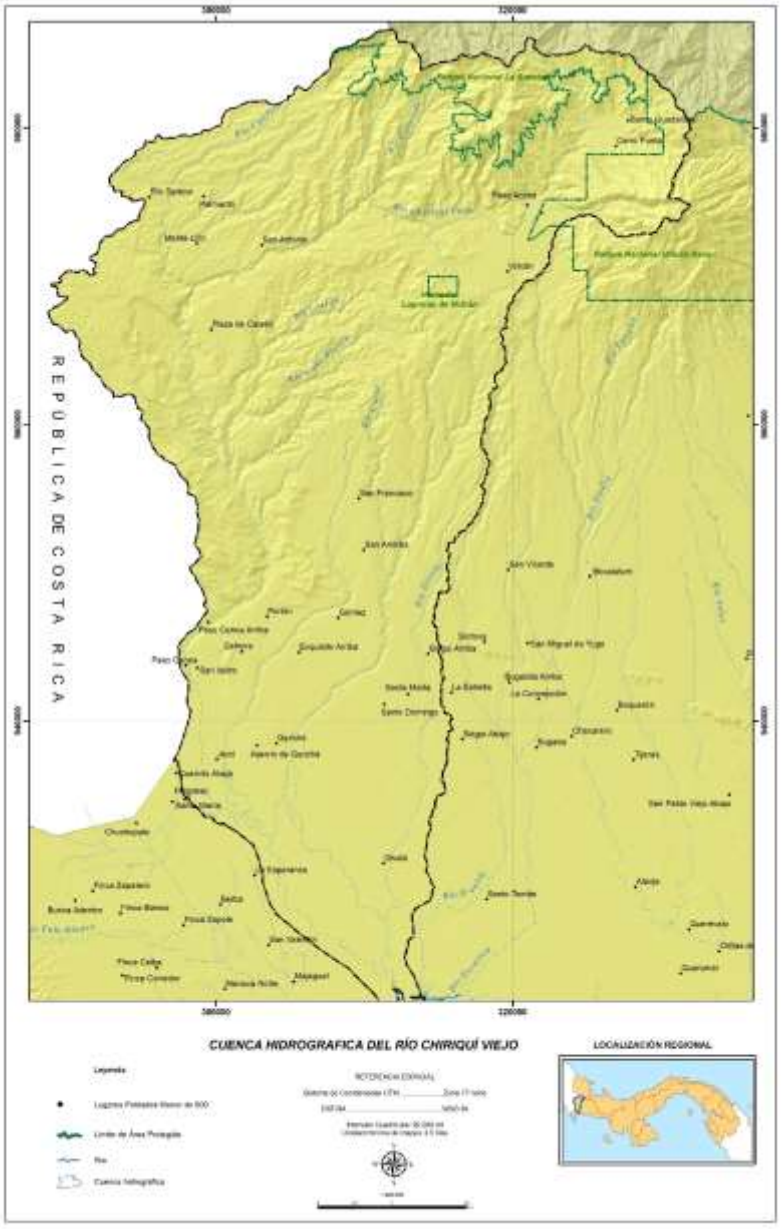
Regarding the National Plan for Water Security, in August 2015 the Government of Panama declared a nationwide state of emergency and ordered the establishment of a High Level Water Security Commission for the elaboration of a 15 year Plan that would increase the country's capacity for water use and management. The plan shall include alternatives for reducing impacts related to climate change in all river watersheds.

On the other hand, the Ministry of Agriculture Development has indicated the need for actions tending to face the impacts of climate change in the sector. These are emerging efforts and need to be strengthened and scaled to the national level systematically. Some actions taken to be highlighted are: the Drought Plan; the Project for Strengthening Disaster Risk Management for the agriculture and livestock sector; climate change awareness activities; training on systems for rainwater collection and use. Likewise, activities for including the climate change variable have been undertaken with support from international organizations. These activities include: awareness on mitigation, adaptation and food security, climate-smart agriculture approach with French cooperation, and base line determination about water and soil sustainable management through the Resilience Project, both with support from Inter American Agricultural Cooperation Institute (IICA).

Regarding the National Energy Plan, the process also began in August 2015 through a national dialogue on energy as a plural and participative debate scenario in order to define a roadmap for the next 35 years. The process has 3 phases: the first one began with the reception of proposals presented by residents of the Azuero provinces, Veraguas, Bocas del Toro, Chiriquí, Darien, Coclé and the Ngäbe Buglé indigenous territory; the second phase includes dialogue table sessions in Panama City to end in January 2016; the third and final phase is the elaboration of the National Energy Plan and its delivery to the Executive Body. Besides, a virtual platform would be established for the population in general to have active participation in the process.[7]

[7] Website of the National Energy Secretariat. http://www.energia.gob.pa/Plan_Energetico_Nacional

Map 1. Chiriquí Viejo River Watershed



Map 2. Santa María River Watershed

b) Outline the economic social, development and environmental context in which the project would operate.

b.1 Physical context. According to Panama's Environmental Atlas 2010 and Panama's GEO Report 2014, the main physical characteristics of the Republic of Panama are the following: Panama is an isthmus with a total terrestrial area of 74,733.4201 km², and 683.2674 km² territorial waters, for a total of 75,416.6875 km², with a slight inverted and laying "S" shape.

The country is at the final portion of the Mesoamerican isthmus, which connects North America with South America. Politically, Panama is divided into 10 provinces, 75 districts, 631 counties and five indigenous territories: Emberá- Wounaan, Ngäbe-Buglé, Guna Yala, Guna of Madungandí and Guna of Wargandí as of 2009.

The landscape is a mountainous terrain that ranges from irregular areas extending from Panama towards the west and the Caribbean; to hills and vast savannas towards the Pacific. The lowlands of Panama cover most of the country, about 70 percent, with heights below 700 meters. Much of the Panamanian population lives in these hot and lowlands. This group includes: the lowlands and southern plains; hills and plains of central isthmus; the eastern depressions; lowlands and northern plains. The region with hills areas reach altitudes between 90 and 460 meters. They consist of fertile, well-drained plains and valleys. This region is densely forested and scrub and there are some creases, ridges and high plateaus, although quite scattered.

The remaining 30 percent of Panamanian territory, in turn, consists of highlands that exceed the 1,500 meters' elevation. These lands are composed of igneous, metamorphic and sedimentary rocks. Among these, there is the Baru volcano, the Central mountain range, the eastern arch of the north, the eastern arch of the south, and massive volcanic chains and south. Tabasará or the mountains of Cordillera Central, extending the Costa Rican Talamanca mountain range, enter Panama from the west and has an average elevation of 1,525 meters. In the east, the Cordillera de San Blas and then the mountains of Darien, on the border with Colombia, make a lower mountain range, with an average of 915 meters.

South of these and near the Pacific coast are the mountains of Maje and Sapo, with low-lying hills, as Chucano Hill (1,439 meters) and Cerro Piña (1,581 m). The connection between the Panamanian and Colombian Andes takes place in the Highlands of Aspavé and Quia at the east of Darien. On the Pacific coast, separating the Gulf of Chiriquí and the Gulf of Panama, lays the Azuero Peninsula, comprising a set of small mountains and hills, with average elevations like Cerro Hoya (1,559 m). The maximum elevation is the Barú volcano in the Chiriquí province, which reaches 3,475 m; followed by Fabrega (3,335 m), Itamut (3,279 m), and Echandí (3,163 m) hills in Bocas del Toro, Santiago in the Ngäbe Bugle (2,121 m), and Tacarcuna mountain (1,875 m) in the province of Darien, among others.

Panama´s hydrography is characterized by the existence of about 500 rivers; 350 at the Pacific Ocean side and 150 at the Caribbean Sea side. The Pacific Rim covers 70% (53,000 km^2) of the country, and the Caribbean edge is about 30 percent (21,000 km^2). The Continental Divide is constituted by a series of mountain ranges that extend from east to west. Overall, the rivers that run into the Caribbean are short and their waters are usually oriented regularly towards the coasts. The average length of the rivers at the Caribbean edge is 56 km, with an average gradient of 2.5 percent.

At the Pacific coast, the average length of rivers is 106 km, with an average gradient of 2.27 percent. Among the most important rivers are: the Chucunaque (231 km), the longest in the entire country; Tuira (230 km), with the greatest water flow; the Bayano (206 km); Santa Maria (173 km), and Chagres (125 km). The latter is considered the most important river because of its impact on the economy, and also because it is vital for the operation of the Panama Canal. Meanwhile, the largest reservoirs or lakes are Gatun, with 423.15 km^2; Bayano, with 185.43 km^2; and Alajuela with 57 km^2.

Panama has two large coastal areas. The Caribbean coast has 1,287.7 km in length, and the Pacific Ocean coast has an area of 1,700.6 km. Beyond these coasts there are 1,518 islands (1,023 in the Caribbean and 495 in the Pacific), as well as islets and cays. The main islands are: Coiba (493 km^2), Isla del Rey (234 km^2) and Cébaco (80 km^2). Panama is a maritime country with a territorial sea of 12 nautical miles; and an Exclusive Economic Zone of 200 nautical miles, with an area of 319,823.867 km^2, which exceeds the continental and insular territory.

b.2 Socio-economic context. Panama is considered an upper middle income country. In 2014, GDP at market prices (current US$) was $46.21 billion, for a total population of 3.868 million.

Panama has had one of the highest economic growths in Latin America during the recent decade, with an average GDP growth of more than 8 percent between 2006 and 2012. Compared to other countries of the region, Panama had a relatively favorable growth during the global financial crisis with 3.2 percent growth in 2009. However, in 2010 the economy went back to its own rhythm with 7.6 percent growth, in order to reach a GDP expansion of 10.6 percent in 2011, 10.5 percent in 2012, 7.9 percent in 2013 and estimated growth of 7.3 percent in 2014. This strong economic growth translates into better social indicators. Poverty rate went down from 48.5 percent in 2002 to 27 percent in 2011, while extreme poverty went down from 21 percent to 11 percent during this period. Nevertheless, inequality relatively high in Panama (Gini's coefficient of 0.53 in 2011) and challenges remain for the public provision of social services. For example, boys and girls in indigenous communities, have significantly less access to basic education, energy and sanitation services compared to boys and girls from urban areas. The Panama Canal expansion and a series of megaprojects have pumped more vitality to the economy and it is expected they boost its sustained growth. This represents a unique opportunity to move forward into reduction of poverty and inequality.

Panama's exceptional growth performance over the past decade stems from an open and competitive economy. Panama's real growth since 2001 has averaged 7.2 percent, more than double the average for LAC. The country has been one of the few that have been able to catch up with the U.S. in terms of per capita GDP in recent years and its growth rate displayed low volatility in international comparison. The economy is one of the most open in the region and is well integrated into the global economy. It has done well in leveraging its geographical position, including through the Panama Canal, transforming itself into a well-connected logistics and trade hub and a financial center. Through continuous improvements in infrastructure, Panama has established a port network that is on par with major international logistics hubs and an airport network that allows the country to function as a major regional passenger hub for connecting passengers between North, Central and South America. Thus, the country has consolidated its position as the most competitive economy in Central America and second after Chile in LAC, according to the 2014-15 Global Competitiveness Report.

In recent years, five main elements have explained this growth performance: (i) the transfer of the Canal to Panama which has allowed it to benefit from the growth of world trade; (ii) the successful management and expansion of the Canal that spilled over to growth in specific sectors; (iii) the increasing role of public investment; (iv) the parallel increase in FDI and private investment; and (v) a stable macroeconomic environment. [8]

Panama has made significant progress on the poverty reduction front over the past years. Between 2007 and 2012, a period including the years of the Great Recession, Panama managed to reduce poverty (using the national poverty line) from 39.9 percent to 26.2 percent, and extreme poverty from 15.6 percent to 11.3 percent. Thus, of a population of about 3.6 million people, the number of Panamanians living below the national extreme poverty line declined by slightly more than 150,000 people and those living below the moderate poverty line declined by close to half a million people.[9]

Considering this economic boom, besides the application of social programs, such as the 100 at 70 Program, universal scholarship and the Network of Opportunities, among others, the country has experienced a substantial improvement in economic and social conditions of the population; extreme poverty is reduced. Nonetheless, there is no doubt that the inequality breach persists, especially among Panamanian indigenous populations and inequality increases with more vulnerable population segments, especially children, youth, women and elderly within these populations [10]

b.3 Environmental and Climate Change Context

i. **National circumstances**. The emergence of the Panamanian isthmus 3.1 to 3.5 million years ago not only united North America and South America, but also separated the Pacific Ocean from the Caribbean Sea, greatly contributing to global climate modification and an increase in planetary biodiversity. Panama enjoys great

[8]Panama locking in success. A systematic country diagnostic. World Bank. January 2015
[9] Idem.
[10] GEO Report Panama 2014.

though unequally distributed water wealth, generated by its rainfall regimen; and a hydrographic network comprised of 52 watersheds collecting water from some 500 rivers.

Its hydrologic stock is the second highest in Central America after Belize (CCAD, 2005). In the year 2000, forest extension, not including altered forests, covered an estimated 45% of national territory. In 1947 forest cover was 70%. Although 25% of the country's soil has natural agricultural vocation, national statistics show that current use does not necessarily coincide with this potential. In 2000 agricultural production and subsistence farming occurred on 36.6% of national territory (ANAM, 2004). Panama is also blessed with a great wealth of species of plants, birds, reptiles, amphibians, mammals, marine and freshwater fishes as well as endemic species. Of the 25 countries with greatest abundance of flowering plant species, Panama ranks 19th, and 4th in North and Central America. The isthmus is also an important bridge for migratory flow of birds, mammals and reptiles between North and South America (ANAM, 2004).

Categories comprising the National System of Protected Areas (SINAP, for its acronym in Spanish) include terrestrial and marine parks, protected forests, and wildlife preserves, some with internationally recognized management categories such as world heritage sites, biosphere reserves, and wetlands of international importance. In 2006, SINAP contained 66 protected areas occupying 34.43% of Panamanian territory. In the last decade, the number of inhabitants rose from 2,329,329 (1990) to 2,839,277 (2000). Population growth is expected to slow down during the next 25 years as a direct consequence of the overall decrease in fertility rate and gross birth rate at the national level. There has been a drastic shift in the proportion of the population residing in urban areas, from 36% in 1950 to 62.2% in 2000, generating over demand of natural resources and their services and affecting ecosystem capacity in general.[11]

ii) IWRM approach and watershed approach. Panama is considered one of the countries with the largest water resources, approximately 35,000m3 of renewable freshwater resources per capita (FAO, Aquastat)**.** In Panama, water resources management takes place with two approaches: integrated water resources management and watersheds (IWRM) approach. Even though the resource's general framework goes back to 1960, there are several recent regulatory instruments which establish this approach for managing the resource. Particularly, in 2002 when Law 44 of August 5, 2002 was enacted, it established the especial administrative regime for management, protection and conservation of the Republic of Panama's watersheds. This law defines the watershed concept as the area with biological and geographical delimited characteristics, where the human being interacts, where surface and underground waters flow to a natural network through one or several continuous or intermittent flow channels, which at the same time meet at a larger course that may discharge to a main river or natural or artificial deposit at a mangrove or directly to the

[11] Second National Communication to the United Nations Framework Convention on Climate Change. Executive Summary.

ocean. The attachment to the integrated approach is also included in the sector's recent planning instrument: The Republic of Panama's National Integrated Water Resources Management Plan 2010-2030. This Plan indicates that "in recent years, the water management topic takes a new direction due to the occurrence of extreme natural phenomenon linked to water resources, such as floods, droughts, besides others of anthropogenic origin such as water pollution and water resources use conflicts, among others, which demanded and still demand effective and immediate attention."

The Plan considered 11 priority watersheds at the national level including the following rivers Chiriquí Viejo; Chico/Piedra; Chiriquí (Sub watershed of the Alanje river and Sub watershed of the David river); Guararé; La Villa; Santa María; Grande (Sub watershed of the Zarati river and Sub watershed of the Nata river); Anton; Pacora; Bayano; Chucunaque (underlining added).

The estimation of future demand in the sustainability scenario included in the Plan, shows that the greater water demands are in Chiriquí Viejo and Chiriquí river watersheds, presenting higher percentages of the total granted water (31.35 percent and 15.27 percent respectively). It is important to point out that these two watersheds present characteristics mostly appropriate for hydroelectric development, therefore the high percentage of granted volume (…). The sectorial analysis determined that for the agriculture sector, the main watersheds are the Santa María and Grande rivers, given the importance of the irrigation system in both of them. For the agro industrial sector, the highest volume of granted water corresponds to the Chiriquí Viejo river watershed, with 77.4 percent of the granted total at the national level for this sector. This watershed also presents the highest concession levels for hydroelectric (32.94 percent) and agriculture livestock (10.57 percent) sectors, compared to the other watersheds (underlining added).

The structure of the Plan has five axes, coordinated with public policies and the National Strategy for the Environment, approaching limitations faced by Panama for a water resources integrated management. These axes are:

- Water resources sustainability.
- Water and development.
- Water and society.
- **Vulnerability and adaptation to climate change.**
- Institutionalism and water governance.

Objective of strategic axis 4, vulnerability and adaptation to climate change, is to: Promote actions for adaptation and mitigation to climate change, compatible with conservation and recovery of water watersheds and natural resources. There are 2 strategies to achieve this objective, one for the application of adaptation mechanisms and the other one for mitigation.

The 2015-2030 programmed actions of the adaptation strategy are the following:

- To diagnose and identify water watersheds in critical condition.
- To design programs to combat drought and desertification based on the International Convention to Combat Drought and Desertification.
- To reduce socio-natural risks related to water in priority watersheds (short and long term), and include territorial environmental regulation and administration of such watersheds as environmental management techniques. This is a way to add a permanent prevention practice to existing efforts on preparation and mitigation, in line with integral risk management.
- To elaborate climate change scenarios in the Republic of Panama.
- To classify areas according to environmental risks that could cause flooding and/or mudslides within water watersheds; to issue rules and recommendations in order to establish operation, control and follow up measures, using the necessary contingency funds.
- To transform, renew and upgrade national meteorological services through the creation of a National Hydro-meteorological Institute, according to the guidelines of the World Meteorological Association, of which Panama is signatory.

iii) Climate change scenarios in Panama. Climate change scenarios have been generated focusing on the provinces of Veraguas, Coclé and Herrera, in the central region of the country. Modeling infers that climate in the regions studied has undergone changes with respect to temperature and rainfall regimens. In the future temperature is expected to be 1°C to 4°C warmer, with greater tendency toward 2°C to 3°C. Precipitation will also present changes ranging from 10 percent increase to 10 percent decrease.[12]

Table 1. Climate scenarios: implications for disaster risk reduction

CLIMATE SCENARIOS: IMPLICATIONS FOR DISASTER RISK REDUCTION
• Given the expected variability in precipitation patters, it's crucial to improve water storage capacity in order to take advantage of excess volume during wet years. • More frequent high temperature periods may cause heat waves causing severe impact on health, including pathogen proliferation, increase dehydration and other respiratory problems. • After 2015, the threat associated to climate vulnerability could turn to be the main cause behind risk to bigger extreme events. This may require integral assessments and planning for development including planning for disaster risk and adaptation to climate change, in particular, considering food security, access to energy sources and especially sustainable development. • The poorest populations, including vulnerable native populations, will not be able to adapt if doing so implies an effort beyond their food security needs. Climate change potential impacts on the most vulnerable populations in Panama shall be prioritized.
Source: Country's Climate Profile for Adaptation (World Bank, 2012).

[12] Idem.

"Results of weather trends for 2080 show a large increase of annual average precipitation under the climate change scenario A2, and precipitation shows an 80% increase, which may reach between 60 and 70% in January, April and May. Model predictions are uncertain but is clear that the future climate presents more extreme event variability and intensity. However, the number of extreme precipitation events may be reduced for 2080, according to the scale reduction study (PRECIS), thus, this type of event (with more than 40 mm rainfall a day) would go down by half, under the A2 emission scenario. The sea level rise is expected to reach 35 cm by the end of the century.

Based on studies from CEPAL (2020), various models have shown a consistent trend towards a weather temperature increase in Panama, from records of the 1950 to 2006 period and according to climate change scenarios A2 and B2. Results point out a temperature increase in the summer, for scenarios A2 and B1. This increase is projected for 0.5°C to 1°C and 1°C to 2.5°C, respectively. The change tends to be more evident in central and western provinces, including the province of Panama, approximately for 2020. However, close to 2050, especially to 2080, the temperature, under scenario A2 shows values of 1.5°C to 4.5°C, while under B1, increases only between 0.7°C to 2.6°C for the same period."

Table 2.
Weather trends for 2080 regarding temperature and rainfall for the Republic of Panama

Temperature	They are expected to go up during the dry season	0.4°C to 1.1°C by 2020 1.0°C to 3°C by 2050 1.0°C to 5.0°C by 2089
Rainfall	Uncertainty in rainfall projections for the dry season	-7% to +7% by 2020 -12% to +5% by 2050 -20% to +9% by 2080

Source: Climate Change Knowledge Portal. World Bank. Panama Dashboard. Climate Future. [13]

iv) Vulnerability to climate change. Panama is part of the Central American Isthmus. The risk tendencies in the region are complex, Central America is the second most vulnerable region in the world to weather-related risks; after the Asian southeast.

13
http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=PAN&ThisTab=ClimateFuture

According to the EM-DAT CRED database from 1970 to 2011, the 69.7 per cent of the disasters in Central America have been caused by hydro meteorological events being flooding, 55 per cent, storms and hurricanes, 33 per cent, droughts, 10 per cent, and extreme temperatures, 2 per cent. The following chart shows the recorded events in the region.

Table 3. Evaluation and registered hydro meteorological events in Central America 1970-2011

COUNTRY	CEPAL	EM-DAT	DESINVENTAR	
	Assessments	Registered events	No. Records	Period
	Large	Large, medium, small	Large, medium, small	
Guatemala	5	38	5,467	1988-2011
El Salvador	9	31	8,528	1900-2012
Honduras	3	54	13,112	1915-2012
Nicaragua	10	37	842	1994-2012
Costa Rica	4	37	14,116	1968-2012
Panama	1	32	5,711	1929-2012
TOTAL	32	229	47,776	

Source: Regional report on the vulnerability status and disaster risks in Central America.

The occurrence of climate-related disasters in Latin America has already increased by a factor of 2.4 since 1970. Panama experiences a series of extreme weather events including intense and protracted rainfalls, windstorms, floods, droughts, wildfires, earthquakes, landslides, tropical cyclones, tsunamis and ENSO/El Niño-La Niña events. Between 1982 and 2008, Panama was struck by 32 natural disaster events, with total economic damages totaling an estimated US $86 million. In addition, loss of human life during these events totaled 249.[14]

“The country is frequently affected by hydro-meteorological events, such as droughts, floods and mudslides, as several areas show severe conditions, prone to soil and environmental degradation (particularly, the Arco Seco, the Veragüense Savannah, the Township of Cerro Punta and the Ngöbe Buglé Indigenous territory). Hydrological studies indicate that during the periods of ENOS, in its warm phase, known as El Niño, there is a reduction in the artificial lakes levels that feed the Panama Canal system, and the droughts tend to exacerbate or become stronger, during the occurrence of

[14] Panama Dashboard. World Bank. Climate Portal http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=PAN&ThisTab=NaturalHazards

those periods. In the case of El Niño of 1982-1983 and 1997-1998, severe droughts affected the Panama Canal watershed and caused the restriction on the ships' transit due to the low water volume of the watershed's system. The last drought event happened on July 2012, in three districts of the province of Los Santos, where the crops and pastures were severely damaged, leading to declaration of a state of emergency by the Panamanian Government.

During the last decade flooding events caused severe difficulties to the agricultural sector in Panama, but also have affected and increased the damages that occurred in the urban areas of the country. Between 2000 and 2006, the flooding caused the greater human and economic impacts in Panama. For this reason, 62,678 persons were subject to some type of impact associated with eight flooding events, with associated losses for an estimated cost of US $8.8 million".[15] Impacts of "El Niño" and the event known as "La Purísima" are particularly important in this context:

"El Niño-La Niña events". "From 1982 to 1983, ENOS severely affected the agriculture, with losses of US$14 million in livestock and of US$6 million in crops. Then again in 1997 -1998, this phenomenon produced losses that reached US$40 million. As example, only the dairy production lost 7.4 million of liters, which translates into US$1,847,263. Due to ENOS, the agriculture GDP decreased in 3.7%. The drought event of 2001 caused the profit reduction in several crops as well as their production area, due to the uncertainty of the producers regarding the possible changes in rainfall patterns for that period. The dairies were affected again, reducing their volume in 10.4 million of liters and loosing 2,500 heads of cattle. Then, the seasonal crops in Coclé and Herrera were affected by droughts during critical periods of production (July, August, September and October); when the greater volume of rainfalls is expected, prior to the crop season. As reported by the Ministry of Agriculture Development (MIDA), the more severe effects of the drought and ENOS in Panama were registered in Herrera, Coclé, Veraguas, the west and east of the Province of Panama".[16] In September 2015, the National Congress approved a set of water preventive measures to address the impacts of Fenómeno del Niño. "The document includes specific actions such as reducing watering gardens, a national campaign to encourage savings in water consumption, the suspension of permits burning of forests and the ban on non-essential activities, among others. The Minister of Environment, Mirei Endara, said these measures are preventive strategy that tries to avoid panic and to promote efficient management of water resources in the context of climate crisis being experienced, aggravated by El Niño and its damages to multiple productive sectors".[17]

"La Purísima". In December 2010, Panama experienced the longest three-day rainstorm in the history of the Canal and received a historic amount of 760 mm of

[15] Draft document. Conceptual note. Final draft of the Panama financing proposal to submit to the Adaptation Fund. May 2013.
[16] Idem
[17] La Estrella de Panamá. September 12, 2015 http://laestrella.com.pa/vida-de-hoy/planeta/panama-actua-frente-nino-para-35-anos/23891297

rainfall in 24 hrs. The intense rain led to 500 landslides, which impacted approximately 9,000 people and caused a surge in turbidity of the city´s water source to 700 NTU, causing the principal potable water plant that services Panama City to collapse. As a result, parts of Panama City were left without water for 50 days. Canal operations were stalled for 17 hours, and for the fourth time in its history, the Panama Canal Authority had to open the lock drains to lower water levels. In addition, the company charged with operating the Bayano Dam had to open its gates given that the watershed was reaching its maximum capacity. This action resulted in the flooding of the town of El Llano in Chepo. Residents had to be evacuated and lost approximately US$6 million in agricultural production and household constructions. The total cost of La Purísima was estimated at US$150 million[18].

v) Guidelines for action in climate change adaptation and mitigation.

The Second National Communication to the UNFCCC (2012) states that "the emphasis on climate change as crosscutting theme should be taken into account in sectors that can be strategic for national growth given their relevance for the current economy, such as: energy, sustainable agriculture and food security, environmental education, land-use planning and ordering, marine resources, sustainable tourism, integrated water resource management and transport."

Two sectors that have been prioritized in terms of climate change action in Panama are agriculture and energy.

In 2014 CIAT and CATIE[19] jointly conducted a climate change vulnerability analysis for the agriculture sector in Panama: *The Agriculture in Panama and the climate change. Where are the adaptation priorities?* The base for this analysis was the classification of the country districts according to their main crops. The study was aimed to answer the following key questions: How are the principal crops in the country distributed? Would suitable areas to continue the production be gained or lost? How does the capacity of the rural population vary to deal with the adaptation challenge?

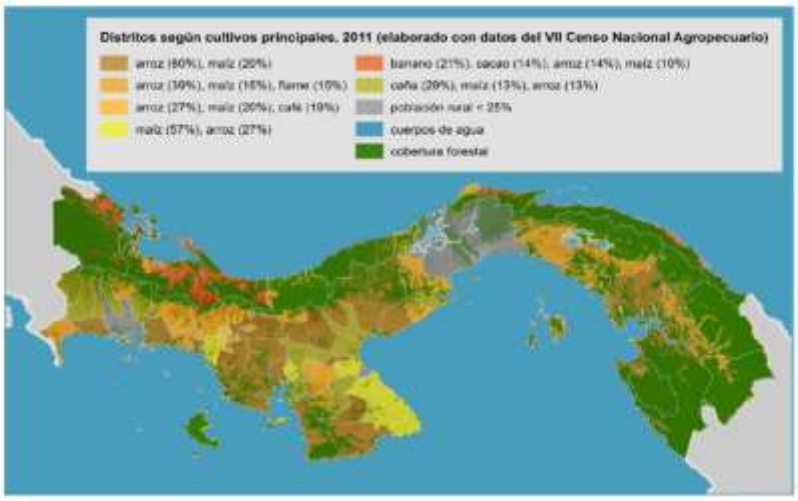
The study indicates that Panama is in the tropical region where the major climate changes are anticipated, part of which have already been perceived in the last half of the past century. Considering the A1 B1 emissions' scenario, it is estimated that for the year 2030 the annual average temperature of the country would have increased 1.3°C, with a maximum value of 1.4°C and a minimum of 1.1°C. In the provinces of Bocas del Toro, Chiriquí and the Ngäbe-Buglé Indigenous territory, the temperature increase will be higher. The changes will be lower to the east of the province of Colon and Panama and the north of Darien, as well as in the Guna Yala Indigenous territory. This increase in the annual average temperature will be accompanied with changes in the rainfalls. Although some climatological models indicate that the rainfalls will increase, most of them indicate that they will decrease. In any case, even if the annual

[18] Panama locking in success. A systematic country diagnostic. World Bank. January 2015
[19] The Tropical Agricultural Research and Higher Education Center (CATIE).

average does not significantly change, the changes in the rainfall patterns cause the distribution to be different in the areas suitable for crops.

The results indicate that it is anticipated that 21 of the 69 districts that are included in the analysis could lose suitable areas for agriculture. These districts are in the Emberá - Wounaan Indigenous territory and in the provinces of Coclé, Darien, Herrera, Panama and Los Santos; they lose suitability because they currently have several crops that are sensitive to the anticipated climate changes. As for the items, the study indicates that the rice, coffee, beans, and plantain will be especially sensitive.

Figure 2. Agriculture map for the Republic of Panama



Source: The Agriculture in Panama and the climate change. Where are the adaptation priorities? Summary.[20]

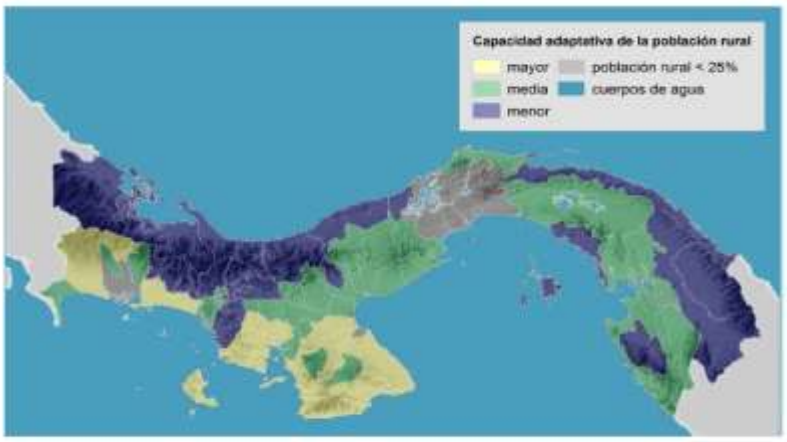
The legend shows the combination of main crops, considered as such because together they occupy at least 60% of the cultivated land in each group of districts. The first thing highlighted is that rice is the main crop in most part of the districts (43), along with corn and coffee. Some districts (8) of the east area of the province of Los Santos have the same combination but the other way around, being corn the most important crop (the underline is added). As for the rice, it is indicated that the modeling of the rice's suitability, which represents 36% of the cultivated area in the country, has results

[20] The Agriculture in Panama and the climate change. Where are the adaptation priorities? Claudia Bouroncle1, Pablo Imbach, Peter Läderach, Beatriz Rodríguez, Claudia Medellín, Emily Fung. Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), 2Centro Internacional de Agricultura Tropical (CIAT)

with a high level of uncertainty. Consequently, it must be treated with caution. According to the preliminary results, only 10 districts, in Coclé, Herrera and Los Santos would lose suitable areas for their production. The surface of the rest of the districts would have an average 2% of suitability profit. This point is important to be considered, given the importance that this grain has for the internal consumption of the country.

The study also analyzed the adaptation capacity of the different communities; it concluded that there are differentiated levels of adaptation capacity to the climate impacts due to the differences in access to basic services, information to renovate resources to start-up the innovation, as working capital and organization. The analysis indicated that, in general terms, the districts with less adjustment capacity are mainly located in the Atlantic coast, where a high proportion of the population has lower satisfaction of their need needs such as housing, water, sanitation and education in relation to the national average.

Figure 3. Adaptation capacity for the rural population in the Republic of Panama



Mapa 5. Distritos del país clasificados de acuerdo con indicadores de servicios básicos, acceso a información y otros recursos para la innovación, provenientes de los últimos censos de población y vivienda y agropecuario (INEC Panamá 2010, 2011).

Source: INEC Panama 2010, 2011.
Note: lighter colors indicate higher adaptation capacity, while darker colors indicate lowest adaptation capacity.

As key aspects to consider, the study indicates that the agricultural sector's adaptation requires:

- Work at different levels, form the parcel or property to the national government. In this respect it is important the support the development of a National Adaptation Plan with the cooperation of different national actors.

- A complimentary analysis of the livestock sector is relevant since it is impacting the change of soil use and contributes to the emission of greenhouse gases.
- The restructuring and diversification of the production systems; aspects which cover the selection of more resistant cultivars and crops and the use of agroforestry systems to improve soil quality, water retention and acquisition of alternative products.

On its part, the MIDA has also started the process of incorporating the scope of climate change in the sector's management. From November 24 to 26, 2015, took place in Panama city, the First Consultation Workshop for the formulation of a Climate Change National Plan for the agricultural area, supported by the Environmental Unit of the MIDA, under the sponsorship of the Spanish Agency of International Cooperation for the Development, with the collaboration of the Tropical Agricultural Research and Higher Education Center, the Food and Agriculture Organization of the United Nations (FAO) and the Inter American Institute of Agricultural Cooperation (IIAC). The purposes of the workshop were to: a) Identify the priority items and axis of action of the Climate Change Plan for the agricultural sector; b) Harmonize the lines of action of the national agricultural sector's institutions, dedicated to strengthening the resilience of the production systems; c) Determine the role that the non-governmental institutions, cooperation agencies, private companies and local actors can play; d) Define a working road map.

The prioritized crops were: rice, corn, beans, coffee, livestock, agribusiness and poultry, as shown in the following chart.

Table 4. Prioritized produce as a result of the First Consultation Workshop for the formulation of a Climate Change National Plan for the agricultural sector – November 24-26 2015.

Rice	Corn	Beans	Coffee
• Essential part of the basic food basket. • Crop of greatest demand at the national level. • Methane producing. • Susceptible to plagues and diseases. • Deficient item in the country.	• Essential part of the basic food basket. • Crop of greatest coverage at the Arco Seco. • Susceptible to plagues and diseases. • Deficient item in the country.	• Essential part of the diet. • Very susceptible to plagues and diseases	• Important crop for agroforestry system in river watersheds •

Live stocking	Agroindustry	Poultry

• 30% of soil under agriculture and live stocking use. • Main producer of greenhouse gases • Vulnerable to weather changes and water stress	• Provides added value to agriculture and live stocking production. • Depends on water and energy resources	• Greatly depends on energy, water and bean supply. •

Source: Draft document. Report of the first consultation workshop for drafting a climate change national plan, for the agricultural sector. March 2015.

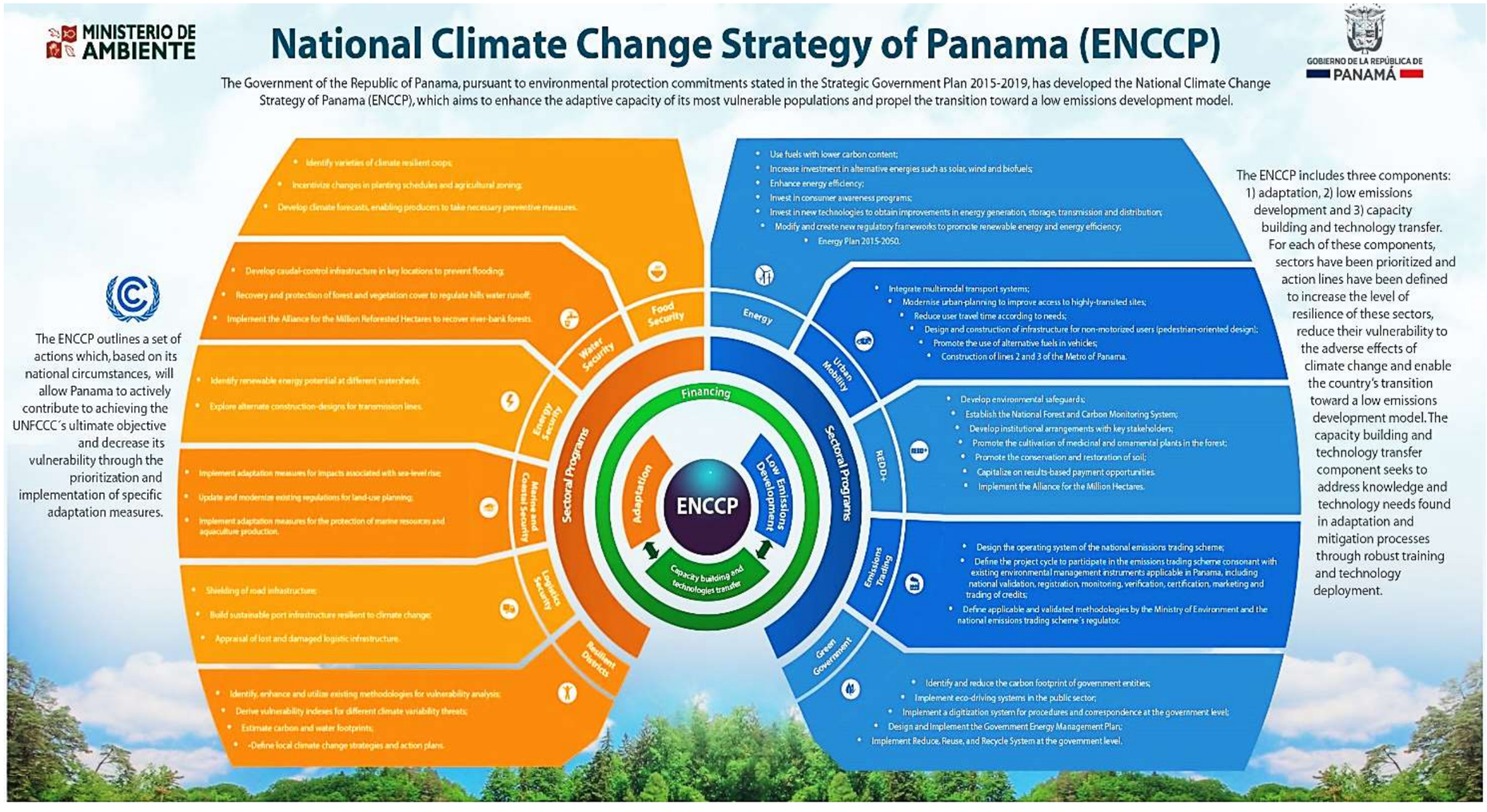
Regarding the energy sector, a sectorial analysis from the climate change perspective is still pending.

In addition, these two sectors have been prioritized as well from the Mitigation perspective. "To achieve the country´s goal of reducing carbon emissions, two sectors of national development must be prioritized: energy and agriculture. In the energy sector, the pursuit of sustainability must be compatible with three basic principles: competitiveness, supply security and environmental protection. It is necessary to assess how the different energy sources can help mitigate climate change by conducting an analysis of the different alternative energies and technological options for adjusting them to the country's situation. The agriculture sector offers a mitigation opportunity through the creation and strengthening of capacities and technology transfer; changes in the management of farmlands (conservation, agroforestry, rehabilitation of farmlands and degraded pastureland); general improvement in the nutrition and genetics of grazing livestock; technologies for collection and storage of manure; and conversion of emissions into biogas." [21]

This approach is consistent with the National Climate Change Strategy of Panama developed by the national government pursuant to environmental protection commitments stated in the Strategic Government Plan 2015-2019. This latter plan aims to enhance the adaptive capacity of its most vulnerable populations and propel the transition towards a low emissions development model, as shown in the next figure.

[21] Second National Communication to the United Nations Framework Convention on Climate Change Executive Summary

Figure 4. National Climate Change Strategy of Panama (ENCCP)



Source: Ministry of Environment. 2015.

vi) Intervention areas of the Program. The intervention geographical areas of the proposed Adaptation Program have been defined regarding the following criteria:

- Importance from the hydrological resources point of view, classified as priority watersheds according to the PNGIRH.
- Its current/future importance for food and energy production (water-food-energy nexus) at the national level.
- Existence of an information base line regarding environmental and climate management, including vulnerability.
- Existence of management and/or planning instruments.
- Conflicts between users for access to the water resource.
- Adaptation capacity

Climate change adaptation reasoning/rational behind the selection of the CHVRW and SMRW, based on their vulnerability to climate change.

1. Clarity of the water-energy-food-climate change nexus. To evidence the nexus approach, it is necessary to demonstrate the importance and interaction of the 3 sectors at the watershed level. Both watersheds comply with this criterion.

2. The Programme proposed rationale and geographical areas are aligned with climate change related ongoing processes, to enable public policy impacts. Yes.
   - Thematic focus areas (food security, water security and energy security) explicitly listed as sectorial adaptation programmes in the climate change national strategy
   - Alignment with climate change strategic action lines included in institutional planning, specifically in MIDA and ETESA.

3. Severity of climate variability or climate change impacts.
   - Yes, the proposed programme includes intervention in the SMRW, located in the region known as the Arco Seco, declared as emergency area by the national government due to severe droughts associated to ENSO and climate change impacts.

4. Presence of both ecosystem values that are viable in the long term and climate change stress.
   - Yes. Ecosystem values and climate change threats previously identified in and in the Watershed management plan of the CHVRW and in conservation area planning processes in both watersheds. CHVRW and SMRW do present ecosystem conditions that enable both conservation and restoration efforts.
   - Output 1 includes activities previously identified in Conservation Area Planning processes as follows: i) Conservation Area Plan for the Rio Gallito micro watershed, located in the SMRW, province of Veraguas. Fideco 2015; ii) Conservation Area Plan for the Rio Caisan sub watershed, located in the CHVR watershed, province of Chiriqui. Fideco 2015

5. The Programme proposed geographical areas builds upon previous climate change analysis and/or planning processes.
6.
   - Yes, climate change importance/vulnerability of both watersheds is identified in national official documents and initiatives. The proposed programme is not conducting tailor made prioritization processes, but identifying climate change considerations in previous planning processes:
     - Second national communication to the UNFCCC. SMRW explicitly included as a prioritized watershed due to climate change. (http://unfccc.int/resource/docs/natc/pannc2.pdf , p. 79-83)
     - National Integrated Water Resources Management Plan 2010-2030 includes both watersheds in the list of 11 prioritized watersheds at the national level. Listing CHVRW and SMRW as the most critical ones in terms of scenario of future demand. http://www.cich.org/publicaciones/pnh2010-2030.pdf
     - CHVRW Plan Management officialised in May 2014 included a climate change vulnerability analysis, which served as a basis for the management programmes proposed. Climate change adaptation and risk is one of the programmatic focus of the Plan. Outputs included in the programme for CHVRW, correspond to activities outlined in the climate change adaptation programme of the management plan.

7. Capacity strengthening process. Presence of local stakeholders with existing capacity to implement climate change adaptation action and deliver results.

- Yes. List of stakeholders engaged with environmental management issues included in both watershed management plans and conservation area plans.
- F. Natura`s proven experience working in partnership with key stakeholders in both watersheds.

Considering the aforementioned criteria, the Program will focus on the following geographical areas:

- Chiriquí Viejo River watershed (map 1)
- Santa Maria River watershed (map 2)

Regarding point No. 3 above, Severity of climate variability or climate change impacts, these watersheds are vulnerable with respect to climate change-related impacts and risks, and are among in the most vulnerable to climate change in the country.

According to the Dry and Degraded Lands Diagnostic of 2009, which supports the National Plan to Address Drought and Desertification, there are four critical areas subject to processes of drought and land degradation. Among these are the SMRW (as part of the region called Arco Seco and the central savannah of Veraguas), and the upper part of the CHVRW (its upper part Cerro Punta).

The SMRW management plan and the consultation process carried out in recent months for the installation of a watershed committee ratify the climatic threat under which population lives at this territory, especially at the middle and lower parts of the watershed. A threat for droughts previously identified in 2009 by the Atlas for Dry and Degraded Lands of the Republic of Panama.

On the other hand, climatic models have determined that at the lower part of the SMRW, for a return period of 100 years, the levels of water in the river can increase from 1.30 m to 4.30 m above the normal average levels; specifically, in areas with elevation lower than 30 meters above the sea level. These results were projected on a digitized map 1: 50,000, and the affected areas are mostly in agricultural production regions.

In conclusion, there is variability pattern in the watershed climate, which is most noticeable in the middle and lower parts. It should be noted that in the period of 5 years has always been an El Niño year at least. The average precipitation behavior during this period is strongly influenced by the degree of severity of this phenomenon. The analysis of temperature data show that the lower part of the basin has undergone changes in temperature over time in general. During ENOS years, areas with high temperatures they are higher at the lower part, but the upper part of the watershed also continues to be affected.

At the upper and middle part of the SMRW, communities are increasingly vulnerable to intense precipitations. This population has low income levels, poor housing conditions, and practice subsistence agriculture. At the national level, a family needs US$427.00 monthly income to fulfill alimentation needs. At most of the SMRW, population is far from meeting this basic need, with monthly incomes from US$60.90 per household, to US$292.70 per household (according to the National Census for Population and Housing 2000).

In regards to the CHVRW, data from hydrological balances of the area show that water scarcity is very low during the dry season in the watershed, especially the upper part. However, during the rainy season, superficial waters cause a critical erosion problem. During the last years, according to the watershed management plan, there is evidence of an increase of 1.3 Celsius degree in minimum temperature through the CHVRW. Common extreme events include forest fires, storms, floods, droughts, electrical storms, and strong winds. In the last years, most common events are floods and forest fires. Given the predominantly agricultural use of the lands (53.8%), it is evident the scarce permanent vegetation cover, which added to a lack of soil conservation practices, cause erosion and alteration of the hydrological patterns, increasing run-off and sediments transportation.

The CHVRW has been identified as a critical area of the country in terms of climate change, given its vulnerability for seasonal flows modifications, changes in water quality, sediments transportation dynamic, modification of the landscape (due to deforestation, agriculture, and increase in erosion process associated to land use changes), and habitat fragmentation.

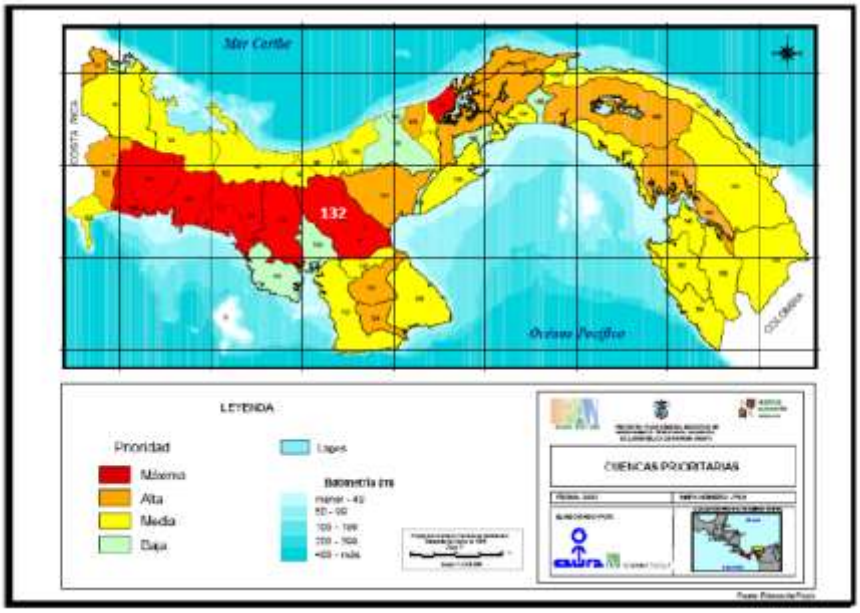
Finally, the climate change importance/vulnerability of both watersheds is identified in national official documents and initiatives. The proposed programme is not conducting tailor made prioritization processes, but identifying climate change considerations in previous planning processes:

- Second national communication to the UNFCCC. SMRW explicitly included as a prioritized watershed due to climate change. (http://unfccc.int/resource/docs/natc/pannc2.pdf , p. 79-83)
- National Integrated Water Resources Management Plan 2010-2030 includes both watersheds in the list of 11 prioritized watersheds at the national level. Listing CHVRW and SMRW as the most critical ones in terms of scenario of future demand. http://www.cich.org/publicaciones/pnh2010-2030.pdf
- CHVRW Plan Management officialised in May 2014 included a climate change vulnerability analysis, which served as a basis for the management programmes proposed. Climate change adaptation and risk is one of the programmatic focus of the Plan. Outputs included in the programme for CHVRW, correspond to activities outlined in the climate change adaptation programme of the management plan.

Below there is a brief outline of both watersheds.

Santa Maria River watershed. This watershed (see map 2 and figure 5) has an Integral Management Plan of the upper, medium and downstream areas from July 2009. According to the Management Plan, the Santa Maria River watershed (identified as number 132 in the hydrological system of Central America) is located in the Pacific divide in the provinces of Veraguas, Cocle and Herrera. The watershed's total drainage area is 3,400.63 Km^2. From its source to its mouth in the sea (Parita Bay) the length of the main river is 168 Km. The watershed's average elevation is 200 msnm, and the highest point is located in the Central Mountain Range with an elevation of 1,528 msnm. In the proposal of the Land Management General Plan (LMGP) of Panama it is considered that that the Santa María River watershed is among the ones with higher priority.

Figure 5. Geographical location of the Santa María River Watershed



Source: Land Management General Plan (LMGP) of Panama, ANAM, 2006.

The Santa Maria River Watershed is integrated within a social and environmental context of important natural systems, which work in an interrelated manner. The main aspects to consider in the watershed's management are:

- In its upper area, we find the Santa Fe National Park and the La Yeguada Forestry Reserve (in the limits). Both present favorable protection and conservation conditions for the internal interrelationships in the watershed's upper area and to the bottom area of it. In this part of the watershed (upper), we find the higher hydropower potential, eco touristic and conservation development; however, as a response to the demands of the rural communities, it is possible the production development through agroforestry systems, although there is a limited productive capacity of the soils.
- In its middle area, the watershed relates to neighboring watersheds, whose communities relate to the hydrological system (as it is the case of the demand for drinking water of the Santiago de Veraguas city) and in its territorial environs there is an important potential for agricultural activities (irrigation of agricultural lands for industrial crops and livestock).

- In its lower area, the watershed relates to the marine coastal system of the Parita Bay, mangrove and touristic activities. The potential and the conservation of this system shall depend of an adequate land management in the watersheds' upper and middle areas. Altogether, the lands on the middle and bottom area, as well as the required environmental services, shall depend in great degree of the protection, conservation and sustainable production actions that are applied in the watershed's upper area.
- Between the middle and lower parts it is located the Pan-American highway, which connects the Santa Maria River watershed's area with Panama's capital city and with the cities and provinces to the West (border with Costa Rica).

According to the Management Plan, "the summary of the problems and potentiality of the Santa Maria River watershed are mainly caused because of the lack of a permanent vegetation cover in fragile lands, as well as the inadequate use of soils with intensive crops which generate negative impacts such as erosion and loss of fertility. However, based on the analyzed information (primary data and participative assessment), it can be concluded that this territory is not in a critical situation regarding the natural resources sustainability, but will have to take immediate measures to manage. There would be not possible rehabilitation or restoration if in the short or medium term the necessary actions are not taken.

From the social perspective, if the situation becomes more critical, the limited opportunities to improve the communities' quality of life, is a situation of merit to catalyze management actions of the watershed with the socioeconomic development. This is accentuated by a possible situation of low percentage of land tenure in the area and the lack of work. The watershed has potentiality related to the use of environmental services, mainly resulting from the availability of water in quantity and quality; also in the long term, the ecotourism alternative is important to be considered. There is also potential to use water in the irrigation of downstream crops and in the same sub watersheds.

It is important to note that the water's greater potential is for the hydroelectric generation; however, this matter deserves serious consideration. As the study presented, the population does not identify this potential in the participatory assessments. It is noted on the other hand, that between the local organizations there are a few "against the dams or related projects". In fact, from the technical perspective and based on information analyzed, besides from justifying the watershed's management to contribute with the improvement of the quality of live, the other important reason is to guarantee the quality and amount of water for hydropower generation, as the agriculture potential is lower, and the forestry potential is even more promising. The hydropower potential in turn has to be part of a regional and national strategy, but without detriment to the local development and the basic needs of the population. This connotation shall be part of a process of concepts' clarification, awareness and strengthening of the capacities to manage and negotiate future project of any nature in the watershed.

Geographically this watershed of the Santa Maria River belongs to the region known as "*Arco Seco of Panama",* which is one of four critical regions exposed to drought and soil degradation in the country, with excess logging and clearing activities, as well as for other techniques equally harmful. This context has turned into environmental degradation, damages and chronic loss of productivity in livelihoods, including dairies and agricultural and livestock subsistence activities, the latter, performed by the poorest families.

Regarding agricultural production items, in the Arco Seco takes place the greatest corn production (77 percent of the national returns are produced in Herrera and Los Santos); rice (the Arco Seco provides 30 percent of the national production of this grain, having Cocle and Herrera the greater number of flooded rice -40 percent of the total). This Arco Seco region is particularly affected by the negative effects of the El Niño phenomenon.

According to the information provided by MIDA personnel of the central level and the regional office of Herrera and Los Santos, communities particularly affected in their productive capacities due to the water management and the climate variability include the areas of Cañazas, Calobre, San Francisco and Parita[22]

Chiriquí Viejo River Watershed. The watershed (see map 1) has a Management Plan from 2014. According to the Management Plan, the Chiriquí Viejo River watershed (identified as number 102 in the hydrological system of Central America) is located in the Pacific side of the Province of Chiriquí. The watershed's total drainage area is 1,339.4 Km^2. From its source to the mouth in the Pacific Sea (river discharges in the Charco Azul Bay) the main river's length is 161 Km. The watershed's average elevation is of 1,100 msnm, the highest point located at the Baru Volcano, at the north east part, with an elevation of 3,474 msnm.

The proposal of the General Land Management Plan (LMGP) of Panama considers that the Chiriquí Viejo River watershed is among the ones with higher priority. According to the LMGP national zoning, the middle and bottom area of the Chiriquí Viejo River watershed is located in the land production and forestry protection category, from a global perspective; it is possible that at a local scale, the differentiation in use can be adjusted.

The Chiriquí Viejo River watershed is integrated in a social and environmental context of important natural systems that work in an interrelated manner. The main aspects to consider in the watershed's management are:

- In its upper part we find the Baru Volcano National Park and the La Amistad International Park, both have favorable conditions of protection and conservation, for the watershed's internal interrelationships and towards the bottom. This part of the watershed has the highest hydropower potential, eco touristic and conservation development, there are important vegetal crop areas, mainly potato and onion. Cultivated in fragile soils, the erosion risk and the release of sediments is high.

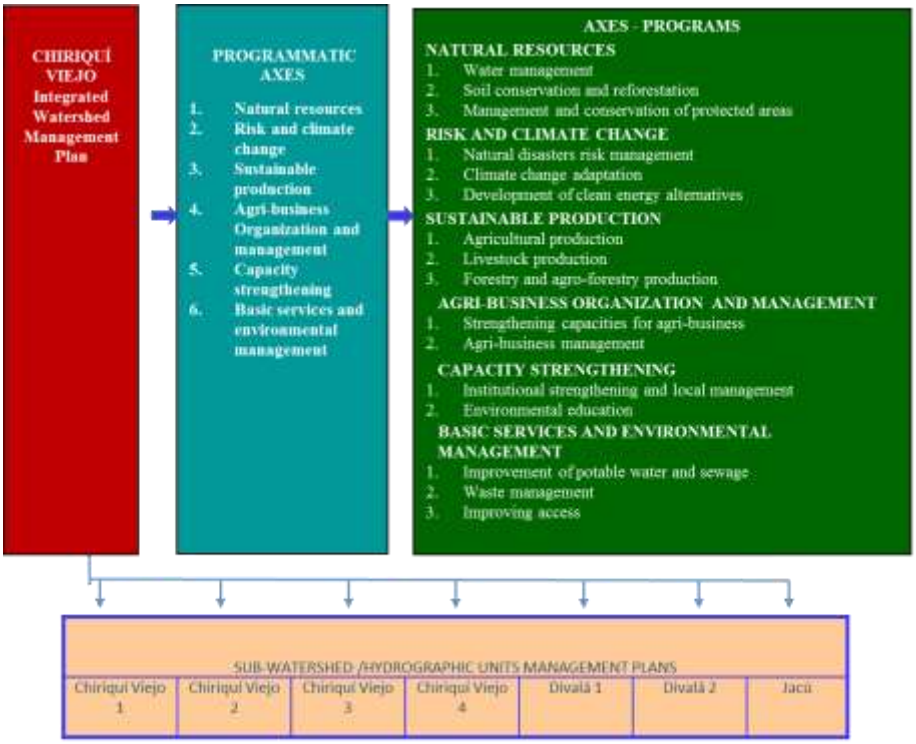
[22] Work meeting held at the Ministry of Environment on December 30, 2015.

Furthermore, if the higher part is not covered by good vegetation, the water infiltration for the groundwater recharge could decrease.

- In its middle area, the watershed has a significant potential for agricultural activities, with important dairy and coffee production (with possibility of irrigation of agricultural lands for crops and livestock). In some sub watersheds and micro watersheds there is potential for the hydropower use, some of them already under development.
- In its bottom part, there are crop areas of oil palm and plantains, the watershed is linked with the coastal marine system of the Charco Azul Bay and mangrove. The potential and the conservation of this system will depend on an adequate management of the watershed's upper and middle areas. As a whole, the middle and bottom areas, as well as the required environmental services will depend to a great extent on the implementation of protection, conservation and sustainable production measures in the watershed's upper and middle areas.
- The main driving force of the superficial water resource defines three important channels (Chiriquí Viejo River, Jacu River and Divala River) and other secondary; these have been modified in their gallery forests, producing fragility to the rivers and creeks' aquatic ecosystem. The riparian forests' recovery is an important task in the watershed's management.

The Management Plan of the Chiriquí Viejo River watershed is organized based on axis, programs and projects. The six axes of the Plan's structure are related to 17 programs. In the watershed, seven (7) sub watersheds have been identified; in each of them the projects that are later integrated to form the integral management plan's programs are defined. Hereafter we introduce the scheme of the programmatic structure of the Management Plan for Chiriquí Viejo River Watershed.

Table 5. Programmatic structure of the Chiriquí Viejo Integrated Watershed Management Plan



Source: Chiriquí Viejo Integrated Watershed Management Plan.

The management Plan integrates measures both to face climate variability, and to contribute to the climate change's mitigation and adaptation. This axe, as well, shall consider the linkage with the other axis (natural resources, sustainable production, organization and agribusiness management, strengthening of capacities and basic services, and environmental management) that allow to integrate the vulnerability analysis of these in light of the climate change; as well as the implementation of the adaptation measures identified in products 2 and 3.

To obtain effective results, it will be encouraged -at the national level- the inter-institutional coordination, participation and integration, related to the climate change risks' theme. The institutions at the national level shall have active participation in this process. In each of the projects it is recommended, as far as possible, to include indicators that take into account the monitoring of the variables related to the change

and the climate variability. The principal institutions involved are: ANAM, SINAPROC[23], MIDA, IDIAP[24], Ministry of Health, Municipalities.

The adaptation to climate change Program in the Plan. The watershed's climate change is an element which links all the actions proposed in the Management Plan. It is important that both, the production and the conservations actions, include climate change as a preventive factor. Therefore, the temperature change, increase in the wind speed, intensity and rainfall's duration, are decisive to identify the solutions to the negative impacts of climate change. The crop losses due to the lack of water, new diseases in the crops, the lack of water for human consumption; are some of the concerns of the watersheds' villagers, thus they expect to have adaptive measures to overcome those threats. These measures will require of education and experiences from local stakeholders, following complementary strategies such as the exchange of experiences and the assessment of good practices.

In the Chiriquí Viejo River watershed, the adaptation to climate change is a program that will facilitate the assessment of options on water harvesting, protection of watershed recharge areas and protection of water sources. Such activities will require the participation of the farmers, users and the community in general. These adaptation actions to the climate change try to:

- In the short term, achieve a clear understanding of the climate change within the population.
- In the medium and long-term, implement adaptation actions, with participation of local stakeholders.
- In the long-term, have the appropriate information for adaptation to climate change, communicating and standardizing the experiences.

The program covers the whole watershed, with special attention to critical areas affected by elements of climate change (that undergo hydrological stress, lack of water, diseases, etc.). Its general purpose is: apply adaptation measures to climate change to minimize and/or control the losses of agricultural crops and guarantee water availability for the community basic uses and for farmers. The strategies include:

- Inform farmers and community of the existence of adaptation measures alternatives to deal with climate change.
- Train local stakeholders in the use of adaptation measures (the exchange of experiences is an important alternative to consider).
- Provide technical assistance and transfer of technologies, regarding adaptation measures recommended for the watershed.
- Develop guidelines for the implementation of climate change adaptation measures, compatibles with the characteristics of the land.

According to the Plan, this results in a group of specific projects at a total cost of US$3.1 million, thus:

[23] National Civil Protection System (SINAPROC).
[24] Institute for Agriculture and Livestock Research of Panama (IDIAP).

- Improvement of the agricultural production through irrigation system.
- Introduction of new plant species.
- Biological control of pests.
- Protection of the water sources.
- Protection of watershed recharge areas.
- Water harvesting.

According to information delivered by MIDA officials of the central level and technical coordinators of the Chiriquí Regional Office, communities within the watershed require priority actions due to conflicts and vulnerabilities associated to the water and climate management for different productive uses are: Divalá, Chiriquí Viejo, La Esperanza, Baco, Progreso, Corotu, Acerrio; Caisán, San Antonio, Bajo Chiriquí and Santa Clara.[25]

In order to obtain broader impacts of the Adaptation Program and avoid dispersion, when possible, we propose the intervention activities in the 2 selected watersheds to be mainly oriented to 2 key produces of the agricultural area in both parts: rice production and livestock. The criteria to select these produces include:

- Importance of the item in the agricultural area; in function of the area dedicated to its production;
- Existence of baseline environmental and/or climate information that serves as reference.
- Possibility of identifying co-benefits of mitigation and in other areas, for example, health area.

The importance and impact of these 2 produces due to climate change effects have been particularly identified by the Ministry of Agricultural Development of Panama. This was discussed and submitted during the VII meeting of the Technical Panel on Climate Change of the Central American Agricultural Council (CAC) in September 2015, held in Panama. During this meeting there were highlighted -as characteristic elements of the national weather condition- the rainfall's decrease in the Pacific side; an increase in the Caribbean side; and the enactment of the Cabinet Resolution to declare an emergency state to deal with the adverse impacts of the El Niño Phenomenon 2015-2016.

The provinces identified as affected by drought are Los Santos, Herrera and Veraguas with the following losses reports, and affected productive activities:

[25] Information provided during the work meeting at the Ministry of Environment on December 30, 2015.

Table 6. Crops

Region	Produce	Loss (B/.)
Los Santos	Rice, corn, squash	30,589.16
	Cattle raising	360,910.05
Herrera	Rice, corn, plantain, coffee, squash, cassava, yams, otoe, cantaloupe, watermelon, and sweet pepper	496,202.44
Veraguas	Mechanized rice	1,566,950.00
	Cattle raising	213,153.00
	Total	

Table 7. Conditions

ACTIVITY	WEATHER CONDITION	ZONES	EFFECT
Mechanized rice	Drought	Los Santos, Herrera and Veraguas	Decrease in production / pest attack
Corn	Drought	Herrera and Los Santos	Decrease in production / pest attack
Bovine beef cattle	Drought	Los Santos and Veraguas	Decrease in body weight - 30% Animals' death
Goat farming	Drought	Los Santos	Animals' death
Dairy cattle	Drought	Los Santos	Decrease in milk production

Source: Presentation made by the MIDA during the meeting of the Technical Panel on Climate Change of the Central American Agricultural Council (CAC). Panama, September 2015.

Project / Programme Objectives:

List the main objectives of the project/programme.

The overall objective of this program is to establish climate resilience water management to enhance food and energy security at the national level, through an integrated and community based approach in the Chiriquí Viejo and Santa Maria Watersheds.

Specifically, the program will be addressing the following objectives:

a) Increasing climate change and variability adaptation capacity in agriculture, livestock and energy production sectors.
b) Establishing climate resilient water management instruments with integrated and community based approach.
c) Strengthening local national capacity for monitoring and decision making to reduce and respond to risks associated to climate change
d) Raising awareness and establish a knowledge exchange platform to respond to and to mitigate impacts of climate related events

Project / Programme Components and Financing:

Fill in the table presenting the relationships among project components, activities, expected concrete outputs, and the corresponding budgets. If necessary, please refer to the attached instructions for a detailed description of each term.

For the case of a programme, individual components are likely to refer to specific sub-sets of stakeholders, regions and/or sectors that can be addressed through a set of well-defined interventions / projects.

Table 8. Project components, activities, expected concrete outputs, and the corresponding budgets.

Project / Program Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
1. Increase climate change and variability adaptation capacity in agriculture, livestock, and energy production sectors	1.1 Concrete adaptation measures implemented for household water security 1.2 Pilot climate smart farming projects implemented 1.3 Pilot diversified financing and income source models implemented in vulnerable population areas 1.4 Concrete adaptation measures implemented for sustainable cattle ranching 1.5 Enhanced sectorial support through climate financing instruments	Enhanced climate change resilience for improved food, water, and energy security in target watersheds	**US$ 4,301,131**
2. Establish climate resilient water management instruments with integrated and community based approach	2.1 Analysis for climate change vulnerability done in prioritized areas at the Chiriqui Viejo and Santa Maria River Watersheds 2.2 Developed technical criteria for granting water use concessions and permits in order to reduce/avoid conflicts among users and increase ecosystem resilience in response to climate-induced stress 2.3 Increased hydrological security in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds, in line with advances of the National Plan for Water Security	Improved water governance and natural resources management in prioritized watersheds by mainstreaming climate change data	**US$515,000.00**

Project / Program Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
3. Strengthened local national capacity for monitoring and decision making to reduce and respond to risks associated to climate change	3.1 Designed and in operation the National System for Climate Data (NSCD), by upgrading ETESA´s existing network for recording climatic information from hydrographic watersheds 3.2 Established an early warning system to identify in advance, the necessary measures in case of hydro-climatic events that could affect food production and power generation 3.3 The NSCD interfaced and equiped with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information 3.4 Designed a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program and national efforts*	Increased preparedness in target watersheds and reduced risk for disasters among vulnerable communities nationwide Improved access to data for informed, timely decision-making regarding climate variability risks	**US$2,851,000**
4. Rising awareness and establish a knowledge exchange platform to respond to, and to mitigate impacts of	4.1 Improved awareness of watersheds vulnerability and participation of population groups in adaptation measures 4.2 Strengthened professional capacities for the climate data analysis and	Improved institutional capacity, knowledge management, and awareness on climate change adaptation	**US$766,870**

Project / Program Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
climate change related events	processing, for different sectors involved 4.3 Strengthened professional capacities on water resources management by incorporating climate change adaptation approach 4.4 Systematized and disseminated experiences on climate changes adaptation, nationwide 4.5 Portal for Climate Change Adaptation in Panama, implemented		
5. Project/Programme Execution cost (9.5 per cent)			801,230.00
6. Total Project/Programme Cost			8,434.001.00
7. Project/Programme Cycle Management Fee charged by the Implementing Entity 8.5%)			716,890.00
Amount of Financing Requested			9,952,121

Projected Calendar:

Indicate the dates of the following milestones for the proposed project/programme

Milestones	Expected Dates
Start of Project/Programme Implementation	Second semester 2016 (August 2016, tbc)
Mid-term Review (if planned)	December 2017 (e)
Project/Programme Closing	August 2019 (e)
Terminal Evaluation	December 2019 (e)

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

COMPONENT 1. INCREASE CLIMATE CHANGE AND VARIABILITY ADAPTATION CAPACITY IN AGRICULTURE, LIVESTOCK, AND ENERGY PRODUCTION SECTORS

Project Outcome(s)	Project Output(s)	Proposed activities
Enhanced climate change resilience for improved food, water, and energy security in target watersheds	P Output 1.1 Concrete adaptation measures implemented for household water security	1.1.a Install at least 50 water harvest systems, 25 in each of the watersheds (SMRW and CHVRW). Train beneficiaries on the installation, use, and maintenance of water harvest systems: i. Carry out a diagnostic for system design. ii. Install water harvest systems and train beneficiaries. iii. Monitor and maintenance. iv. Develop a technical document with guidelines to replicate this technology at national level
	P Output 1.2 Pilot climate-smart farming projects implemented	1.2.a CHVRW. Implement the strategic action of establishing reforestation (for protection of watercourse) and agroforestry - soil conservation systems: 10 farms along 6000 lineal meters of streams of the Caisan river (CHVRW). This activity includes identification of farms according to results from the Vulnerability Analysis, Farm Management Plan (with identification of species, crops/area zoning, costs); and the design and establishment of gallery forest, as well as the agroforestry systems. 1.2.b CHVRW. Establish irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. This includes: i. irrigation needs diagnostic; ii. design and installation of pilot low cost irrigation system, and training; iii. technical assistance to farmers and companies for the implementation of the irrigation system; and monitoring and evaluation. iv. It also includes -at Divalá-, a complement to the irrigation system consisting of an analysis of the water footprint for rice crops, which will allow identification of technological schemes for climate-smart rice production, particularly using the SICA model.

Project Outcome(s)	Project Output(s)	Proposed activities
	P Output 1.3 Pilot diversified financing and income source models implemented in vulnerable population areas	1.3.a SMRW. Implement the strategic action of creating capacities for operating orchid and "naranjilla" crops, as well as establishing the correspondent commercialization scheme at CRSM. It includes: i. training on establishment and management of orchid and "naranjilla" crops; ii. design of business plans; iii. development/improvement of seedling nurseries; advice and technical assistance for commercialization.
	P Output 1.4 Concrete adaptation measures implemented for sustainable cattle ranching	1.4.a SMRW. Implement a sustainable cattle ranching project at SMRW, covering cover 800 has.
	P Output 1.5 Enhanced sectorial support through climate financing instruments	1.5.a Conduct a review on current credit products offered to agriculture and energy sectors; including technical recommendations on climate financing instruments. 1.5.b Develop 4 business plans (2 for each watershed) to establish and operate mini-hydro energy projects, including the correspondent farm management plan, informative prospectus to access financing sources for climate change adaptation activities, and technical assistance offered to obtain such financing. Design a technical recommendations document to replicate this experience at national level. 1.5.c Socialize the concept of Microfinance, based on ecosystems and climate change adaptation. It includes: i. Development of Microfinance Institutions mapping for both watersheds; ii. Informative/instructional meetings on Microfinance for Ecosystem-based Adaptation (MEbA) with Microfinance Institutions, and identification of those interested/willing to participate in the training and technical assistance, iii. Selection of 2 Microfinance Institutions (one at each watershed) to develop the training and technical assistance in order to design and offer one finance product.

Expected concrete outputs:

1.1 Concrete adaptation measures implemented for household water security

Water security is the population's capacity to safeguard (1) the sustainable access to sufficient amounts of water of adequate quality for life support, the human well-being and (2) the socio-economic development, for (3) guaranteeing protection from contamination transmitted by water and disasters related to water, and (4) for the ecosystems' conservation (5) in a peaceful and politically stable environment (UN-Water, 2013).

This activity aims to promote water security at the household level by:

1.1.a) Installation of at least 50 water harvest systems, in situ and ex situ, 25 in each watershed (SMRW and CHVRW). Train beneficiaries on the installation, use, and maintenance of water harvest systems.

To do this, programme activities include:

a) Conducting a diagnostic for system design. A rapid needs assessment will be conducted to define the location and specific technical solution for each site. During the assessment, particular attention will be given to the areas in SMRW located in the Arco Seco region, which are facing significant water scarcity scenarios.
b) Install water harvest systems and train beneficiaries, based in the rainwater harvesting integrated approach, as explained below.
c) Monitoring and maintenance.
d) Elaboration of a technical document (knowledge product) with guidelines to replicate this technology at national level

Training process and dissemination of the technical document will be conducted in coordination with the correspondent municipalities, to facilitate long-term sustainability and replication at the district level.

In the context of this output activities, the Programme will promote reflection among participants regarding new storage and conveyance of water. Through this activity, there shall be a link between this Adaptation Program and the process of the National Plan for Water Security for 2030 that the National Government is developing. The link shall take place through showing how the water harvesting projects, known as adaptation measures, directly contribute to the water security purpose at family and farm level.

The programme will include both in situ and ex situ water harvesting techniques. In situ to increase the amount of rainfall stored in the soil by trapping and storing it in the desired location, using soil conservation measures, mainly terracing, which is a traditional practice, particularly in the Chiriqui Viejo area. Ex situ water harvesting will be developed as well, storing water in natural and artificial reservoirs, particularly in the SMRW, which are facing dramatic water scarcity scenarios due to the ENSO oscilation.

This activity will build upon previous recent experiences promoted by the Panamanian Government, particularly the SCALL initiative. This concept is being also promoted by MIDA, particularly oriented to those producers with no access to irrigation systems in Chiriqui Province and Arco Seco.

The climate change additionality /innovation through the Adaptation Programme is given through the **integrated approach** that will orient this activity:

- ✓ Promoting the concept of rainwater multi-purpose utilization
- ✓ Making visible the associated services to rainwater utilization as income generating activity
- ✓ The RWH is much more than the system installation, it includes:
  - Knowledge transfer (income generating activities that could be linked to rainwater harvesting, emphasizing women participation)
  - Raise awareness about rainwater environmental services: energy production, aquifer recharge, food security
  - Potential for Flooding & draught prevention

Output Summary:

Adaptation measure	Water harvesting systems at household level
Definition	Water harvesting refers to redirection of rainwater and storm water runoff, and storage for productive use (agriculture, drinking water and more). Harvesting rain is a practice that has been around for centuries to support agriculture and cope with seasonal water availability. When water supply becomes limited, practical solutions can fill the gap. Rainwater harvesting systems provide distributed storm water runoff containment, while simultaneously storing water that can be used for irrigation, flushing toilets, washing clothes, washing cars, pressure washing, or it can be purified for use as everyday drinking water.
Scope:	Local, replicable at the national level
Adaptation benefits	These systems will contribute to **increase food security and resilience to drought**, as well as to reduce the need for irrigation water and energy use for water transport. Location and technical characteristics to be defined based upon current climate change available data from Hidromet.
Technical solution	In situ water harvesting systems, particularly in CHVRW Ex situ water harvesting systems, particularly in SMRW
Adaptation plus	Will enable linkage between adaptation action and the Water Security National Plan

Adaptation reasoning:

Type of measure	CC risk or impact identified	Expected result on the ground	Difference with business as usual water management or agricultural best practices
Water harvesting systems widely accepted in climate change literature as adaptation measure	Altered seasonal patterns of precipitation and run-of; unsustainable water consumption; severe water scarcity situation for human consumption and production	Improved water access for households (using quantity and quality indicators). Increased water supplies to meet demand	Linkage with participation in VIA analysis, water sources conservation projects and restoration of hydrological cycle in prioritized areas. The project will promote reflection among participants regarding new storage and conveyance of water

Important fact:

Even though RWH has a long history and has been used by many ancient civilizations, this practice is not widely spread in Panama. An evidence of this situation is that Min. of Environment-CATHALAC and MIDA water harvesting programmes were launched recently in 2009-2010 and 2015, respectively. No more than 40 systems have been installed. (http://laestrella.com.pa/economia/productores-ponen-esperanzas-cosecha-agua/23888753)

1.2 Pilot climate smart farming projects implemented

This output promotes good practices for climate-smart agricultural production in the CHVRW, to increase communities' resiliency and adaptive capacity through the climate management of the water, through forest conservation/agroforestry management (1.2.a) and climate resilient irrigation systems (1.2b).

The proposed adaptation activities include conservation and management actions. Conservation actions proposed meet the ecosystem based adaptation approach.

1.2. a) Establishing protective plantations (riparian buffers/gallery forests) and agroforestry systems and soil conservation across at least 6,000 lineal meters in 10 farms located in the banks of creeks in the Caisan River Subwatershed.

This strategic activity is pre-identified and prioritized in the Strategy No. 4 of the Caisan River's Sub-watershed Conservation Area Plan (CAP): "Conservation and restoration of the forest ecosystem that protects water sources for human consumption". The expected effect is to increase the forest coverage which protects the sub-watersheds' water flows. The activity includes:

- Properties' identification based on the vulnerability analysis results.
- Properties' management Plan with the identification of the species, zoning and cost.
- Design and start-up of protective plantations (riparian buffers/gallery forest) and the corresponding agroforestry system, mainstreaming the ecosystem based adaptation approach (EBA).

To strengthen the climate change dimension of this project, this activity includes coordination with Technological University of Panamá for purposes of defining a

protocol/methodology to measure carbon sequestration benefits in the long term, as well as measuring improvement of income generation among the beneficiary farms.

Output Summary:

Adaptation measure	Protective plantations / Riparian buffers and agroforestry
Definition	Forest conservation, reforestation and agroforestry management are widely accepted as ecosystem based adaptation measures.
Scope:	Local: Caisan River Sub-watershed in CVRW
Criteria for selection:	Caisan River is 21.5kms long and it is a tributary of the Chiriqui Viejo river in the middle section. The advance of the agriculture and cattle ranching sector at the watershed and sub-watershed level have significantly altered the forest coverage, reducing it to fragments of forest connected by riparian buffers and live fences. In addition, the CHVRW is under intense pressure from the hydropower sector, with 13 hydro projects approved (Public Services Authority, 2014) and 24 future projects under revision. **Caisan River sub watershed is threatened by 2 concessions for hydropower generation already in progress**. Residents of the Caisan River sub watershed fear that the river will suffer the same irreversible situation affecting the Chiriqui Viejo River, leaving them unprotected and losing their livelihoods, since the Caisan river is their main water source for production. During the dry season most communities face water supply scarcity, having to use pump wells. These water concessions, both at the watershed and sub watershed level, have been granted without considering the climate change variability, since no climatic data is being generated or analyzed; conflicts among water users are not considered either. This sub-watershed is a clear example of a non-coherent water management model, in complete absence of climate change considerations and community vulnerability. To mitigate this scenario, the Ecological Trust Fund of Panama supported the development of a Conservation Area Planning process in 2014, with a participatory approach. This CAP is being partially implemented, due to lack of financial resources to implement at the scale needed. In addition to the climate buffering result of the forest conservation and agroforestry, this project will also serve as a mechanism to demonstrate alternatives to improve the extensive cattle ranching model “potrero” that is currently in place.
Adaptation and climate benefits and co-benefits	These systems will contribute to both water management and climate regulation purposes, including drought mitigation. In terms of water management, these systems will contribute to riverine flood and erosion control. Other co-benefits include alternative livelihood possibilities derived from the agroforestry; carbon sequestration, among others.
Technical solution	Plantation and agroforestry management including native and commercial species.
Adaptation knowledge plus	New protocol/data to measure impact in carbon sequestration and income generation in the long term

Adaptation reasoning:

Type of measure	CC risk or impact identified	Expected result on the ground	Difference with business as usual water management or agricultural best practices
Riparian buffers listed as green infrastructure solution and ecosystem based adaptation measure for water management. (Green infrastructure guide for water management. UNEP-IUCN- TNC**. 2014**	Altered seasonal patterns of precipitation and run-off;	Erosion and flood control; water purification and biological control; biodiversity benefits; aesthetic and recreation values to communities engaged in the project; contribution to stabilization of stream flow and water temperature.	EBA approach is not explicitly included in agriculture best practices projects currently conducted in both watersheds

Forest conservation and protection of water sources are accepted EBA measures, as defined by IUCN.

	Management practices
Climate-buffering	
Diversification	Crop diversification, intercropping and crop rotation within fields; landscape diversification; multiple sowing dates
Moisture conservation	Nurse crops or trees as shade; early spring harrowing to prevent capillary rise and evaporation
Groundwater regulation	Forest or tree protection; protection of water sources
Flood control	Planting and protection of trees in wetlands to regulate water levels and thus protect nearby fields from flooding.

Ecosystem-based practices that increase resilience to climate change and other disturbances
Ecosystem-based Adaptation. A natural response to climate change. IUCN 2009

Important fact:

The Caisan River subwatershed encompasses 14 communities in 2 “corregimientos” (10 in Corregimiento Plaza Caisan with 2901 inhabitants and 4 in Corregimiento Dominical with 998 inhabitants, accordingly to data of the Statistics Institute, 2010). Communities directly related to the Caisan River subwatershed are: Caisan Primavera, Caisan Centro Plaza, Plaza Caisàn y Alto La Mina, Caña Blanca Arriba, Caña Blanca Centro y Caña Blanca Abajo. The area of the subwatershed is 6,527.9 ha. In the upper part of the subwatershed the main activities are livestock for milk and meat and in the middle and lower parts are mainly dedicated to small scale agriculture.

Direct beneficiaries: Small farm owners located in the riparian area of the Caisan River. Selection process pre-conducted for the Conservation Area Plan process. Fideco 2015. This subwatershed encompasses 14 communities in 2 corregimientos (10 in Plaza Caisàn with 2901 inhabitants and 4 in Dominical with 998 inhabitants, accordingly to data of the Statistics Institute, 2010). Communities directly related to the Caisan River subwatershed are: Caisan Primavera, Caisan Centro Plaza, Plaza Caisàn y Alto La Mina, Caña Blanca Arriba, Caña Blanca Centro y Caña Blanca Abajo.

Ecological viability of the Caisan River Sub Watershed calculated using MIRADI software resulted in condition “regular”. The forests as conservation objects were ranked in a “poor” situation (0-15%). By way of this Programme conservation activities will be conducted, generating evidence about the importance/pertinence of the Ecosystem Based Adaptation Approach. Raising awareness about the EBA approach among the farm owners participating in the forest project is a direct benefit of this output.

1.2.b Establish climate resilient irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. This includes:

Project No. 18 of the Management Plan will be implemented in the CHVRW that corresponds to the **"improvement of the agricultural production through irrigation systems**". The purpose of this project is to increase the agricultural production using efficient and low cost irrigation technologies. This activity will take place in the community of Cerro Punta (upper watershed) as indicated in the Management Plan. To define a concrete linkage with food security dimension, this project will include also the community of Divalá in the lower watershed, which is a community traditionally dedicated to rice production. The following tasks shall take place:

- Irrigation needs' assessment
- Systems design and installation of 2 low cost irrigation pilot systems (one in the upper watershed and other in the lower watershed)
- Technical assistance to farmers and companies for implementation of the irrigation system (at least 20 farms)
- Monitoring and evaluation.
- In the area of Divala, the irrigation system will be complemented with a water footprint analysis of the rice production. The purpose of this activity is to allow identification of technological schemes for climate-smart rice production. For example, the Rice Grow Intensive System (RGIS- SICA for its initials in Spanish: Sistema Intensificado de Cultivo del Arroz)[26] that has shown positive results in respect of water reduction with co-benefits in terms of health.

Adaptation measure	Establish climate resilient irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields
Definition	Irrigation involves supply of water to the fields, by gravity or pumping. The water can be diverted from a river or canal, or drawn from a lake or a reservoir, or from the ground; or it can simply be retained at the place where the crop will be cultivated. Irrigation involves supply of water to the fields, by gravity or pumping. The water can be diverted from a river or canal, or drawn from a lake or a reservoir, or from the ground; or it can simply be retained at the place where the crop will be cultivated. A good irrigation scheme is characterized by the predictable availability of adequate water at the place and the time when the crops need it.
Scope/Scale:	Local, watershed level. Cerro Punta and Divalá (upper and lower watershed respectively)

[26] Rice Grow Intensive System known as SICA for its initials in Spanish is a proven innovation in more than 50 countries; practiced by 9.5 million producers in over 3.4 million hectares (SRI-Rice, 2014). Instead of a predetermined technological package SICA is performed with flexible practices, but fundamentally based on four principles: a) early Transplant healthy seedlings 8-12 days old; b) Reduction of competition among seedlings (through low seeding: separated by a minimum of 25 cm seedlings); c) Reduced water: Application favoring soil aeration (alternating wet with dry soil, without maintaining the flooded land); d) Adding organic matter to improve soil texture and nourish the crop (application of manure, cover crops, etc.).IICA, FONTAGRO, CONIAF. Fact sheet.

Adaptation additionality:	The purpose is to promote, by the first time in Panama, a climate resilient irrigation system. Climate resilience of the proposed system will be supported by observing the following measures/guiding principles: • High over-all efficiencies of water-dependent production systems: High output and high value per m3 of water • Adequate hydraulic feasibility; good design; and good operation • Balance between water demand and raw water availability • To the extent possible, limited reliance on pumping • Adequate drainage • As much storage as possible • Good control of water allocation over time and within the scheme • Limited losses, for the sake of flow capacity and scour control • Predictable and reliable water allocation • Good collaboration between the farmers • Good access to information about the normal and actual weather • Good knowledge about management options, covering both cultivation and water management
Adaptation reasoning	The watershed management plan, approved in May 2014 identified aspects such as variability in rainfall (rainfall distribution in the year, intensity), soil fertilization needs, low availability of water for irrigation of crops and lack of labor as aspects that directly affect yields. The management plan is formed by 6 pillars, each divided into programmes and projects. One of those pillars is the Risks and Climate Change, which includes 2 programmes and 6 projects as follows: a) Disaster risk reduction: Projects: Flood control; drought mitigation; control de deslizamientos and fire prevention and management. b) Climate change adaptation: Projects: **Improving agricultural production through irrigation system;** Introduction of new plant species**;** Biological pest control**;** Protection of water sources**;**Protection of water recharge areas**;** Water harvesting. This project of the Climate Change Adaptation Programme of the Management Plan has not been implemented yet, due to lack of financial resources. By implementing this project with funding from the AF, it will be possible to positively influence agricultural productivity, while making visible the water-food-climate change nexus among the farm owners and other stakeholders.
Technical solution	The systems will consider the following climate related challenges to irrigation and logic of intervention: • Threat: rainfall irregularities • Effect: water shortage • Responsive measure: irrigation supply. Complemented by considerations regarding recommendations for shorter cultivation cycle and drought contingency planning. The scheme will be: • hydraulically feasible (for example in terms of raw water availability); • well designed (for example in terms of storage capacity, conveyance capacities and control structures); and • well operated (for example in terms of water allocation within the scheme). • financially feasible - meaning that the economic benefits exceed the operation and maintenance costs with a margin that makes it attractive to the farmers.

	A scheme with these characteristics is likely to have a good (or fair) climate resilience, because it is intended for 'normal', short- or medium-term weather irregularities. Climate change will mainly affect the hydraulic feasibility; the design (of new or upgraded schemes); and the operation (supported by data and knowledge). Hydraulic feasibility is the basic requirement for any investment in irrigation infrastructure. If a scheme is not hydraulically feasible, it is not likely to generate economic and social benefits. On the contrary, it can be a waste of money, and, at worst, positively harmful to resource management and cultivation. Hydraulic feasibility analysis will be a critical requirement of the initial diagnosis need assessment and for the system design.
Adaptation knowledge plus	a) In the context of this output, the Programme will generate discussion about the possibility of switching from use of freshwater to wastewater in order to increase availability of water for energy and agriculture. b) Innovative on the ground experience, mainstreaming climate change adaptation intro irrigation systems design and operation. c) Technical document resulting from the project, will serve as reference material for potential replication and further research. d) No specific technical standards regarding climate resilient irrigation systems have been identified during the proposal writing process. Nevertheless, recent experiences conducted particularly in Asia Pacific will be reviewed as referential material to inform the system design, installation and operation.

Type of measure	CC risk or impact identified	Expected result on the ground	Difference with business as usual water management or agricultural best practices
Agriculture best practice. Clima**te change additionality linked to the use of climate** dimension **for system design and development in the context of a wider adaptation programme**	Altered seasonal patterns of precipitation and run-off;	Water management and water productivity increased	Current irrigation systems do not incorporate climate data into design and implementation phases. This will be ensured by observing technical standards that include climate change considerations taken from climate smart irrigation projects; conducting training workshops for sustainable water use accordingly to the crop needs, crop stage and production calendar. In the context of this output activities, the Programme will generate discussion about the possibility of switching from use of freshwater to wastewater in order to increase availability of water for energy and agriculture. Water footprint data of rice production

Important facts
Criteria for the selection of the intervention areas and beneficiaries

- Direct beneficiaries: Communities of Cerro Punta and Divala.
- Selection criteria/process: Cerro Punta and Divala communities. Based in the consultation process for the Management Plan and its inclusion in the management plan project portafolio.
- Divala community selection based also in light of the importance of rice production in this location.
- Rice production in Divalá severely affected by drought associated with El Niño impacts.
- Both communities encompass a population of 13,116 inhabitants, (Population Census Data, 2000).

1.3 Pilot diversified financing and income source models implemented in vulnerable population areas

This output focuses in the SMARW area, promoting improvements in the health of ecosystems and income generation to increase communities' resiliency and adaptive capacity, through promotion of non-traditional crops (1.3.a) and sustainable cattle ranching (1.3.b)

1.3.a Creating capacities for operating orchid and "naranjilla" crops, as well as establishing the correspondent commercialization scheme at the Rio Gallito Sub-Watershed.

This activity is pre-identified in the Rio Gallito Sub Watershed Conservation Area Plan as a sustainable income generating activity, based on natural resources management. The expected result is to contribute to the reduction in the expansion of intensive agriculture and the reduction in the changeover to extensive livestock. It includes:

i. A participatory community rapid assessment to identify and validate communities/farm owners with potential/interest to participate in the project.

ii. Training on orchids and "naranjilla" crops growing and management. Drafting of the corresponding business plans.

iii. Development/improvement of seedling nurseries

iv. Technical assistance for marketing and commercialization.

Adaptation measure	Creating capacities for operating orchid and "naranjilla" crops, as well as establishing the correspondent commercialization scheme at the Rio Gallito Sub-Watershed.
Criteria for selection:	The Gallito River Subwatershed is identified as a priority site within the SMRW accordingly to the Conservation Area Plan conducted in 2014, due to the provision of ecosystem services and its physical, environmental, and socio economic importance. The Rio Gallito Sub Watershed is part of Bulaba River sub-basin; it has approximately 5322.8 km2, is classified as a small basin and the length of its main river (Rio Gallito) from its source to the output is about 10.7km. Its importance lies in the maintenance of environmental services such as water quality for human consumption and for agricultural uses and connectivity between the forests of the upper sections of the basin with 2 important protected areas: the Santa Fe National Park and Forest Reserve La Yeguada. Climate change is one of the major threats for the four conservation objects defined in the Conservation Area Planning process conducted in 2014 along with forest coverage loss, land use conversion for extensive cattle ranching, unsustainable productive practices, solid waste pollution and loss of connectivity of water bodies. "Climate change puts pressure on the food security of residents through the fluctuation in the short and long-term of weather patterns (temperature, water and electricity) necessary for agricultural activities and impacting production and crop yields. Climate change threat was ranked as very high (high for primary forest, river ecosystem and pez titi (Sicydium salvini) and very high for secondary forests" (Rio Gallito Conservation Area Plan, FIDECO 2014) The Rio Gallito Sub Watershed is home to 1081 residents of which 55% were male and 45% female; 61% of the total inhabitants had more than 18 years, representing a productive population pressing natural resources, especially water and soil, to meet their basic needs. The watershed has 27 communities in 4 districts (El Alto, Rio Luis, Ruben Cantu and Santa Fe). Communities within the sub watershed are small settlements with less than 100 persons, lack of basic services and a livelihood associated to the extensive use of natural resources, especially soil. In addition to the vulnerability to climate change mentioned above, these communities present socio-economic vulnerability evidenced by the existence of poverty and extreme poverty in all the communities, where the unique productive alternative is the use of land (in 70% of the communities the average income is in the range of US$101-299/per month). Regarding socio economic activities, those are mostly related to extensive use of land and natural resources, typically for auto consumption (subsistence), based in family labor and low technology; there is also a . There are 3 types of farms: small (0.1-9.99 ha-cattle and 10 animals) located in the middle and lower watershed; medium size (10-50 hectares and less than 50 animals, located in the middle and lower section of the watershed and large farms (50+ hectares and 50+ animals located in the lower watershed). In the upper section there are "potreros" for pasture rent located in areas important for forest ecosystems and water sources.
Scope/Scale:	Local, sub watershed level.
Adaptation additionality:	Promoting these non-traditional production, can prevent these farmers to consider land use change for traditional extensive cattle ranching model, prevalent in the watershed, increasing their vulnerability to climate change associated to the drought that is severely affecting the watershed.

	Orchid production is an incipient non-extended activity at the watershed level, with positive revenues for current developers. Nonspecific losses due to climate variations have been reported by the producers.
Adaptation reasoning	Project focus: The project will emphasize in effective transfer of technology to the target groups, using a participatory approach for effective transfer of technologies, including climate change considerations, to empower stakeholders, analyzing feedback for further refinement. To do this, the project will include a need based and focused training programme, demonstration sites and model training courses. Performance measures will include, for example: ➢ Identification of potential "clusters" of production, selection of beneficiaries and imparting training and technical inputs in order to produce orchids of local/international standards ➢ demonstration of proven technologies through technology dissemination • ➢ Upgrading of Knowledge, Know How techniques, Managerial Skills and Self employment among extension functionaries, farmers, school drop outs, young man and women. ➢ Promotion of inter–institutional collaboration to facilitate popularization ➢ Commercialization analysis and business plan

Type of measure	CC risk or impact identified	Expected result on the ground	Difference with business as usual water management or agricultural best practices
Market based approach to sustainable development and sustainable consumption and production. Climate change additionality depends on targeting vulnerable producers to climate and non-climate risks.	Extensive cattle raising model depleting soil and water resources, exacerbated by water scarcity problems due to severe drought. In depth analysis is included in the CAP.	Increased income generation for programme participants; discouraging traditional "potrero" extensive cattle ranching production system, avoiding advance of agricultural frontier to new areas;	These products are nontraditionally produced in the region. Innovation potential for local communities Use of climate data to define production system, calendar and commercialization strategy.

1.4 Concrete adaptation measures implemented for sustainable cattle ranching

A sustainable livestock project will be implemented in the Santa Maria River Watershed. This project is pre-identified in the Agricultural and Forestry Production Program of the Watershed Management Plan, whose purpose is" to improve men and women's socioeconomic capacity in the watershed, their contribution to the ecological and organic production to the food safety, forestry production, family income and the natural resources conservation".

This sustainable cattle ranching project will be based in the agro-silvo-pastoral (ASP) approach, which has proved to be an effective ecosystem base adaptation measure.

This activity includes implementing ASP systems in at least 800 hectares. The specific site/communities for this project will be determined during the Consultation Workshop that will take place in April 28 with watershed stakeholders and water users, organized by Fundación Natura as part of the national consultation process for this proposal elaboration. To this end, technical information about the state of the art of the livestock production and climate scenarios will be presented by regional staff of the Min of Environment and Ministry of Agriculture (MIDA). The activity might also be adjusted in light of the results of the VIA analysis results. Nevertheless, preliminary critical areas identified by MIDA during the consultation process for the full proposal writing process included the Districts of Cañazas, Calobre, San Francisco and Parita.

Particular attention will be given to assess and make visible the mitigation co-benefits of this sustainable cattle-raising project based on the potential reduction of methane emissions.

Important facts:

- This projects entails the whole ASP system design, implementation and monitoring during the life of the programme. An international bidding process is envisioned to ensure quality, state of the art technical solutions and cost benefit figures. Regional Knowledge centres that will be considered include, for example: CIAT, CATIE, IICA, among others.
- This project will benefit from on the ground experience gathered by F. Natura as a result of previous projects supported in the context of the FIDECO and debt for nature swaps. Climate change dimension will be an innovation.
- The project will also benefit from existent successful experiences of sustainable cattle raising projects implemented in Costa Rica and Colombia, for example, with GEF funding. At the national level, experiences derived from the GEF Small Grants Programme, supporting small scale ASP schemes will also be considered as reference materials.

Type of measure	CC risk or impact identified	Expected result on the ground	Difference with business as usual water management or agricultural best practices
ASP models recognized as good practice for climate change adaptation in rural LAC region. (Inventory of good practices for climate change adaptation in rural LAC region: options and lessons learned using the	Extensive cattle raising model depleting soil and water resources, exacerbated by water scarcity problems due to severe drought. In depth analysis is included in the CAP.	Increased income generation for programme participants; discouraging traditional "potrero" extensive cattle ranching production system, avoiding advance of agricultural frontier to new areas;	ASP programme designed from a climate change perspective.

livelihood approach. EUROCLIMA Thematic studies ·4. EU, 2014). Also recognized as non-regret EBA measure by international key institutions such as IUCN, CATIE, FAO, CIAT.		increase productivity per hectare dedicated to cattle raising	

1.5 Enhanced sectorial support through climate financing instruments

Accordingly to the UNFCCC, climate finance refers to local, national or transnational financing, which may be drawn from public, private and alternative sources of financing. Climate finance is critical to addressing climate change because large-scale investments are required to significantly reduce emissions, notably in sectors that emit large quantities of greenhouse gases. Climate finance is equally important for adaptation, for which significant financial resources will be similarly required to allow countries to adapt to the adverse effects and reduce the impacts of climate change.

Although Panama´s financial sector is known for its world class services and robustness, it is a fact that the climate change dimension has not been mainstreamed yet into the sectors dynamics. Some initial steps have been taken by local banks regarding credit facilities for “green investments”. The National Bank and local development entities for the agriculture sector have dedicated special credit lines, without a strategic framework. In addition, the impact of these investments has not been quantified. The hypothesis is that these facilities have not reached the small farm owners, who are by definition, more vulnerable to climate change conditions.

To provide an entry point regarding this issue, the Adaptation Programme aims to involve the financial sector into the adaptation efforts, by reaching financial institutions that are traditionally devoted to the agriculture sector and provide a better understanding of climate-related risks and impacts on specific regions, agricultural activities and crops. In addition, the Program will promote research and analysis of the existing sources to support adaptation measures, and the extent that those sources are known and used by local stakeholders. To do this, the Adaptation Programme will focus in the microfinance sector.

Regarding the energy sector, the Program will build upon the opportunities created and experiences derived from the Law 45 of 2004 for the promotion of small generation plants using new, renewable and clean sources (mini hydros) and other similar regulations. The hypothesis is that small farm owners could benefit of existent incentives to develop these projects, but the lack of information to access credit facilities inhibits project development.

a) Review of existing offer of credit products for the agricultural and energy sectors, emphasizing if they include the climate change dimension and recommendations

for its incorporation and/or strengthening, including the opportunities generated from the national, regional and global financial facilities. A technical document will be drafted.

b) Develop 4 business plans (2 for each watershed) to establish and operate mini-hydro energy projects, including the correspondent farm management plan, informative prospectus to access financing sources for climate change adaptation activities, and technical assistance to obtain such financing.

c) The On the supply side, programme will work in socializing the MEBA concept among local microfinance institutions (MFIs), aiming to create an interest/demand for these products and services. assessing the microfinances concept for adaptation based on ecosystems, whose purpose is to give support to the microfinance institutions (MFIs) in the development and implementation of new products and micro financial services focused in the climate change adaptation, including innovations in the risk management associated to these effects To do this, the following activities will take place:

- Development of Microfinance Institutions mapping for both watersheds,
- Informative/instructional meetings on Microfinance for Ecosystem-based Adaptation (MEbA) with Microfinance Institutions, and identification of those interested/willing to participate in the training and technical assistance,
- Recruitment of 2 Microfinance Institutions (one at each watershed) to develop the training and technical assistance in order to preliminary design and offer one finance product.

To conduct this activity, the Adaptation Program will take into consideration the experiences and products developed in the context of the Microfinance for ecosystem based adaptation project (MEBA) project in Perú and Colombia.[27]

COMPONENT 2. ESTABLISH CLIMATE RESILIENT WATER MANAGEMENT INSTRUMENTS WITH INTEGRATED AND COMMUNITY BASED APPROACH

2.1 Analysis for climate change vulnerability in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds.

[27] The Microfinance for Ecosystem-based-Adaptation to Climate Change (MEbA) project initiated its activities in April 2012 implemented by the United Nations Environment Programme – Regional Office for Latin America and the Caribbean and the Frankfurt School of Finance & Management. The project is funded by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany, under the framework of the International Climate Initiative (IKI). The MEbA project was conceived to promote and support the introduction of specific (micro) financial products and services. The main pillars of the projects are (1) the assistance in the development and implementation of new financial products and services tailored to rural populations that are vulnerable to the effects of climate change (e.g. small agricultural producers and other local actors of the North Andean Region); (2) the provision of customized capacity building to Microfinance Institutions (MFIs); and, (3) awareness raising, carrying out training activities which address identified knowledge gaps and meeting MFI client needs to increase climate change resilience with a focus on Ecosystem-based Adaptation via partnerships with key local technical actors. http://www.pnuma.org/meba/

The purpose of conducting a Vulnerability Impact Assessment (VIA) is to assess the impacts of climate change in the selected programme areas. It makes an integrated analysis of ecosystem services demand and supply based on human pressures on natural resources, which is supported by primary information collected in the field through visits, ecosystem services mapping, group interviews and socioeconomic surveys. The conduction of a VIA is a complex process. The idea of this activity is to conduct a robust, but pragmatic process, to provide an entry point for discussing strengths and weaknesses to address climate change challenges including data on sensitivity, impact and vulnerability as well as recommendations for implementing adaptation measures.
For purposes of this study the VIA will be conducted based on the IPCCs framework which evaluates 3 factors: i) The exposure, or degree in which a system is exposed to a weather variation; for example, the temperature increase; ii) The sensibility, or degree in which a system is positively or negatively affected by weather changes, for example, the increase or decrease in space available for crops; iii) The potential impact of climate change; that is, the expected consequences of this process in a system without considering any adaptation action; iv) the adaptive capacity, or the set of available resources of people and communities to face the losses and benefit from the possible opportunities that arise with the climate change. These VIAs to be conducted in the context of this Programme will contain:

- Current tendencies
- Future scenarios
- Possible socio-economic impacts in the watershed
- Set of adaptation measures, duly prioritized

In parallel to boost adaptation action, and based in existent CC knowledge and data, the Programme will implement a series of non-regret adaptation measures, so adaptation activity in the ground will take place while the VIAs are conducted. According to The World Bank no-regret options are "adaptation options (or measures) that would be justified under all plausible future scenarios, including the absence of manmade climate change. These are essentially activities that provide benefits even in the absence of climate change. The idea is that the VIA results also supports the no regrets measures designed by the Programme. No regret adaptation measures included in the Programme such as community based water management are listed in the boxes below.

Even though the no regret approach, it is important to emphasize the fact that the adaptation measures proposed have been identified in initiatives and planning documents of national entities mentioned in the previous sections.

a) Update the Santa María River Watershed (SMRW) Management Plan including the climate change's dimension. For this activity, it will be used as basis, the watershed's current Management Plan and the study on the water source's current vulnerability in light of the climate variability in the Santa Maria River Watershed - prepared in 2004-. The updating process shall include the conduction of a vulnerability analysis to climate change, following the methodology proposed by IPPC as mentioned above.

b) Vulnerability analysis of the Chiriqui Viejo River Watershed (CHVRW) and the validation/adaptation of the climate change adaptation measures included in the Management Plan's Adaptation Program. The methodology indicated previously shall be applied.

2.2 Developed technical criteria for granting water use concessions and permits in order to reduce/avoid conflicts among users and increase ecosystem resilience in response to climate-induced stress

The climate change implicitly entails a change in all the hydrological cycle's components. In this change, in addition to the physical processes that are usually considered when describing the water cycle, the forest cover, the land use and the water extraction for human consumption have a great importance. Given the evapotranspiration's importance in the water balance, the forests play a relevant role as climate change will modify its structure and biological functions, which shall affect the biomasses' production and, therefore, the uptake of water resources. Currently there are techniques for modeling the new conditions that climate change will impose to ecosystems (for example, GOTILWA+ model), which allows to analyze the forests' response regarding the water balance. These works have not taken place in Panama.

a) Assessment of hydrological balance and environmental flows in prioritized areas of the SMRW. For the SMRW, the flows of Gallito's river micro watershed shall be assessed. The importance of this sub-watershed lies in the environmental services' maintenance such as the quality in the water for human consumption and agricultural uses and connectivity with adjacent forests. The selection of this site is based also in the fact that it has a Conservation Plan from September 2015 which defines conservation purposes and strategies. One of the criteria for the plan's drafting was the "awareness on the necessary measures for adaptation and to mitigate climate change effects."

b) Assessment of hydrological balance and environmental flows in prioritized areas of the CHVW. The flows of the R. Caisan's sub watershed shall be assessed. This sub watershed has both an agricultural and hydroelectric generation's use, having been identified as one of the main threats "the infrastructures' development such as possible hydropower projects and the transfer of water from the Caisan River to the hydropower project in the Caña Blanca River, as well as possible roads and real estate projects. Likewise, another threat is the "agrochemical contamination due to agricultural and livestock activities. The selection of this sub watershed is based also in the fact that it has a Conservation Plan from September 2015 which defines conservation purposes and strategies, serving as a validated baseline and entry point.
c) Development of a technical document for decision makers with criteria to consider during the process of granting water concessions for hydropower generation and agriculture production, based on the new climate information and knowledge generated by the Programme .

d) Revision of existing concessions in both watersheds, based on the technical document and recommendations to apply required adaptations to re-establish / improve the hydrological cycle.

2.3 Increased water security in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds, in line with advances of the National Plan for Water Security

2.3a. **District water security plans**. To support the long term feasibility of the infrastructure solutions installed and to ensure coordination and with the national process conducted for the National Plan for Water Security, 2 hydrological security district plans, including weather information, will be drafted (1 for each watershed). These plans shall be drafted with participative methodologies and based on the provisions of existing planning instruments, including, but not limited to, the watershed's Management Plan, local government plans, as well as what it is indicated in the instruments at the national level. The principal criteria to select the districts shall be in function of its adaptive capacity, the vulnerability analysis' results (output 2.1) and serious interest expressed by the local municipal authorities.

2.3.b Based in the water flows and hydrological balances conducted, the information gathered about water concessions and the climate data generated (component 3), the Programme will strengthen national policy of the Agriculture Sector conducted by the Min of Agriculture (MIDA), by elaborating a **new national map for agriculture and livestock production in the country, based on climate and water management data**, including biodiversity, forest coverage, demography and other socio economic drivers.

This product will allow that for the first time, economic transformative processes such as switching to drought tolerant crops, relocation of production areas/efforts, will be suggested, based on climate analysis.

COMPONENT 3. STRENGTHENED LOCAL NATIONAL CAPACITY FOR MONITORING AND DECISION MAKING TO REDUCE AND RESPOND TO RISKS ASSOCIATED TO CLIMATE CHANGE

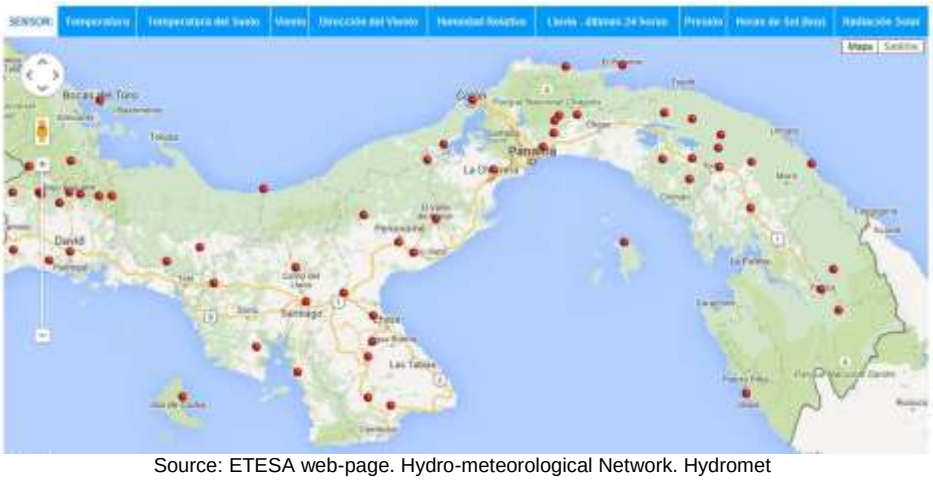
According to World Bank data in the climate change knowledge portal, in Panama at the local levels, early warning systems, weather forecast technology and more modern communication systems are needed, especially for long-term forecasting. In addition, skills in using software programs for modeling climate will need to be developed. Training and awareness-raising on climate change threats and climate-resilient development will be necessary to better equip those whose livelihoods depend on climate-sensitive sectors. ETESA is the national entity responsible for establishing and operating national-level meteorological and hydrological infrastructure to provide information, predict weather patterns, issue advisories, and provide climate related services in the country. The amount and distribution of meteorological stations managed by ETESA could be

improved. Such stations currently provide uneven patches of density in the data, with an average coverage of 312 km^2 per station, in comparison with the recommend standards of the OMM of 20 km^2.

Hydrometeorological Stations (Total = 215)			
Meteorological		**Hydrological**	
Type A	5	Limnigraphical	34
Type B	20	Limnigraphical	0
Type A Automatic	21	Automatic	22
Type A Satellite Automatic	13	Satellite Automatic	8
Rain Cans	3		
Rain Gauges	67		
Automatic Rain Gauges	22		
Total	**151**	**Total**	**64**
Conventionals	95 (63%)	Conventionals	34 (53%)
Automatic	56 (37%)	Automatic	30 (47%)

Source: ETESA web-page. Hydro-meteorological Network. Hydromet

Meteorological Satellite stations



Source: ETESA web-page. Hydro-meteorological Network. Hydromet

The need for this activity is also highlighted in the PNGIRH 2010-2030 as follows: “Strategy 5.1.2: develop systems for timely, reliable and accessible information that favor a stronger capacity for negotiation and consultation among the various stakeholders”.

One of the main technical problems encountered is the lack of a culture of documentation, recording and provision of information, both meteorological and social, which could relate to climatic aspects. A system of indicators to evaluate economically relevant resources in Panama, such as coastal and marine resources, agriculture, biodiversity, water resources and energy, should be applied at the national scale with a databank that spans several decades as a vital part in order to orient decision-making on integrated resource management.

This component focuses on strengthening the existing hydro-meteorological network and enhancing key climatic information products to support planning and inform adaptive measures at local level and regional level, for mitigating the impacts of climate change and climate variability induced risks particularly in critical areas, such as of the Arco Seco portion of the SMRW. The overall objective of this component is to improve the gathering, monitoring and processing and dissemination of climatic data, improving the climate information baseline to support informed adaptive and risk reduction measures for climate risks affecting vulnerable communities.

To advance in these objectives the following activities will be developed.

Expected concrete outputs:

3.1 Designed and in operation the National System for Climate Data (NSCD), by upgrading ETESA´s existing network for recording climatic information from hydrographic watersheds. [28]

Activities include:

- Complete modernization of existent conventional stations with new automated equipment. Strengthening existent stations network and installation of new stations nearby, to complement/enhance observations of existing stations. Based on ETESA´s analysis and planning, the Programme will support the installation and implementation of TYPE A automatic weather stations; i.e, weather stations that meet the quality standards for robust observation and measure at least 7 parameters (rainfall, wind, relative humidity, air temperature, day length, barometric pressure and solar radiation). It is essential to have these observations in real time, meaning that the observations are transmitted in a very short time interval via satellite; allowing monitoring program activities to be remotely monitored in a timely basis. To date, the Department of Hydrometeorology of ETESA has successfully completed the acquisition of 30 Type A automatic weather stations for satellite transmission, based on competitive bidding process. The Adaptation programme will support the preparation and acquisition of a new suite of hydro meteorological stations to increase climate data collection and analysis at the national scale, including the Program intervention areas. [29] The network will encompass automated stations; automated hydrological stations, automated climatological stations and automated precipitation stations with satellite transmission. The final sites for installation of the stations will be jointly defined among ETESA, Min. of Environment, MIDA and other relevant entities.

Technical specifications of the stations provided by ETESA (translation to English in progress):

Especificaciones Técnicas	
1.	La instalación de las estructuras en las estaciones meteorológicas, deben incluir cerca perimetral con puerta de metal y candado para el acceso.
2.	La instalación de la caja de metal que alberga el sistema electrónico y el transmisor debe ser en un mástil fijo, contiguo a la torre.
3.	Se instalará la antena de transmisión, paneles solares y otros equipos como pluviómetros en las estructuras adecuadas, de manera que se pueda brindar soporte y seguridad a los mismos.

[28] These activities and a full description of the equipment architecture, needs and system functionalities will be validated with ETESA, previous to the submission of the full proposal document.

[29] Based on information provided by ETESA technical staff to the Ministry of Environment, in the context of the proposal development works. Institutional email communication. January 2016.

4.	Instalación de tuberías de metal y/o PVC que protegerán el cableado de los sensores instalados.
5.	El proponente deberá ser totalmente responsable de transporte a las estaciones indicadas, utilizando sus propios medio (bote, motor, combustible, tripulación) e igualmente deberá brindar el transporte al personal de ETESA asignado a la supervisión de los trabajos en esta misión. Para lo cual, para garantizar la seguridad de los colaboradores de ETESA, deberá presentar para consideración de ETESA, el plan de viaje propuesto especificando el tipo de transporte y sus operadores.
6.	El proponente deberá suministrar y transportar todos los materiales de construcción que sean requeridos para la instalación de los equipos en los lugares indicados.
7.	El proponente deberá cumplir con la entrega de un informe final de la instalación y la puesta en operación de cada una de las estaciones, dicho informe debe incluir datos, fotos, mapas y diagramas referentes al trabajo realizado.
8.	Torre para los sensores, caja metálica y demás accesorios necesarios: a) Todos los componentes, incluido el registrador de datos, las interfaces de sensores, el transmisor de telemetría, la batería y su regulador, se instalarán en el interior de la caja sellada resistente a la intemperie y protegida contra la lluvia. b) Todas las conexiones eléctricas para esta caja protectora se realizarán a través de conectores impermeables, que cumplan con el grado de protección IP64 como mínimo. c) La caja de equipos debe contener contacto de puesta a tierra seguro en su parte Inferior, que sirva de punto de conexión común con una varilla de acero bañada en cobre, de 6 pies de largo y 5/8 pulgadas de diámetro. d) Las uniones de los tramos de la torre se deben ajustar una dentro de la otra y deben estar aseguradas con pernos. e) Los accesorios metálicos para la torre (pernos, tuercas, abrazaderas, etc.) deben ser de acero inoxidable. f) La torre debe tener instalado un sistema de protección contra descargas eléctricas, la misma que comprenderá de un pararrayos, cable de bajada aislado del mástil y una varilla a tierra de 5/8 de pulgadas por 6 pies de largo, unida a la de la caja. g) Para el soporte de la caja de metal de los equipos se debe incluir un poste o tubo de acero galvanizado de 4" de diámetro y de 2.0 metros de largo con una platina de ½" soldada en el extremo superior con 2 pies de largo formando una "T", en el extremo inferior deben estar soldadas al menos 3 varillas de hierro de 1.5 pies dispuestas de tal forma que sirvan de anclaje. h) Para el soporte de pluviómetro se debe incluir un poste o tubo de acero galvanizado de 3" de diámetro y de 1.5 metros de largo y en el extremo

	inferior deben estar soldadas al menos 2 varillas de hierro de 1.0 pies dispuestas de tal forma que sirvan de anclaje. i) Los cables utilizados para las conexiones al sistema deben ser resistentes a los rayos UV. j) Todos los soportes y accesorios metálicos extras necesarios para la estación automática deben ser fabricados de materiales resistentes a la corrosión, incluyendo, pero no limitados al acero inoxidable, aluminio anodizado o fierro de galvanización profunda.
9.	Cerca perimetral metálica: a. Debe cubrir un área aproximada de 25 metros cuadrados como mínimo, manteniendo dentro de este perímetro las bases de los anclajes para los vientos tensores de la torre. b. Debe ser de tubos redondos galvanizados de 1" de diámetro, calibre #40. c. Debe tener malla de ciclón, calibre 11, de 5 pies de altura. d. La malla de ciclón debe estar anclada al suelo con concreto. e. Debe tener serpentina de seguridad (alambre de trinchera) de 10 o 12 pulgadas de diámetro en la parte superior, en todo su alrededor. f. Debe contar con una puerta de acceso de tubos con alambre de ciclón, con cadena y candado de seguridad.

Important facts:

1. This component, which is intensive in terms of the amount of resource allocated within the programme (US$2 million dollars), will benefit from previous recent bidding and public purchasing processes conducted by ETESA, particularly the Contract No. GG-172-2015 for the acquisition of automatized meteorological stations with transmission by GOES", dated December 4, 2015, as stated in copy of the contract provided by ETESA.

2. In addition to the stations purchase and installation, this component implies the assessment of existent capacities in ETESA-Hidromet and MIDA, to manage the upgraded network to generate, analyse and disseminate climate data to the different users across the nation. The "creation" of a demand for this data and climatic services is part of the logic of this component. This knowledge process is in the core of this component.

3. Establishment of "climate nodes" in the Ministry of Agriculture (MIDA) to interact with ETESA network is a new application that will be enabled by the Programme and its capacity building activities.

The upgraded national network with the new satellite meteorological stations with agro meteorological sensors, that will be installed by the Adaptation Programme is shown in the image below.

Other activities to enable network operation includes: Implementation of real-time communication in existing automated stations. ETESA technicians will calibrate all of the equipment/sensors onsite and will run tests to ensure that all the equipment is working (capturing and transmitting data) properly; acquisition of replacement parts as needed for sound system operation. Development of a system for data compilation, quality control and information accessibility, including climate services based on information generated by the network."

3.2 Established an early warning system to identify in advance, the necessary measures in case of hydro-climatic events that could affect food production and power generation

Early warning systems (EWS) for disaster risk reduction. According to the Inventory and Characterization of the Early Warning Systems in Panama of February 2012, there are 18 operating EWSs in the Republic of Panama. Of these, 8 are in the Province of Panama, 2 in Veraguas, 2 in Bocas del Toro, 3 in Darien, 1 in Colon and 3 in Chiriquí, including the Chiriquí Viejo River's watershed (CHVRW) since 2008 (flooding EWSs).

a) The following activities will be implemented in the CHVRW to address the weaknesses identified by the CHVRW's EWS from the aforementioned inventory:
   - Installation of the sound system for warning in the communities.

- Complete the signposts along the communities at risk areas.

b) For years, through multiple planning processes has been noted the need for monitoring and forecasting systems to address the effects of drought; by monitoring climate indicators, to predict the likelihood of occurrence of droughts and develop preventive actions. Among the priority projects (as stated in the National Action Program to Combat Desertification and Drought on Panama, ANAM 2004), it was identified the establishment of a characterization and pluviometric monitoring system for critical areas susceptible to desertification and drought (among which is the Santa Maria River watershed). According to the Santa Maria River Watershed Plan, the areas most affected by drought are located in the middle and lower parts –which are also susceptible to floods. Both areas –the middle and lower parts of the watershed- are vulnerable to flooding and drought, specifically in the same course of the Santa Maria River and the Cañazas, Cocobó, Escotá, Conaca rivers (all tributaries of the Santa Maria River). Among the most affected communities are those within the districts of Santa María and Parita. Therefore, it is proposed to establish an early warning system, combined for drought and flooding, at the above described area (Santa Maria River and tributaries Cañazas, Cocobó, Escotá, Conaca).

   According to the abovementioned inventory, there are not EWSs in the SMRW. This activity consists in the design and implementation of EWSs for the watershed. Unlike the CHVRW's EWS, EWSs at the SMRW will combine both drought and flood dimensions. This EWS approach is innovative, since there are no prior experiences in Panamá for drought EWS, although there are some at Central America. The location of the EWSs will be based in the VIAs results; preliminary critical locations identified during the consultation process for the full proposal presentation and considering areas of particular vulnerability identified by MIDA (Districts of Cañazas, Calobre, San Francisco and Parita).

The EWS installation includes all phases for its design, start-up and monitoring, as shown in the following chart.

Figure 6. Elements of a EWS: chronological order and technical-political links

Source: The Regional Report on the vulnerability and disasters' risk condition in Central America.

This output includes workshops and simulations to train technical staff and communities on the early warning system.

3.3 The NSCD interfaced and equipped with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information

The purpose of this activity is to make visible and increase the utilitarian value of the hydro meteorological network for agricultural research, planning and enhanced food production. For this purpose, a specific interface with MIDA will be developed to guarantee that specific equipment and climate relevant skills are in place to support the agriculture sector. Climate data for climate smart agriculture is the basis of this activity. This encompasses the design and installation of the ETESA-MIDA interface.

3.4 Designed a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program and national efforts*

Adaptation interventions have now become an integral part of plans and policies to deal with changing climate, but they are often also integrated into general development efforts. However, little evidence exists as yet on the success of these measures in reaching their intended objectives, and/or contributing to development, and/or mitigation efforts. One important step in making adaptation count is to design appropriate monitoring and evaluating mechanisms for adaptation investments that can contribute to evidence-based decision-making in the future. Whether an adaptation measure has produced desirable results or not, or if, the measure is in progress, whether it is on a desirable path or not are issues that can be tackled by M&E processes. In contrast to mitigation investments, each adaptation investment is unique, not easily replicable, often bottom-up, very site- . While the secondary and tertiary benefits of adaptation may cut across various sectors, the design, implementation and immediate benefits are specific to a location.[30]

Although several adaptation projects have been initiated in Panama, there is not a systematic and formal methodology or tool to assess the impact of such efforts. The purpose of this activity is to provide a M&E framework for the adaptation initiatives conducted in the country at a national/local scale, emphasizing, but not restricted, to the components and activities of the proposed Adaptation Programme.

The following aspects will orient the design and implementation of the system[31]:

[30] Good practice in designing and implementing national monitoring systems for adaptation to climate change". CATIE-CTCN. 2015

[31] Based in the lessons learned identified in the document: "Good practice in designing and implementing national monitoring systems for adaptation to climate change". CATIE-CTCN. 2015

- Indicators: To choose an appropriate set of indicators which focuses on the key issues and information needed for decision making. For this purpose, the indicators will reflect the local context, the processes that will be monitored and the progress of these processes. To define the set of indicators will be defined based on factors that define climate change vulnerability (exposure, impacts, sensitivity) as a guide, for this purpose it is necessary to demonstrate that the prioritization of adaptation actions is actually focusing on a useful priority.
- Integrating the indicator system into existing development structures and procedures, by adding adaptation issues. Interactions will be explored with existing health and hydro meteorological monitoring systems.
- Define how the monitoring and evaluation reports will be included systematically in decision making spaces defining mandates and reporting channels with established authorities.
- Considering that adaptation is a complex process over the long term, one about which we still know very little, the approach for setting up the indicator system will be flexible and pragmatic in terms of goals setting, defining processes, selecting indicators and finding adequate data.
- A participatory approach to involve a wide range of relevant stakeholders during the design and implementation stages of the indicator system.

The M&E protocol shall be particularly sensitive to measure and evidence impact/effects on mitigation and social co-benefits of the adaptation measures, including gender considerations and impacts in other sectors, such as health and poverty and potential mitigation co-benefits.

COMPONENT 4. RISING AWARENESS AND ESTABLISH AN ADAPTATION KNOWLEDGE EXCHANGE PLATFORM TO RESPOND TO AND TO MITIGATE IMPACTS OF CLIMATE CHANGE RELATED EVENTS

National Knowledge Platform for Climate Change Adaptation. Capacity to make use of climatic information is limited in terms of both national coverage and in the use and translation of meteorological data into useful climatic information, making it less valuable for decision making. In all of the socioeconomic sectors, there is recognition that having competent agencies for the provision of climatic information (official data, information and forecasts) represents an advantage at the moment of formulating monitoring systems such as early alert.[32]

As stated in the Second National Communication to the UNFCCC, specifically, to strengthen institutional and individual capacities for better understanding of climate change and its effects, emphasis should be on:

- Knowledge and prediction of climate changes at the national, local and district levels
- Quantification of climate change impacts at the national, local and district levels

[32] Second National Communication to the United Nations Framework Convention on Climate Change Executive Summary

- Identify ways to eliminate obstacles that hamper the adoption of adaptation technologies and measures in the different national socioeconomic sectors
- Qualitative and quantitative estimation of the costs of adaptation and of not adapting
- Quantification of the costs of planned, unplanned and unforeseen mitigation measures

Efforts in this component will consider the guidelines and recommendations of the Nairobi Work Programme, particularly those derived from the Latin-American Knowledge Adaptation Initiative, particularly in terms of the methodology to define knowledge adaptation gaps and hands-on recommendations to fill those gaps.

The main guidelines are in the core of this knowledge component:

- All projects described in the components below will include the generation of "knowledge products" derived from the implementation. This means that TORs for every on the ground project, will explicitly include knowledge products as deliverables, such as working documents; policy briefs; technical guidelines/recommendations; info-graphics, audio visual aids, others, that will constantly feed the adaptation platform.

- A knowledge management process and responsible person will be dedicated to ensure this knowledge production, dissemination and exchange across the whole program. This task will also be highlighted in the Program Coordinator TORs.

This knowledge management function will be responsible of ensuring that the different participative events of the Programme, include the use of the materials generated by the Programme. This is particulary important regarding knowledge exchange with local stakeholders that don`t have access to online resources.

4.1 Improved awareness of watersheds vulnerability and participation of population groups in adaptation measures

This output aims to create a shared understanding of the climate change adaptation dimension and the logic of intervention of the program based in the nexus approach. To do this 3 specific activities will be conducted:

a) Technical working sessions with key implementing partners and project staff to define WorkPlan, coordination arrangements and kick off meetings/requirements. These activity also includes the development and facilitation of training sessions with key project staff and partners about the nexus approach to water–energy–food security as an option for adaptation to climate change.

b) Inception workshops with local and national stakeholders to present the approved programme; revisit programme rationale, scope, define shared visions and operational arrangements for programme implementation. At least 2 local workshops, one for each watershed with local stakeholders. One national workshop with government and civil

society stakeholders to present the Programme, identify sinergies with other ongoing adaptation efforts/initiatives and define operational and coordination aspects.

c) Socialize the SMRW and the CHVW vulnerability analysis to facilitate the implementation of identified adaptation measures. If vulnerability analysis are not sufficiently disseminated within the communities and water users, they will not accomplish the purpose of serving as a tool to improve adaptive capacity. To this end, specific activities will be conducted to ensure devolution of information to the communities and stakeholders who participated in the process.

- Socialize the SMRW vulnerability analysis to facilitate the implementation of the identified adaptation measures. This socialization shall take place through workshops and conferences during the drafting process on the different aspects of the climate change adaptation process. At the end of the process, there shall be 3 sessions to present the results. For the plan's drafting there shall be a participative and informative methodology, therefore during the long process, informative activities shall take place (conferences and workshops). The purpose of this combined methodology is that, at the end of the process, in addition to having the vulnerability analysis technical document, progress has been made in the population's awareness on climate change's impacts, in particular on the water cycle, and the possibilities and measures to deal with it.

- Socialize the CHVRW's vulnerability analysis to facilitate implementation of measures identified in the Management Plan.

4.2 Strengthened professional capacities for the climate data analysis and processing, for different sectors involved

For this purpose, the following activities will take place:

a) a) Training on climate modeling course with special emphasis in future scenarios that impact the food and energy generation activities (at least 40 participants). The target audience for this training is technical staff from both government and non-government institutions, including but not restricted to regional technical staff at the CHVRW and SMRW. An important note is that the modelling tools that will be used for the training courses to the extent possible will be based in open sourced platforms, so that the participants will have no further impediments to apply the acquired knowledge and skills.
b) International training: Climate change adaptation: Role of the Eco-Systemic Services (40 participants nationwide, including key actors of the 2 priority watersheds CHVRW and SMRW). Together with CATIE. Arrangements will be made with course providers to include training on identification and valuation of eco-systemic services of water supply, focusing on hydrological modeling tools to determine hydrological profits. One of these tools is the one developed by the

Natural Capital Project known as INVEST, which is "a suite of free, open-source software models used to map and value the goods and services from nature that sustain and fulfill human life. InVEST models are based on production functions that define how changes in an ecosystem's structure and function are likely to affect the flows and values of ecosystem services across a land- or a seascape. The models account for both service supply (e.g., living habitats as buffers for storm waves) and the location and activities of people who benefit from services (e.g., location of people and infrastructure potentially affected by coastal storms).[33]

4.3 Strengthened professional capacities on water resources management by incorporating climate change adaptation approach

This activity is linked to the hydrological balances and environmental flows analysis. The target audience for this training is technical staff from both government and non-government institutions, including but not restricted to regional technical staff at the CHVRW and SMRW. Training will include open source, spatially-explicit and modular tools and methodologies. The following formal training activities will be replicated in Panama:

a) International training on participative integrated watershed management. Ministry of Environment -CATHALAC[34] (40 participants nationwide, including key actors of the 2 priority watersheds CHVRW and SMRW). Together with the Ministry of Environment and CATHALAC
b) International training on adaptation based on ecosystems in marine coastal zones (20 participants). Together with CREHO[35].

Full and partial scholarships to participate in the courses will be offered. For choosing course participants, a selection process will take place at the national level through an open platform. The selection process will consider professional background, the working sector, the potential for replicating gained knowledge, among others.

[33] Invest is an ecosystem services modelling tool developed by the Natural Capital Project, operated as a partnership between Stanford University and the University of Minnesota, The Nature Conservancy, and the World Wildlife Fund
[34] Water Center for the Humid Tropics of Latin America and The Caribbean (CATHALAC).
[35] Ramsar Regional Center for Training and Research on Wetlands (CREHO).

Important facts:

1. An interphase with the Technological University of Panama (UTP) will be designed and implemented to ensure that knowledge derived from this suite of specialized courses contributes / feed the curricula that the University is developing to mainstream climate change as a cross cutting topic in the graduate and post graduate curricula.
2. This interphase might include provision of funding to support specific research studies related to the different projects included in the Programme. This is particularly relevant regarding the agroforestry and agrosilvopastoral projects included in Outputs 1.2 and 1.4, for the development of methodological tools to enable mid and long term monitoring of the adaptation effects, as well as to advance towards preliminary research on carbon sequestration potential of the proposed activities.
3. Through this interphase, the Programme aims to guarantee long-term learning impact, which sometimes is a weakness of the specialized courses model, because of institutional staff rotation, lack of equipment (hardware and software) and other similar institutional gaps.

Con formato: Fuente: Negrita
Con formato: Centrado
Con formato: Fuente: Negrita

4.4 Systematized and disseminated experiences on climate changes adaptation, nationwide

a) Systematization process of current and planned adaptation action in Panama, including but not restricted to this Adaptation Programme. A mapping exercise and analysis of projects / initiatives undertaken will be made. A technical and practical document that will be available in print and digital format will be developed.
b) A suite of 10 workshops will be held at national level (1 per province) to present the document. These workshops will be organized jointly with universities.

4.5 Portal for Climate Change Adaptation in Panama, implemented - Adaptation knowledge management and communication strategy

The purpose is to enable adaptation knowledge popularization at all levels. To do this, the Programme includes the following activities:

4.5.a Communication strategy and systematization of experiences from the program. The design and implementation of this strategy is a key action to secure national and local appropriation of the programme activities and results; to enable effective and permanent public participation and transparency. This communication strategy will identify actions at different levels, including participatory activities, media and social media platforms; interaction with other ongoing adaptation efforts and continuous feedback from direct and indirect programme beneficiaries and stakeholders.

4.5.b Design and operation of the Portal for Climate Change Adaptation in Panama. This portal will serve as a gateway to the progress on adaptation to climate change in the country. It will also provide information and guidance on adaptive processes globally, so that existing online resources about adapting to climate change can be effectively used. The portal will keep a log with the proposed program progress on climate change adaptation, and it will serve as an interactive channel with direct project beneficiaries and the general public. Activities include: Design of portal structure and contents; Portal continuous update and maintenance.

4.5.c Compilation and synthesis of materials for different audiences -farmers, institutions, academia, etc.- on adaptation to climate change (as part of the "knowledge products" generation process).

4.5.d Training on the use of the portal for different audiences, including the access and use of climate data by vulnerable communities with limited access to online resources

4.5.e Establishment of an advisory technical committee within the Climate Change National Committee to orient the program´s knowledge management process.

4.5.f Experience exchanges activities at the local level, including at least one international "pasantía" (guided visit):

i. For capacity building on agroforestry, sustainable cattle ranching, and irrigation systems in operation (international); to be carried out at mid-term of proposed projects implementation.

ii. For capacity building on the EWS (international).

iii. For farmer-to-farmer exchanges at SMRW and ChVRW.

The identification and selection of the "pasantías" will be done considering suggestions from the stakeholders (experts and beneficiaries) participating in the projects, as well as recommendations from F. Natura based on technical research, to ensure quality pertinence, relevance and cost benefit figures.

Affirmative actions will be undertaken across the activities of this component to promote participation of women implementing a gender perspective, as well as actions to incentive the participation of young people.

A1. PROGRAMME`S CONTRIBUTION TO THE OVERALL INCREASE IN RESILIENCE, IN COMPARISON TO STANDALONE INDIVIDUAL PROJECTS.

Four aspects have been identified as means of the proposed Adaptation Programme to promote increase in resilience in a more effective way in comparison with standalone individual projects:

a) The use of the nexus approach is the main programme strategy, rather than applying the traditional sectorial approach, which is usually the basis for standalone individual projects. The reasoning behind the project is that adaptation is a complex process which can`t be pursued successfully from a sectorial perspective. Using the Nexus approach will help us to better understand the complex and dynamic interrelationships between water, energy and food in Panama, exacerbated by unknown climate change conditions, so that we can use and manage our limited resources sustainably. The idea is that the programme will force us to think of the impacts a decision in one sector can have not only on that sector, but on others. By promoting synergies among the different programme components, we can then design, appraise and prioritise response options that are viable across different sectors. For example, the EWS (output 3.2) is a response option viable for the 3 sectors involved in the project. It is expected to provide room for interactions and a stakeholder dialogue among farmers, the hydrological network managed by ETESA (energy sector), the institutions responsible for water issues analysis and the entity responsible for disaster risk management (SINAPROC). Currently in Panama, the advances in design and implementation of EWS has been carried as single projects, mainly conducted by SINAPROC, without further involvement of other users and stakeholders.

b) Another mean to promote increase in resilience derived from the nexus approach is that the programme has been conceived in a way that it pretends to include actions in 3 working areas: i) evidence (promoting the generation of reliable climate data-component 3) and implementation of on the ground adaptation measures (outputs 1.2-1.4); ii) scenario development (strengthening modelling skills through specialized training, output 4.1) and iii) response options (for ex. Development of EWS, output 3.2).

c) Another difference with traditional standalone projects is that the programme presents a combination of on the ground adaptation activities and actions to inform/influence decision making processes in the 3 sectors involved (i.e: elaboration of a new zoning map for agriculture and livestock production; technical documents with recommendations to improve the water concession process and to restore the hydrological cycle in highly intervened watersheds; technical document to promote microfinance sector engagement with adaptation efforts; a M&E protocol to track adaptation results at different scales). Standalone projects that do not apply an integrated approach often focuses either on implementation (evidence generation, for ex. through pilot projects) or policy processes fostering technical or policy dialogue without on the ground specific activities).

d) Finally, programme components have been designed in a way that components are independent, but connected, since results of one component serve as inputs for other component outputs. For ex., technical data resulting from 2.1 will serve as input for 1.1-1.5; 2.3 directly linked to 1.1

A2. CLIMATE CHANGE SPECIFIC ORIENTATION OF THE PROPOSED PROGAMME, AS OPPOSED TO BUSINESS AS USUAL (BAU) WATER MANAGEMENT PROJECTS AND AGRICULTURE BEST PRACTICES.

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
1. Increase climate change and variability adaptation capacity in agriculture, livestock, and energy production sectors						
Output 1.1	Concrete adaptation measures implemented for household water security	a) Install at least 50 water harvest systems, 25 in each of the watersheds (SMRW and CHVRW). Train beneficiaries on the installation, use, and maintenance of water harvest systems.	Water harvesting systems widely accepted in climate change literature as adaptation measure	altered seasonal patterns of precipitation and run-of; unsustainable water consumption; severe water scarcity situation for human consumption and production	Improved water access for households (using quantity and quality indicators). Increased water supplies to meet demand	Linkage with participation in VIA analysis, water sources conservation projects and restoration of hydrological cycle in prioritized areas The project will promote reflection among participants regarding new storage and conveyance of water
Output 1.2	Pilot climate-smart farming projects implemented	a) Implement the strategic action of establishing reforestation (for protection of watercourse) and agroforestry - soil conservation systems, at 10 farms along 6000 lineal meters of streams of the Caisan river (CHVRW). This activity includes identification of farms according to results from the Vulnerability Analysis, Farm Management Plan (with identification of species, crops/area zoning, costs); and the design and establishment of gallery forest, as well as the agroforestry systems.	Riparian buffers listed as green infrastructure solution and ecosystem based adaptation measure for water management. (Green infrastructure guide for water management. UNEP-IUCN-The Nature conservancy. 2014)	altered seasonal patterns of precipitation and run-of	Erosion and flood control; water purification and biological control; biodiversity benefits; aesthetic and recreation values to communities engaged in the project; contribution to stabilization of stream flow and water temperature.	EBA approach is not explicitly included in agriculture best practices projects currently conducted in both watersheds
		b) Establish irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. This includes: irrigation needs diagnostic; installation of pilot low cost irrigation system; technical assistance to farmers and companies for the implementation of the irrigation system; and monitoring and evaluation. It also includes -at Divalá-, a complement to the irrigation system consisting of an analysis of the water footprint for rice	Agriculture best practice. Climate change additionality linked to the use of climate data for system design and system development in the context of a wider adaptation programme	altered seasonal patterns of precipitation and run-of	Water management and water productivity increased, based in Water Footprint Methodology and indicators	Current irrigation systems do not incorporate climate data into design and implementation phases. This will be ensured by observing technical standards that include climate change considerations taken from climate smart irrigation projects in LAC; conducting training workshops for sustainable water use

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
		crops, which will allow identification of technological schemes for climate-smart rice production.				accordingly to the crop needs, crop stage and production calendar. In the context of this output activities, the Programme will generate discussion about the possibility of switching from use of freshwater to wastewater in order to increase availability of water for energy and agriculture.
Output 1.3	Pilot diversified financing and income source models implemented in vulnerable population areas	a) Implement the strategic action of creating capacities for operating orchid and “naranjilla” crops, as well as establishing the correspondent commercialization scheme at CRSM. It includes training on establishment and management of orchid and “naranjilla” crops; design of business plans; development/improvement of seedling nurseries; advice and technical assistance for commercialization.	Market based approach to sustainable development and sustainable consumption and production. Climate change additionality depends on targeting vulnerable producers to climate and non-climate risks.	Extensive cattle raising model depleting soil and water resources, exacerbated by water scarcity problems due to severe drought. In depth analysis is included in the CAP.	Increased income generation for programme participants; discouraging traditional "potrero" extensive cattle ranching production system, avoiding advance of agricultural frontier to new areas;	Use of climate data to define production system, calendar and commercialization strategy.
Output 1.4	Concrete adaptation measures implemented for sustainable cattle ranching	a) Sustainable cattle ranching project implemented at SMRW, covering cover 800 has.	ASP models recognized as good practice for climate change adaptation in rural LAC region. (Inventory of good practices for climate change adaptation in rural LAC region: options and lessons learned using the livelihood approach. EUROCLIMA Thematic studies ·4. EU, 2014). Also recognized as non-regret EBA measure by international key institutions	Extensive cattle raising model depleting soil and water resources, exacerbated by water scarcity problems due to severe drought. In depth analysis is included in the CAP.	Increased income generation for programme participants; discouraging traditional "potrero" extensive cattle ranching production system, avoiding advance of agricultural frontier to new areas; increase productivity per hectare dedicated to cattle raising	ASP programme designed from a climate change perspective.

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
			such as IUCN, CATIE, FAO, CIAT.			
Output 1.5	Enhanced sectorial support through climate financing instruments	a) Review current credit products offered to agriculture and energy sectors.	Enabling condition to promote adaptation, by facilitating access to climate finance options	Lack of access to climate finance options to implement adaptation initiatives	Understanding of barriers in the finance sector to effectively support adaptation efforts	
		b) Develop 4 business plans (2 for each watershed) to establish and operate mini-hydro energy projects, including the correspondent farm management plan, informative prospectus to access financing sources for climate change adaptation activities, and technical assistance offered to obtain such financing.	Enabling condition to promote adaptation, by facilitating access to climate finance options	Lack of access to climate finance options to implement adaptation initiatives	Generate evidence, "making the case" to support the hypothesis that financial risk to support adaptation initiatives could be appropriately quantified and managed.	Innovative approach. Climate finance options currently available at the corporative level, not oriented to support individual projects at the farm level.
		c) Socialize the concept of Microfinance, based on ecosystems and climate change adaptation. It includes: Development of Microfinance Institutions mapping for both watersheds; Informative/instructional meetings on Microfinance for Ecosystem-based Adaptation (MEbA) with Microfinance Institutions, and identification of those interested/willing to participate in the training and technical assistance, - Selection of 2 Microfinance Institutions (one at each watershed) to develop the training and technical assistance in order to design and offer one finance product. * To complete this activity, the program	Enabling condition to promote adaptation, by facilitating access to climate finance options	Lack of access to climate finance options to implement adaptation initiatives	Promote interest in local microfinance institutions for incorporating climate change adaptation into their portfolio of finance options	Innovative approach for the microfinance sector in the country

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
		will take into consideration the experiences and products developed in the context of the MEbA project at Perú and Colombia.				
2. Establish climate resilient water management instruments with integrated and community based approach						
Output 2.1	Analysis for climate change vulnerability done in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds.	a) Update SMRW Management Plan, incorporating the climate change dimension. It must include the analysis of current tendencies, future scenarios, potential socioeconomic impacts on the watershed, and duly prioritized adaptation measures.	VIAs considered a key step for science driven adaptation processes in the context of the UNFCCC	General	Management plan updated with climate change data and clear understanding of future scenarios of drought for the region.	Innovative approach. Few Climate Change VIAs conducted in Panama
		b) Analyze vulnerability of the CHVRW, and validate/adjust climate change adaptation measures identified by the Adaptation Program outlined in the watershed Management Plan.	VIAs considered a key step for science driven adaptation processes in the context of the UNFCCC	General	Validation of prioritized adaptation measures	Innovative approach. Few Climate Change VIAs conducted in Panama
Output 2.2	Developed technical criteria for granting water use concessions and permits in order to reduce/avoid conflicts among users and increase ecosystem resilience in response to climate-induced stress	a) Identify the hydrological balance and environmental flow for the SMRW, specifically at the Gallito river micro watershed.	Generating on the ground evidence of the water-energy-food-climate change nexus	altered seasonal patterns of precipitation and run-of	Improved level of participation and stakeholders dialogue	Science-policy Interface. Technical information available to inform the dialogue, available for all participants in an equal access basis
		b) Identify the hydrological balance and environmental flow of the CHVRW, specifically at the Caisán river micro watershed.	Generating on the ground evidence of the water-energy-food-climate change nexus	altered seasonal patterns of precipitation and run-of	Improved level of participation and stakeholders dialogue	Science-policy Interface. Technical information available to inform the dialogue, available for all participants in an equal access basis
		c) Develop a technical document with criteria to consider during the process of granting water use permits for agriculture and power generation -based on information and findings from the environmental flows analysis.	Generating on the ground evidence of the water-energy-food-climate change nexus	altered seasonal patterns of precipitation and run-of	Ministry of Environment using climate data to justify approval or rejection of water concessions	Science-policy Interface. Technical information available to inform the dialogue, available for all participants in an equal access basis

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
		d) Review current concessions on both watersheds, based on the technical document, in order to determine recommendations for improving or restoring the water cycle.	Generating on the ground evidence of the water-energy-food-climate change nexus	altered seasonal patterns of precipitation and run-of	Ministry of Environment using climate data to justify approval or rejection of water concessions	Science-policy Interface. Technical information available to inform the dialogue, available for all participants in an equal access basis
Output 2.3	Increased hydrological security in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds, in line with advances of the National Plan for Water Security	a) Design 2 district plans for water security, incorporating climate information (1 at each watershed, SMRW and CHVRW).	Mainstreaming adaptation into sectorial and development planning	altered seasonal patterns of precipitation and run-of	Municipalities actively engaged in adaptation action	Adaptation action traditionally reserved for public and private environmental institutions
		b) Complement current technical analysis to elaborate a new national map for agriculture and livestock production in the country, based on climate and water management data generated by the program. For the first time, solutions oriented to switching to drought tolerant crops will be discussed based in climate analysis.	Mainstreaming adaptation into sectorial and development planning	altered seasonal patterns of precipitation and run-of	Ministry of Agriculture long term strategic planning informed by the new climate information. New map officially adopted as planning tool.	Innovative approach.
3. Strengthened local-national capacity for monitoring and decision making to reduce and respond to risks associated with climate change						
Output 3.1	Designed and in operation the National System for Climate Data (NSCD), by upgrading ETESA´s existing network for recording climatic information from hydrographic watersheds	a) Design and operation of the National System for Climate Data, by upgrading ETESA´s existing network for recording hydro-agro meteorological information from hydrographic watersheds.	Capacity building for climate change science and future analysis	Limited access to future scenario analysis due to lack of capacity to generate, systematize and deliver climate data in a timely basis	Consolidated network at the national scale; providing information and climate data to public and private stakeholders in an equal access basis	Currently access to climate data is limited; particularly for non-government stakeholders
Output 3.2	Established an early warning system to identify in advance, the necessary measures in case of hydro-climatic	a) Implement the sound warning system at the communities included in the CHVRW early warning system; and complete signposts along communities at risk areas. This EWS is focused on floods.	Capacity building for adaptation response	Losses due to extreme weather events	Response capacity improved for drought and flooding events. More communities and people trained	EWS are not widely distributed across the country currently. Programme will positively improve this trend.

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
	events that could affect food production and power generation	b) Implement an early warning system for floods and droughts at the SMRW.	Capacity building for adaptation response	idem	idem	idem
		c) Workshops and simulations to train technical staff and communities on the early warning system.	Capacity building for adaptation response	idem	idem	idem
Output 3.3	The NSCD interfaced and equipped with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information	a) Interface and equip the NSCD with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information.	Capacity building for adaptation response	Limited access to future scenario analysis due to lack of capacity to generate, systematize and deliver climate data in a timely basis	Farm owners accessing climate data to adjust production cycles and calendars	Current approach is mainly stationery and reactive; programme will promote an integrated and systematic approach
Output 3.4	Designed a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program and national efforts*	a) Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program. This includes program inception workshops with public and nongovernmental relevant stakeholders (at least three workshops). *This program will serve MiAmbiente in starting to evaluate progress of other adaptation efforts being implemented in the country.	Capacity building for Adaptation M&E and to assess adaptation impact	General	Assessment of impacts of adaptation investments conducted	Innovative tool. In the present, there is lack of a protocol that could be used at different scales
4. Rising awareness and establish a knowledge exchange platform to respond to, and mitigate impacts of climate-related events from local and national scope						
Output 4.1	Improved awareness of watersheds vulnerability and participation of population groups	a) Socialize the SMRW and CHVRW vulnerability analyses to facilitate the implementation of identified adaptation measures.	Adaptation knowledge capacity building	Lack of understanding of the climate change dimension	Climate change dimension included in local organizations decision making processes	Limited access to adaptation information; communities participate in consultation process, but afterwards is not informed or directly engaged in implementation efforts

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
	in adaptation measures					
Output 4.2	Strengthened professional capacities for the climate data analysis and processing, for different sectors involved	a) Offer a Climate Modelling Course with special emphasis on future scenarios impacting food-energy generation activities (at least 40 participants).	Adaptation knowledge capacity building	Limited technical capacity for climate change analysis	Planning and future analysis conducted at different levels using climate data	Capacity building activities will include participants at the national and local level, government and non-government sectors
		b) Offer an international course on Adaptation to Climate Change: Role of Ecosystem Services (40 participants nationwide, including stakeholders in the two prioritized watersheds).				
Output 4.3	Strengthened professional capacities on water resources management by incorporating climate change adaptation approach	a) Offer an international course on participatory and integrated watershed management emphasizing conflict management skills (40 participants nationwide, including stakeholders in the two prioritized watersheds).	Adaptation knowledge capacity building	Sectorial approach for water management, not considering climate data	Water users and institutions with water related competencies use climate data in a regular basis for planning, budgeting and reporting purposes	Capacity building activities will include participants at the national and local level, government and non-government sectors
		b) Offer an international course on ecosystem-based adaptation at marine-coastal zones. (20 participants)	idem			
Output 4.4	Systematized and disseminated experiences on climate changes adaptation, nationwide	a) Mapping and analysis of projects / initiatives undertaken. A technical and practical document that will be available in print and digital format will be developed.	Adaptation knowledge capacity building	Limited access to information about adaptation project results.	Improved understanding of adaptation experiences, translated into improvements in adaptation projects planning and implementation skills, both at the local level in CHVRW/SMRW and at a national scale	The Programme will promote extensive lessons learned sharing, through national and local events. Systematization of lessons learned by the Programme will be conducted in parallel to project implementation, as opposed to do it at the end of the project implementation
		b) 10 workshops will be held at national level (1 per province) to present the document.	idem			

Output No.	Description	Budget Notes/Activities	Type of measure	CC risk or impact identified	Expected result on the ground	Difference with BAU water management or agricultural best practices
Output 4.5	Portal for Climate Change Adaptation in Panama, implemented	a) Design and operation of the Portal for Climate Change Adaptation in Panama.	Adaptation knowledge capacity building	Information on climate change adaptation available, but not organized accordingly to users' needs. Each institution generating their own adaptation library, without an integrated/coordinated approach. Technical information not always available in Spanish	Updated adaptation information available for public use	Portal nested into national government entities to ensure sustainability
		b) Compilation and synthesis of materials for different audiences on adaptation to climate change.	idem	idem	Increased public awareness about climate change causes, impacts and adaptation options	Currently not available
		c) Training on the use of the portal for different audiences (producers, institutions, academia, etc.).	idem	idem	idem	n/a
		d) Communication strategy and systematization of experiences from the program.	idem	idem	idem	Accepted best practice for project management.
		e) Establishment of an advisory technical committee within the Climate Change National Committee to orient the program´s knowledge management process.	idem	Limited participation in the Committee;	More institutional resources dedicated to participate in the Committee. Increased interest of institutional staff to participate in the committee.	Innovative approach regarding the climate change national committee current dynamics
		f) Experience exchanges activities at the local level, including at least one international technical guided visit.	idem	Limited access to information about adaptation project results, limitations and lessons learned.	Climate change dimension included in local organizations decision making processes	Activity not implemented in a regular basis, due to lack of financial resource; programme proposed will make a difference in this regard.

A3. SUPPORT AND INSTITUTIONAL ENGAGEMENT OF KEY GOVERNMENT PARTNERS.

To successfully implement the nexus approach, securing political and technical commitment of the government institutions with sectorial competencies and mandates is critical. For purposes of the proposed programme, support from key stakeholders is guaranteed.

- Ministry of environment (MiAmbiente) as fund designated authority has fully endorsed the project concept and has already designated a climate change officer as institutional focal point and member of the proposal writing team.
- Ministry of Agriculture has also designated a focal point, who actively participated in the proposal writing process; in addition, an endorsement/support letter signed by the Ministry is attached was submitted.
- Support letter from ETESA was submitted.
- A support letter from SINAPROC, national entity responsible for emergency and disaster risk reduction, is submitted hereto.
- In addition to the abovementioned support letters, institutional arrangements for programme implementation include signing a collaborative agreement between F. Natura and the 3 entities to fully describe the extent and scope of the institutional involvement and support.
- The idea is that these agreements will promote preparation of an integrated work plan and also integration of programme outputs and activities within the institutional correspondent operative plans.

In parallel to government partners, local partner's engagement is also critical. For this purpose, consultation with key civil society organizations in the CGVRW (FUNDICEPP) and SMRW (AMIPARQUE) have been conducted and the organizations have expressed their interest in participating in programme design and implementation efforts, considering that climate change threat and conflict among water users is a permanent condition in both watersheds, not being addressed with a systematic approach yet. Both organizations are key local stakeholders, as stated in the correspondent Watershed Management Plans and Conservation Area Plans. Support letters from both organizations were already submitted.

B. Describe how the project / programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The combined effect of several programme activities will result in economic tangible direct and indirect economic benefits to the local communities within the CHVRW and the SMRW. Specific programm results in this direction are:

- Income generation activities at SMRW through promoting orchid and "*naranjilla"* crops production and commercialization.
- Design and implementation of at least one microfinance credit product to support ecosystem based adaptation measures. This activity will enable economic positive results to both the microfinance institutions and the farm owners who access the facility
- Economic benefits derived from the implementation of 4 mini hydro projects
- Improved economic results of productive campaigns, including rice production, associated to the low cost irrigation systems
- Positive impacts in governance are expected because of the reduction of the number of conflicts among water users due to an improvement of the water concessions and permission processes,
- Enhanced public participation and engagement in environmental and sustainable dialogues and processes
- Water security improved resulting from the installation of water harvest systems at the farm level
- Improved awareness and professional and technical skills of local people regarding the causes, impacts and effects of climate change.
- The intervention areas of the programme are home of vulnerable communities to hydro meteorological events: floods in the case of the CHVRW and both drought/floods events in the SMRW. In the case of the SMRW the districts that have been preliminary identified as areas to implement sustainable production activities and the EWS are included among the poorest districts at the national scale, for example, the Cañazas district.
- Co-benefits in poverty reduction as a result of income generating activities promoted by the Adaptation Programme.

At the national level, economic positive results will derive from: avoided losses and damages caused by droughts and floods, because of the implementation of the EWSs; improved economic results of the production campaigns due to the use of climate date to orient decision making and production calendars.

Environmental benefits of the proposed adaptation measures are evident, particularly considering that the 2 intervention areas -CHVRW and SMRVW- are listed among the 11 prioritized watersheds in the National Integrated Water Resources Management Plan 2010-2030. The environmental importance of these two sites is clearly outlined in the future water demand analysis of the abovementioned Plan, which determined that for the agriculture sector, the Santa María River is one of the main watersheds, given the importance of its irrigation system. In parallel, for the agro industrial sector, the highest volume of granted water corresponds to the Chiriquí Viejo river watershed, with 77.4 percent of the granted total at the national level for this sector. This watershed also presents the highest concession levels for hydroelectric (32.94 percent) and agriculture

livestock (10.57 percent) sectors, compared to the other watersheds. Environmental benefits of the proposed interventions in both watersheds include contribution to the restoration of the hydrological cycle at the Gallito and the Caisan sub watersheds; habitat restoration in these two areas through increased forest coverage to protect water sources and reduction of the land use conversion to extensive cattle raising; avoided loss of connectivity of water bodies; protection of water provision ecosystem services. Another important environmental benefit is the expected reduced amount of methane emissions as a result of the sustainable cattle ranching project through the ASP model.

The expected benefits from program implementation, from social – economic-environmental points of view are as follows:

COMPONENT	SOCIAL BENEFITS	ECONOMIC BENEFITS	ENVIRONMENTAL BENEFITS
1. Increase climate change and variability adaptation capacity in agriculture, livestock, and energy production sectors	• Improved water access for households (using quantity and quality indicators). • Increased water supplies to meet demand • Improved food security (by improving access to water and agricultural practices, food supply will be enhanced) • Improved level of participation and stakeholders dialogue • Population with lower risk exposure due to climate-resilient sources of income and adapted livelihoods	• Increased income generation for program participants • discouraging traditional "*potrero*" extensive cattle ranching production system, avoiding advance of agricultural frontier to new areas; • increase productivity per hectare dedicated to cattle raising • Increased potential for agriculture diversification • Understanding of barriers in the finance sector to effectively support	• Erosion and flood control • water purification and biological control • biodiversity benefits • aesthetic and recreation values to communities engaged in the project • contribution to stabilization of stream flow and water temperature. • Water management and water productivity increased, based in Water Footprint Methodology and indicator • reduction of the land use conversion to extensive cattle raising

COMPONENT	SOCIAL BENEFITS	ECONOMIC BENEFITS	ENVIRONMENTAL BENEFITS
		adaptation efforts • Generate evidence, "making the case" to support the hypothesis that financial risk to support adaptation initiatives could be appropriately quantified and managed. • Promote interest in local microfinance institutions for incorporating climate change adaptation into their portfolio of finance options	• protection of water provision ecosystem services • reduction of amount of methane emissions as a result of the sustainable cattle ranching project through the ASP model
2. Establish climate resilient water management instruments with integrated and community based approach	• Improved level of participation and stakeholders dialogue • Municipalities actively engaged in adaptation action • Enhanced long-term access to water • Sustainable livelihoods	• Ministry of Agriculture long term strategic planning informed by the new climate information. New map officially adopted as planning tool. • Increased success possibility by selecting right crops and compatible areas for increasing crops yield and	• Management plan updated with climate change data and clear understanding of future scenarios of drought for the region. • Ministry of Environment using climate data to justify approval or rejection of water concessions (environmental flows and ecosystem health sustained).

COMPONENT	SOCIAL BENEFITS	ECONOMIC BENEFITS	ENVIRONMENTAL BENEFITS
		economic benefits from them.	• Validation of prioritized adaptation measures
3. Strengthened local-national capacity for monitoring and decision making to reduce and respond to risks associated with climate change	• Early warning systems save lives and help protect livelihoods. • Local authorities better enabled to evacuate or shelter people in advance; and to count on a faster response to problems of food and water insecurity • Informed decisions result in positive impacts on food security and social welfare • Response capacity improved for drought and flooding events: more communities and people trained • Consolidated network at the national scale; providing information and climate data to public and private	• Farm owners accessing climate data to adjust production cycles and calendars • Potential economic losses due to extreme events avoided through EWS. • Expansion of monitoring network may increase the number of potential beneficiaries of risk mechanisms. • More informed decisions result in positive impacts on crop production and farmer's incomes. • Assessment of impacts of adaptation investments conducted	• Access to better data to help make informed decisions on protecting conservation sites; restoring highly intervened areas; and adapt to climate change.

COMPONENT	SOCIAL BENEFITS	ECONOMIC BENEFITS	ENVIRONMENTAL BENEFITS
	stakeholders in an equal access basis • Improved level of participation and stakeholders dialogue		
4. Raise awareness and establish a knowledge exchange platform to respond to, and mitigate impacts of climate-related events from local and national scope	• Climate change dimension included in local organizations decision making processes • Updated adaptation information available for public use (increased capacity for developing and implementing efficient adaptation approaches to climate change) • Water users and institutions with water related competencies use climate data in a regular basis for planning, budgeting and reporting purposes • Improved level of participation and	• Increased capacity for developing and implementing efficient adaptation approaches to climate change that lead to protection of property and farmer's incomes • Planning and future analysis conducted at different levels using climate data • Updated adaptation information available for public use, to make informed economic-wise decisions	• Increased knowledge and awareness about climate change and its impacts will help create consciousness on environment protection • Climate change dimension included in local organizations decision making processes • Increased public awareness about climate change causes, impacts and adaptation options • Improved understanding of adaptation experiences, translated into improvements in adaptation projects planning and implementation skills, both at the local level in CHVRW/SMRW

COMPONENT	SOCIAL BENEFITS	ECONOMIC BENEFITS	ENVIRONMENTAL BENEFITS
	stakeholders dialogue. • Incorporation of gender perspective by participation and dedication quotas in the program		and at a national scale •

B1. PROJECT BENEFICIARIES AND THE PROCESS FOR THEIR SELECTION

The expected direct beneficiaries of the Programme are local farmer communities located in the CHVRW and the SMRW, selected in previous planning processes. Nonetheless, policy, technical, financial, and knowledge instruments to be generated by the program will benefit the entire Panamanian population in adapting to climate change and variability.

The selection criteria for local and regional beneficiaries includes:

1. Watersheds selected as priority watersheds in Panama, highly vulnerable to climate change as stated in the Second National Communication to the UNFCCC and in the National Integrated Water Resources Management Plan 2010-2030
2. Conservation and management strategies included in the CHVRW Watershed Management Plan CHVRW 2014 and SMRW Management Plan 2010
3. Priority areas located within both watersheds, Gallito River micro watershed (SMRW) and Caisan River sub watershed (CHVR) based in results of conservation area planning processes conducted for both watersheds considering critical ecosystems, including climate change dimension.
4. The importance of agriculture production for food security and vulnerability to climate change, based in severity of impacts of drought events, as determined by Min. of Agriculture

Component 1:

1.1 Water harvest systems: Beneficiaries will be identified based on the preliminary results of the VIA

1.2 Climate Smart farming projects:

- Irrigation system in the CHVRW. Direct beneficiaries: Communities of Cerro Punta and Divala. Selection criteria/process: Cerro Punta and Divala communities' selection based in the consultation process for the Management Plan. Divala

community selection based also in light of the importance of rice production in this location. Rice production severely affected by drought associated with El Niño impacts. Both communities encompass a population of 13,116 inhabitants, (Population Census Data, 2000).

- Protective plantations and agroforestry systems and soil conservation across at least 6,000 lineal meters located in the banks of creeks that contribute to the Caisan River's water system. Includes reforestation of riparian buffers in the Caisan River watershed. Direct beneficiaries: Farm owners located in the riparian area of the Caisan River. Selection process pre-conducted for the Conservation Area Plan process. Fideco 2015. This subwatershed encompasses 14 communities in 2 *corregimientos* (10 in Plaza Caisan with 2901 inhabitants and 4 in Dominical with 998 inhabitants, accordingly to data of the Statistics Institute, 2010). Communities directly related to the Caisan River subwatershed are: Caisan Primavera, Caisan Centro Plaza, Plaza Caisàn y Alto La Mina, Caña Blanca Arriba, Caña Blanca Centro y Caña Blanca Abajo.

1.3 (Diversified income source models implemented in vulnerable population areas, by creating capacities for operating orchid and *naranjilla* crops and establishing the correspondent commercialization scheme at the SMRW) and 1.4 (Concrete adaptation measures implemented for sustainable cattle ranching) will be focused in the Gallito River micro watershed, identified as a priority site within the SMRW accordingly to the Conservation Area Plan conducted in 2014, due to the provision of ecosystem services and its physical, environmental, and socio economic importance.

Highlights of the Rio Gallito Micro Wateshed: The Rio Gallito micro watershed is part of Bulaba River sub-basin; it has approximately 5322.8 km2, is classified as a small basin and the length of its main river (Rio Gallito) from its source to the output is about 10.7km. Its importance lies in the maintenance of environmental services such as water quality for human consumption and for agricultural uses and connectivity between the forests of the upper sections of the basin with 2 important protected areas: the Santa Fe National Park and Forest Reserve La Yeguada. For the four conservation objects defined, climate change was identified as one of the major threats along with forest coverage loss, land use conversion for extensive cattle ranching, unsustainable productive practices, solid waste pollution and loss of connectivity of water bodies. "Climate change puts pressure on the food security of residents through the fluctuation in the short and long-term of weather patterns (temperature, water and electricity) necessary for agricultural activities and impacting production and crop yields. Climate change threat was ranked as very high (high for primary forest, river ecosystem and pez titi (Sicydium salvini) and very high for secondary forests.

Beneficiaries profile. According to the Statistics Institute (2010) there are 1081 resident inhabitants in the watershed, of which 55% were male and 45% female; 61% of the total inhabitants had more than 18 years, representing a productive population

pressing natural resources, especially water and soil, to meet their basic needs. The watershed has 27 communities in 4 districts (El Alto, Rio Luis, Ruben Cantu and Santa Fe). Communities within the micro watershed are small settlements with less than 100 persons, lack of basic services and a livelihood associated to the extensive use of natural resources, especially soil. In addition to the vulnerability to climate change mentioned above, these communities present socio-economic vulnerability evidenced by the existence of poverty and extreme poverty in all the communities, where the unique productive alternative is the use of land (in 70% of the communities the average income is in the range of US$101-299/per month). Regarding socio economic activities, those are mostly related to extensive use of land and natural resources, typically for auto consumption (subsistence), based in family labor and low technology. There are 3 types of farms: small (0.1-9.99 ha-cattle and 10 animals) located in the middle and lower watershed; medium size (10-50 hectares and less than 50 animals, located in the middle and lower section of the watershed and large farms (50+ hectares and 50+ animals located in the lower watershed). In the upper section there are “potreros” for pasture rent located in areas important for forest ecosystems and water sources.

1.5 Enhanced sectorial support through climate financing instruments. Direct beneficiaries will be identified during the project implementation, particularly during the inception workshops through preliminary identification of interested stakeholders, including farm owners and microfinance institutions. Microfinance institutions with presence in the Rio Gallito Micro Watershed and that have been preliminary identified as key potential partners institutions are: Fundaciòn Hèctor Gallego, Santa Fe; Cooperative La Esperanza de los Campesinos, Santa Fe; Cooperativa de Turismo de Santa Fè, Santa Fè. (All 3, listed as key external actors in the Rìo Gallito Micro Watershed CAP). (Conservation Area Plan for the Rio Gallito Micro Watershed . Fideco 2014).

Component 2:

Outputs 2.1 (VIAs analysis); 2.2 (Hydrological balance and Environmental flows analysis) for both watersheds CHVR and SMR, will indirectly benefit programme local stakeholders as a whole, since information gathered will be used to inform decision making processes, particularly through recommendations to improve water concession processes and technical guidelines to restoring water cycle.

Output 2.3: Design 2 district plans for water security. Criteria for the selection of Districts to design water security district plans will be defined in accordance with the implementation of the Water Security National Plan driven by the Min of Environment

Component 3:

Output 3.1 National System for Climate Data Direct beneficiaries: Farm owners participating in output 1 activities with access to climate data through Hidromet and interface with MIDA. Indirect beneficiaries: Stakeholders involved with water-energy-

food sectors at the local and national level will benefit of access to climate data. Academic sector, government institutions, civil society with access to climate data to inform project implementation and decision making processes.

Output 3.2 EWS operating in CHVRW and SMRW. Direct beneficiaries: Local communities located in both watersheds. Specific siting of the EWSs will be defined jointly with SINAPROC as a program implementation activity.

Output 3.3: Joint mode ETESA-MIDA to provide access to producers to climate data. Direct beneficiaries: Farmers in CHVRW and SMRW. Beneficiaries at a national scale due to acces to climate data.

Component 4:

4.1 Improved awareness of watersheds vulnerability and participation of population groups in adaptation measures. Direct beneficiaries: local communities in CHRW and SMRW.

4.2, 4.3: Strengthened professional capacities and skills. Beneficiaries of specialized training and capacity building activities will be selected through an open (national) and competitive basis in coordination with implementing partners (Min of Environment, MIDA, ETESA) and the Climate Change National Committee and academic sector (Technology University of Panama-UTP; UNACHI (Autonomous University of Chiriqui) and the National University of Panama (public universities with presence in both watersheds). Participation will include participants form the 2 selected watersheds and other geographical areas of the country. Affirmative criteria will be used to encourage participation of women and indigenous/minority groups.

4.4 and 4.5: Systematization of adaptation experiences and climate change adaptation portal. Direct beneficiaries: Activities targeted to reach a wide audience-general public a national level.

B2. PROGRAMME FOCUS REGARDING BENEFICIARIES PROFILE

The targeted direct beneficiaries are vulnerable communities of local farmers located in the CHVW and the SMRW, including the prioritized sub-watersheds (Rìo Gallito and Rìo Caisan) engaged with agriculture and livestock production, other major users of water resources including hydro energy stakeholders and microfinance institutions. Government and non-government institutions will benefit of access to climate data and specialized training for climate change science and action.

This Programme is not targeting indigenous communities particularly. Indigenous communities are being directly targeted regarding climate change dimension through the REDD+ Programme (ONU REDD, UNDP).

B3. EQUAL ACCESS AND DISTRIBUTION OF THE ADAPTATION BENEFITS AMONG BENEFICIARIES

Programme will be sensitive to both gender equality (promoting equal opportunity) and also equal benefits, by recognizing the different situations of women and men, and developing strategies to ensure that both sexes can benefit from the adaptation experience and results. For purposes of the Programme, Equality refers to ensuring project resources, activities and opportunities are equally available to women and men, and treating both sexes in the same way. Equity refers to the process of treating women and men fairly so that the project generates similar benefits. To achieve this the key will be to find out the gender-based barriers to full participation for each specific group of women and men. The programme strategy to do this and overcome the barriers for each group includes:

a) conducting a social/gender overview to be very aware of the context and to determine the factors affecting women and men (this specific analysis will be included in the VIAs (2.1);

b) development of indicators that will help to measure how effectively the project is addressing the different needs, interests and resources of both women and men (as beneficiaries, workers and citizens). This provision will be a key element when designing the M&E protocol included in output 3.4

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

- The proposed program directly addresses climate change adaptation measures in the water sector and its linkages with food security and energy production among others, in priority areas of Chiriquí Viejo and Santa Maria rivers watersheds.

- The activities proposed in the 4 components require investment for the creation of a water use model in line with the different demands of each of the two priority watersheds. These investments are mainly focused on specific activities to reduce conflicts over water use in both national priority watersheds, besides introducing the climate variability element in decisions-making about water management for the benefit of users.

- It is expected that the proposed program will generate long-term benefits in terms of resilience. This will be a result of the strong focus on capacity building at multiple levels, to help the process of resolving current conflicts between different water users, in view of the climate variability scenario the country is already facing. These capabilities include solutions in the field of technologies (such as water harvesting systems; irrigation systems; early warning systems, flood and drought; farms planning

with climate-smart sustainable agricultural and livestock systems); financing (with the encouragement through climate financial instruments); country strategies (with the introduction of climate change adaptation elements into national, district and local plans for integrated watershed management); and knowledge management (with the establishment of a national knowledge platform on adaptation to climate change).

- The proposed program also has a strong focus on generating benefits with a multiplier effect, which results will have a positive impact on a larger number of people beyond the direct beneficiaries in each of the proposed areas. This through (i) the impact on food security that will generate nationwide in agricultural commodities for essential consumption among population (rice, vegetables and cattle); (Ii) the impact on the generation of energy for the national energy matrix (with appropriate monitoring and management of water flows at strategic sites in both rivers Chiriquí Viejo and Santa Maria); (Iii) the impact on the management of climate knowledge for water resource management and its linkages with the agricultural, energy and other sectors; and (iv) the impact on the response capacity of the country for timely decision-making in the public and private sectors regarding water resources, based on their connection with agricultural production, hydropower and other sectors, supported by climate information.

- To select the proposed projects, the following criteria were taken into consideration:

    - emphasis on vulnerable population: Consider i) groups and sectors highly vulnerable to climate change (implementation of no regret measures[36]); ii) priority productive activities; and iii) highly vulnerable social groups (extreme poverty areas).
    - areas were previously identified as vulnerable to climate change and have previous planning processes in terms of watershed (watershed management plans and conservation plans for microwatersheds).
    - there are well-developed social capital and potential for results replication or transfer.
    - have a greater relationship with capacity building, development of learning experiences and adoption of technologies and practices, emphasizing the possibility of creating transfer processes.
    - can generate immediate benefits for participants, in the short term, and consider the environmental and climate change issues.
    - Consider the financial analysis of productive projects, mainly on aspects of profitability, social benefits and environment.

[36] No regret measures are those relevant enough from the climatic point of view, and that, at the same time, are relevant from the development point of view, even if specific climatic threaths may not occur in the future.

Urgency for solutions

- One of the problems with greater urgency to be solved, at both watersheds -Chiriquí Viejo and Santa Maria rivers- is related to the use of water; which is in great demand and has potential for hydroelectric generation, domestic use, livestock and agriculture.

- The Chiriquí Viejo river watershed is a very important territory for the Republic of Panama, for its suitability for agricultural production and its natural conditions that allows great water resource availability, which is being exploited for hydropower generation; both qualities are based on the hydro climatic conditions of the watershed, its landscape, life zones, and the quality of soils, especially at the upper watershed.

    - Currently, 77% of available water at the Chiriquí Viejo river watershed is under concession for hydropower generation. According to the ANAM (2008)[37], as of 2008, there were 19 concessions along the river course for hydropower generation; however, total number of concession was 191. In most cases, concessions for hydroelectric power generation were granted without conducting appropriate studies that would ensure the availability of water in line with generation capacity design; because of this, such activity is likely to harm the river ecosystem.

    - The Chiriquí Viejo river watershed area produces 81% of onions, 97% of potatoes, 97% of carrots, cauliflower 99%, 73% of beans, 43% of coffee consumed nationally, and is source for 31% of the milk also consumed nationwide[38]. In addition, half of the rice production of the Chiriquí province is produced at the lower part of the watershed (over 11,000 hectares planted).

    - According to the National Plan for Integrated Water Resources Management (ANAM, 2011) 77.4% of the total national water concessions for the agribusiness sector is located in the Chiriquí Viejo River watershed. It also indicates that this watershed sustain the highest water volume granted in concession for hydroelectric generation (32.94%) and agriculture (10.57%), compared to other areas.

    - The watershed management is necessary because of the hydropower potential, the potential of small-scale irrigation systems, ecotourism potential, domestic water uses, and agricultural development in the middle and lower parts. By choosing not to act with this vision, not only development opportunities will be lost,

[37] Development of Hydrological Monthly Balances Elaboración de Balances Hídricos Mensuales, Offer – Demand by hydrographic watersheds; Proposal for Modernization of Hydrometeorological Network, Republic of Panama. Technical document, Cuenca 102. 2008.
[38] Management Plan for Chiriquí Viejo River Watershed.

but existing problems of poverty, environmental degradation, environmental conflicts and the impact of climate change will increase.

- Meanwhile, the Santa Maria River watershed is also one of the priority watersheds in the country[39]. The potential of water resources is important for local/regional activities, at the upper, middle and lower parts of the watershed; and at the river mouth (the Parita Bay). This watershed meets the needs of much of the population living in the provinces of Coclé, Herrera, Veraguas and part of the Ngäbe Bugle Indigenous territory.

    - Its hydropower potential has been considered as strategic alternative for the future of both, the inhabitants of the watershed, and the provision of services to local and neighboring areas (Integral Management Plan Upper, Middle and Lower parts- of Santa María River Watershed, 2009).

    - This watershed is located in a promising economic development zone. The region, and particularly the lower part of the watershed, integrates important productive activities in the national agricultural sector. According to the data of cultivated area, the region of the middle and lower watershed is considered a sugarcane area, and home for production of rice and corn; the rest of other crops do not cover large areas. In addition, 42% of the middle and lower watershed area is devoted to livestock, perhaps the activity that generates more income to the region. Also, this section experiences water-related conflicts between the shrimp industry and the sugar industry.

    - In contrast, the upper part of the watershed is dedicated to traditional agriculture (slash and burn); planting subsistence crops such as grains, roots and tubers, vegetables, for one or two years and subsequent abandonment or conversion to pasture. Along with perennial crops (such as coffee and orange), this agricultural system is the basis of food security of the population in this area. Livestock activities, especially ranching are also observed.

- It is estimated that from the investment proposed to implement this program, important benefits that justify the whole operation will be achieved. These benefits include economic, social and environmental aspects. At the local level, the population living at the Chiriquí Viejo River watershed is 99,000 people, and at Santa Maria River watershed is 75,500 people. However, the scope of benefits extends to the national level, considering the impact on economy and food security both offer, to supply a significant proportion of agricultural commodities and energy generation.

[39] According to the Land Management General Plan (LMGP) of Panama, ANAM, 2006.

- The risk of doing nothing in a scenario of climate change threatens the integrity of both areas, with the consequent environmental, social and economic impact locally and nationally.

- Past experiences show that, for example, extreme events related to El Nino and La Nina in Panama between 1982 and 2008, amounted up to 32 disasters. These claimed some B / 86 million in economic damages and nearly 250 lives lost nationwide. Starting 2015, forecasts indicate that the threat of climate variability is becoming a driving force of greater risks for ever more extreme weather events; a reason to prioritize attention to potential impacts of climate change on the most vulnerable populations; and address the risks from an integrated planning on disaster risks regarding food security, access to energy and sustainable development.

- The cost benefit of the proposed program is based on recognition of the importance of these regions and their vulnerability to climate change; and to acknowledge that the problem posed forces a scenario of continued deterioration and progressive vulnerability to life-support systems.

- The proposed program will focus on the effectiveness of the anticipated outcomes and impacts for each component, and the profitability of all the detailed activities.

C1. PROGRAMME COST EFFECTIVENESS ADDITIONAL FACTS.

As originally conceived, the Programme presents a positive cost effectiveness scenario, based in the following aspects:

a) The Programmme is targeting both implementation/on the ground results (for ex. piloting productive alternatives, consolidating a national network for climate data management) and in parallel influencing sensitive public policy processes and facilitating information for conflict resolution among water users, promoting policy coherence and inter-sectorial coordination

b) The nexus approach privileged by the Programme is by definition a cost effective approach. Historically, most adaptation efforts and plans have been prepared to meet sectorial goals. They generally focus on sectorial and project-based activities, without adequate consideration or coordination of cross sectorial interactions among key climate-sensitive sectors such as water, energy, and food. As opposed to traditional sectorial projects implemented in Panama, this Programme is pursuing multiple results at 3 sectors and at different levels and scales.

c) In absence of a climate change adaptation national baseline, the Programme will contribute with technical data to advance the baseline; outputs 4.5 and 3.4 b will be particularly important for this purpose (the M&E tool to assess effectiveness of climate change adaptation measures implemented by the programme is conceived to serve

also as a tool for MiAmbiente to initiate monitoring of adaptation efforts and results at the national scale)

d) The Programme will benefit from data, results and consultation processes conducted by key programme partners in the context of national scale planning processes (National Plan for Water Security, an Energy Plan 2015-2050, and a National Pact for Agriculture); in other context, a similar adaptation programme will have to allocate resources to conduct parallel consultation and validation processes.

e) The Programme has been designed to serve as an implementing facility for planning processes conducted previously (National Integrated Water Resources Management Plan 2010-2030; Watershed management plans and Sub-watershed Conservation Area Plans). This is a highly cost effective figure of this programme.

f) The Programme is expected to accomplish complex adaptation expectations as evidenced in the following table (adapted from "The nexus approach to water-energy-food security. An option to climate change adaptation. Golam Rasul & Bikash Sharma (2015) :

I. Mainstreaming climate change adaptation into development: Yes. 2.3b
II. Transformative potential:
- Builds adaptive capacity: Yes: 2.3a
- Improve livelihoods Yes: 1.2, 1.3. 1.4
- Builds local institutions: Yes 1.5, 3.1, 3.3, 4.2, 4.3
- Builds response capacity: Yes. 3.2

III. Addresses the drivers of vulnerability:
- Activities seek to reduce poverty and other non-climatic stresses that make people vulnerable: Yes 1.1, 1.2, 1.3,
- Promotion of minority rights: No
- Transformation of social relations to combat discrimination and underlying social and political vulnerability. Yes 2.2c

If necessary, additional cost-benefit figures will be provided with the full proposal document.

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

The proposed program is consistent with national policies and programs to address adaptation to climate change, building climate resilience, disaster risks reduction, and associated programs and policies to strengthen IWRM incorporating elements that increase resilience and adaptation climate change; to harmonize water use for human consumption, food production and energy development; to achieve a climate-resilient water management sector (water-food-energy- climate change adaptation nexus); to establish a national monitoring system for adaptation to climate change; and to establish a national knowledge platform for adaptation to climate change.

In particular, this proposal is consistent with:

- The Integrated Management Plan (Upper, Medium and Downstream) of the Santa Maria River Watershed (2009); and Integrated Management Plan for Chiriquí Viejo River Watershed (2014).

Both management plans indicate the need to incorporate elements that enhance resilience and adaptation to climate change, as well as harmonize the different water uses in a scenario of conflicts and deterioration, aggravated by drastic climate changes.

- Second National Communication to the UN Framework Convention on Climate Change, Panama, Panama (2011).

This Second National Communication raises the need to build capacity to provide strategies, policies and appropriate measures in the priority sectors: water resources and their relationship to agriculture in the Santa Maria River Watershed. Specifically, it suggests the need for investment in improving water resources monitoring networks, and developing an early warning system, for populations most vulnerable to drought and flooding, among other measures.

- The National Plan for Integrated Water Resources Management of the Republic of Panama • 2010-2030 (2011).

This plan recommends promoting the development of programs to support the poorest vulnerable communities, to facilitate their adaptation to climate change effects. It also establishes the need to strengthen climate observation networks, to monitor the parameters and indicators of climate change; and develop mechanisms for coordination between public sector and civil society, in order to contribute to fulfill international agreements made by the Panamanian government in relation to climate change.

- Act No. 41 of 1998 "General Law for the Environment".

It establishes that the National Authority for the Environment (ANAM) will establish special programs for watershed management, which, due to the level of deterioration or need for strategic conservation, are suitable for a decentralized management of water resources by local authorities and users.

- National Climate Change Policy.

This policy shapes the actions that Panama, according to its national circumstances, can structure to have an impact on achieving the ultimate objective of the UN Framework Convention on Climate Change (UNFCCC), and improve the country´s adaptive capacity by reducing vulnerability and identifying priority adaptation measures. Specifically, it highlights the need for interventions to strengthen water security, food security and energy security.

- The "National Strategy for the Environment: Environmental Management for Sustainable Development 2008-2012".

The Objective 10 stresses the need for conservation and restoration of watersheds, with an ecosystem and participatory approach.

- Law 44 of August 5, 2002. Official Gazette 24,613.

This law sets a special administrative system for the management, protection, and conservation of watersheds in the Republic of Panama.

- Executive Decree 70 of July 27, 1973.

It regulates the granting water use permits and concessions; and it determines the integration and operation of the Consultative Council of Water Resources.

- National Policy for Integrated Disaster Risks Management (PNGIRD), and the National Plan for Disaster Risk Management 2011-15.

It establishes the need to improve preparedness for extreme natural phenomena; and more frequent and intense floods and droughts.

- Law 24 of June 4, 2001, by which measures are adopted to support the farmers affected by adverse weather conditions and other eventualities.

Its aim is to provide financial assistance to farmers affected by adverse weather conditions; sharp falls in market prices; or for exotic pests and diseases that significantly affect agricultural production.

- Law No. 25 of June 4, 2001, that dictates provisions on the agricultural transformation national policy and on its implementation.

This law was established as a national response to support the agricultural sector for investments farmers made with own funds or loans, in order to improve their crops/livestock and adapt to the new environment of competitiveness and production efficiency. The producer is suitable to receive a reimbursement for investments made in production activities detailed by the program. An average of 50% of the investments -referred to in the regulations- could be reimbursed depending on the produce subject to support.

- The Government Strategic Plan 2015-2019.

In addition to the above instruments, the proposed program is consistent with:

- Executive Decree No. 84 of April 9, 2007, by which the National Policy for Water Resources is approved.
- Decree Law No. 35 of September 22, 1966, by which the exploitation of state waters is regulated, in order to ensure their exploitation according to the social interest.
- Decree Law 35 of September 22, 1996, that establishes regulations for water uses.
- Executive Decree 16 of March 5, 2002. Official Gazette 24,506 of March 7, 2002. By which the Executive Decree 104 of December 23, 1994 is modified.
- National Biodiversity Policy; National Policy on Climate Change; National Decentralization Policy of Environmental Management; National Policy on Comprehensive Management of Hazardous and Non-Hazardous Waste; National Environmental Policy Information; National Cleaner Production Policy; and National Policy for Environmental Monitoring, Control and Supervision.
- Law No. 11 of April 12, 1995, by which the Regional Convention on Climate Change, signed in Guatemala on October 29, 1993 is approved.
- Law No. 10 of April 12, 1995, which approves the United Nations Framework Convention on Climate Change signed at New York on May 9, 1992.
- Law No. 88 of November 30, 1998, whereby the Kyoto Protocol of the United Nations Framework Convention on Climate Change (signed in Kyoto, the December 11, 1997) is approved.

Last but not least, currently the state is taking steps towards the establishment and implementation of three important instruments related to the proposed program:

National Plan for Water Security, National Energy Plan 2015-2050 and the National Pact for Agriculture Sector.

These 3 processes are planning efforts conducted currently by the central government at a national scale. The proposed Programme is conceived as an implementation opportunity to generate on the ground evidence that will demonstrate how climate change is a cross cutting dimension and that by delivering adaptation results, other positive results are produced in the 3 sectors. In operational terms, once approved, the Programme will invite the responsible offices of these plans to participate in the Programme work plan validation, so that synergies are identified from the very beginning.

D1. SPECIAL CONSIDERATION REGARDING PROGRAMME COORDINATION WITH MINISTRY OF AGRICULTURE (MIDA) CURRENT INITIATIVES.
e

As part of the actions taken towards building the Plan for Adaptation to Climate Change, through workshops and seminars run by the Environmental Unit of MIDA, they have identified strategies and lines of work, which are compatible with the Adaptation Project which focuses on the watersheds of the rivers Chiriqui Viejo and Santa Maria. Some strategies and lines of work are:

1. Identify the measures of adaptation to climate change for each production system.
2. Establish public-private partnerships for knowledge management on Climate Change.
3. Identification of key actors and their responsibilities in the Plan for Adaptation to Climate Change.
4. Establishment of agro-forestry and pasture systems according to territorial characteristics.
5. Use of clean technologies appropriate
6. Adoption of organic farming practices that reduce GHG emissions
7. Use of the Integrated Watershed Approach for agricultural extension service.
8. Incorporating GIS System agricultural extension
9. Establishment of pilot projects on adaptation and mitigation to climate change.
10. Integrated Risk Management in agriculture
11. Systems for and Use of Rainwater collection and use
12. Using climate forecasts locally
13. Networking Information on Climate Change.
14. Consideration of gender and traditional knowledge of indigenous peoples

E. Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

Overall, the project meets all environmental requirements established in the 1998 General Law for the Environment. In particular, the project was designed taking into consideration compliance to environmental requirements, studies, and regulatory standards for better agricultural practices, water quality, and climate risks control.

- The NIE (Fundación Natura) will ensure observance of environmental and social policy of the Adaptation Fund during design, implementation, monitoring and evaluation of the proposed program, in order to identify, prevent and minimize any damage that the intervention could cause to people and the environment.
- Environmental and social risks will be addressed to ensure that environmental and social concerns, and communities are represented in the design and implementation of projects.
- Among the requirements to be met are:

- Compliance with the laws pertinent to the activities included in the 4 proposed components.
- Projects provide fair and equitable access to benefits in a manner that is inclusive, without impeding access to basic supply of clean water and sanitation, energy, education and safe and decent work conditions, and the right to the land. The program, through the proposed projects, will not exacerbate existing inequities, especially related to marginalized and vulnerable groups.
- In analyzing the proposed projects, the NIE reviewed and considered the particular impacts on marginalized and vulnerable groups.
- During the entire program international human rights will be respected and promoted.
- The NIE will encourage equal participation of men and women; both will receive comparable social and economic benefits, and they will not be subject to disproportionate adverse effects during the development process that the proposed program promotes.
- The national labor standards will be met, as well as those identified by the International Labor Organization.
- Every project implemented will be consistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments related to indigenous peoples.
- Projects financed will not involve unnecessary conversion or degradation of critical natural habitats.
- Projects designed will be implemented in a manner that avoids any unnecessary or significant reduction or loss of biological diversity, as well as the introduction of known invasive species.
- The program will not generate significant and / or unjustified increase in greenhouse gases emissions or any other cause of climate change.
- The program was designed in such a manner that will meet applicable international standards for maximizing energy efficiency and minimizing material resource use, waste generation, and release of pollutants.
- Proposed projects were designed and will be implemented in a way that avoid significant and negative impacts on health.
- Proposed projects were designed and will be implemented in such a way that promote soil conservation and prevent degradation or conversion of productive lands, or lands that provide valuable ecosystem services.

E1. COMPLIANCE WITH LEGAL OR TECHNICAL STANDARDS RELEVANT TO THE PROGRAMME COMPONENTS.

Considering the nature of the proposed activities, the Programme will comply at least will the following technical standards:

a) Output 3.1. Internationally approved standards for Type A automatic weather stations for satellite transmission. ETESA as the institution responsible for the operation of the national network will be responsible for providing evidence of the applicable standards and evidence of compliance. These standards are included in previous bidding documents used by ETESA to complete the acquisition of 30 Type A automatic weather stations for satellite transmission, based on competitive bidding process conducted in 2013-2015
b) Output 3.3. The M&E tool will be developed accordingly to technical guidelines and provisions developed by the Climate Technology Centre and Network (CTCN) described in the document "Good practice in designing and implementing national monitoring systems for adaptation to climate change"
c) Output 1.2 Water Footprint Analysis for rice production in Divalá, (CHVRW), will be conducted following the methodology described in "The water footprint assessment manual: Setting the global standard. Earthscan, London, UK.
d) Programme implementation leaded by F. Natura will observe the RBM (results based management) model for planning, implementation and reporting purposes.
e) Technical national standards for agriculture and livestock sector defined by MIDA and other national applicable regulations will be observed in coordination with MIDA and the Climate Change National Committee
f) Shall the final design of each intervention demands an environmental impact assessment, this will be performed for development of water harvesting systems, irrigation systems, and construction of infrastructures related to the early warning systems and the National System for Climatic Data. Preliminary no category 3 EIAs are envisioned. In addition, for development of improved farming practices, all regulations regarding fertilization or waste management will be met. Preliminarily no need for category 3 EIAs are envisioned.

F. Describe if there is duplication of project / programme with other funding sources, if any.

- The proposed program does not duplicate the country´s efforts aimed at adapting to climate change, agricultural production, power generation, risk management, water management - watershed management, and sustainable development.

- By contrast, the proposed program presents specific and scalable interventions that provide relevant results and experiences to prepare the country in terms of water management -a key element for economic, environmental and social sustainability of Panama-, taking into account the factor of climate change and risk management.

- There are not experiences in Panama of a programmatic interventions to address conflicts in water resource management as the core of climate change adaptation, building resilience, and reducing climate vulnerability; to propose improvements in food and energy security based on integrated water management, in a way that the water-energy-food-climate change adaptation nexus becomes visible.

- In addition, there is momentum right now to implement the proposed program, which coincides with the country's intention to implement a National Plan for Water Security, an Energy Plan 2015-2050 and a National Pact for Agriculture. The proposed program offers a unique scenario to create synergies between the agendas of mitigation and adaptation to climate change, in order to conserve and restore important ecosystem services for the population and agriculture.

Additional considerations regarding complementarity with climate change initiatives.

In Panamá adaptation action is relatively recent. An important milestone to define a starting point is the Climate National Policy gazetted in 2007. Equally remarkable are the processes for the 2 national communications to the UNFCCC already presented (2001 and 2011).

Currently adaptation efforts are taking place both in the policy arena and in the implementation side. To clarify coordination lines with ongoing processes and avoidance of overlapping or duplication of efforts, we identified 3 categories of relevant processes: public planning long term processes; climate change projects or programs and climate change capacity building processes.

a) Long term planning processes. As mentioned previously 3 specific processes are considered particularly relevant for the proposed Adaptation Programme: the National Plan for Water Security, the National Energy Plan and the National Pact for Agriculture Sector. As mentioned above, the three of them are planning processes, which will require complementary actions from different sectors to achieve the desired goals. In this sense, the Adaptation Programme is envisioned as an implementation effort which will provide on the ground evidence to support the strategic guidelines established by the Plans regarding climate change dimension. These plans are also in an initial phase, so there is a good timing to establish coordination lines between the Adaptation Programme and the responsible entities and ensure complementarity of actions. For example, the Ministry of Environment, implementing partner of this programme, is the leading institution in the process of the Water Security Plan; this situation facilitates the required dialogues and arrangements to maintain permanent coordination through mutually aligned work plans. With regards to these planning processes the idea is to establish a dynamic where the Adaptation Programme provides evidence from the ground to feed the plan implementation process.

b) Regarding specific adaptation programmes or projects under implementation, 2 key efforts shall be highlighted: a) the process for the 3rd national communication implemented with funding from the GEF to update the GEI 2005-2010 and define an adaptation and low carbon development strategy. Again, this process is leaded by MiAmbiente, so coordination with the Adaptation Programme is secured, through: i) the designation of the focal point for this effort (as part of the institutional arrangements). Important to emphasize the fact that the responsible person in charge from MiAmbiente of presenting the 3rd communication process is the same officer designated as institutional focal point to accompany the Adaptation Program proposal writing process; ii) through the close coordination with the Climate Change National Committee headed by MiAmbiente. B) The FCPF Project or REDD+ Phase 2 with funding from the WB, jointly implemented with UNDP. This project is particularly oriented to complete the national forest inventory, so no duplication with the proposed adaptation programme is foreseen.
c) Climate change capacity building processes: i) the technological needs assessment (TNA) with technical assistance from UNEP-DTU and the CTCN is also in the works. It will be important to establish opportune communication with this initiative in order to share information regarding the technical solutions promoted by the Adaptation Programme to ensure the experience is adequately considered in the assessment. ii) Technical process to transform the environmental unit of the MIDA (Min. of Agriculture) into a climate change and environment division within the Ministry. This Ministry is actively participating in the proposal writing process; coordination between the AP and the Ministry has been emphasized and became operational very early in the process, starting with the proposal writing process. Also coordination with national efforts driven by MIDA, particularly the “Plan Sequía” to address effects of ENSO (El Niño Southern Oscilation) is secured through MIDA`s focal point who has accompanied the proposal writing process.

Other climate change projects under implementation include: a) the USAID Adaptation Regional Programme which focuses in the region of the Darien, so no overlapping or duplication in terms of activities in the prioritized watersheds by the Adaptation Programme is expected; b) climate change project under implementation jointly by MiAmbiente, Authority of Aquatic Resources in partnership with Wetlands Int. and UNDP, focusing in the role of mangroves as carbon sinks, working directly in the province of Darien and the coastal area of Chiriqui Province; the project is mainly oriented to address mitigation issues, so no overlapping, but complementarity is foreseen for the works in the Chiriqui Province.

Actually other adaptation efforts are taking place in the country implemented at local levels by Universities, NGOs and/or local groups. The adaptation knowledge platform included in Component 4 will contribute to make visible adaptation efforts all across the country and promote knowledge sharing and synergies among the different participants and stakeholders. This type of synergy and coordination is not taking place currently systematically.

Finally, and as indicated in previous sections, the Adaptation Programme will directly support implementation of prioritized actions of the Management Plans and the Conservation Area Plans of the CHVRW and SMRW. An explicit coordination mechanism will be defined during the inception workshops with MiAmbiente regional offices to align the correspondent work plans and participate jointly in the monitoring and evaluation sessions, including those in the context of the PMEMAP (monitoring programme for the management effectiveness) which includes both watersheds. With regards to the implementation of the CAPs for the Gallito River Watershed and the Caisan River Watershed, coordination is secured, since implementing action for both CAPs is being promoted by F. Natura.

G. If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

The proposed Adaptation Programme includes a specific component devoted to promote adaptation learning and knowledge management at the national and local levels: To do this, the Programme will undertake the following strategies:

G1. STRATEGY TO CAPTURE THE EXPERIENCES AND LESSONS LEARNED. ON THE GROUND.

Programme strategy to promote knowledge sharing across the different components includes a combination of the following methods:

a) Positioning the climate change national committee as a technical advisory instance for the programme. The Programme will promote the creation of a knowledge subcommittee within the Climate Change National Committee, whose purpose will be to permanently look for information and knowledge pieces that could be derived from the different programme activities).
b) Project implementation architecture defined by F. Natura will emphasize the role of the Programme Coordinator regarding the need to include explicit and periodic milestones in the WP to share advances/limitations among programme partners and project staff
c) Observing RBM recommendations, the M&E process will be launched in a very initial stage of programme implementation, aiming to capture lessons learned from the very beginning and introduce adjustments in the plan as needed.
d) Systematization of adaptation experiences described in 4.4 will feed the knowledge sharing process.
e) Specific knowledge and experience sharing activities between key stakeholders of the 2 watersheds, including at least one international technical guided visit to enable output 1 results. Development of a suite of web based tools such as webinars and communities of practice to promote knowledge sharing
f) Establishing operative/functional communication channels with existing local governance instances, particularly Watersheds Committees, juntas locales de agua

(water local committees), boards of rural aqueducts, and the municipalities to present programme advances and coordinate actions.

g) Reporting documents at all levels (program partners, project staff, consultants) will include the requirement of documenting interactions with stakeholders, coordination meetings with government and nongovernment partners during the implementation of the contract/agreement and outline knowledge products envisioned or limitations to reach those.

G2. PROGRAMME STRATEGY TO ENSURE OUTREACH OF KNOWLEDGE PRODUCED, PARTICULARLY TO STAKEHOLDERS WITH LIMITED ACCESS TO INFORMATION TECHNOLOGY TOOLS.

The Programme will promote:

a) Periodic public events to present/discuss programme activities and receive feedback from local stakeholders.
b) Information/Dissemination materials to be used during the different stages of the program (fact sheets, media dossiers, other) as part of a larger communications strategy for the programme, taking advantage of working sessions conducted in the different components
c) F. Natura will promote collaborative agreements with academic institutions with presence in CHVRW and SMRW, specifically public universities to keep them informed and engaged with programme activities
d) Functional coordination with MIDA, IDIAP (Institute of Agriculture Research) and other related public services, to include programme information and activities as part of their Extension Programmes in CHVRW and SMRW
e) Technology responses: Applications via cell phones, radio, others to facilitate access to climate data generated by the programme components, particularly output 3
f) Coordination and information channel with local water management instances (“juntas locales de agua”, irrigation committees; watershed and sub-watershed committees and sub-committees, health committees, other)

G3. PROGRAMME KNOWLEDGE MANAGEMENT STRATEGY FOR LONG TERM PROJECT OUTCOMES SUSTAINABILITY

Programme strategy to guarantee long term sustainability of the knowledge products, especially the climate change adaptation portal is to develop it linked/hosted in the Min. of Environment (MiAmbiente) web site, and promote the creation of an inter institutional working group ETESA-MiAmbiente-MIDA to orient the portal design and implementation. Other options to guarantee long term sustainability of the portal is to explore functional partnerships with CATHALAC and/or Technological University of Panamá (UTP).

H. Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in

compliance with the Environmental and Social Policy of the Adaptation Fund.

The NIE (Natura Foundation) has worked in close coordination with the Ministry of Environment (DNA) for development of this concept of the proposed program. Moreover, in view of the multiple sectors involving the proposed program, both the NIE and DNA have also held meetings and consultations with institutional stakeholders -the Ministry of Agriculture Development and Electric Transmission Company (ETESA). These consultations will be extended to other governmental actors and other sectors (private, civil society, etc.) in the formulation stage of the full proposal until April 2016. In addition, the formulation of this program concept was based on the results from several consultative processes carried out at Chiriquí Viejo and Santa Maria river watersheds -as part of the development of their management plans-.

Also the results from consultations made by the Ministry of Environment to date, during the current preparation of the National Plan for Water Security 2015-2030, were taken into consideration.

The Programme

Support from key stakeholders is guaranteed. Ministry of environment (MiAmbiente) as fund designated authority has fully endorsed the project concept and has already designated a climate change officer as institutional focal point and member of the proposal writing team. Ministry of Agriculture has also designated a focal point, who actively participated in the proposal writing process; in addition, an endorsement/support letter signed by the Ministry is attached in annex. Support letter from ETESA was submitted. A support letter from SINAPROC, national entity responsible for emergency and disaster risk reduction, is also submitted.
In addition to the abovementioned support letters, institutional arrangements for programme implementation include signing a collaborative agreement between F. Natura and the 3 entities to fully describe the extent and scope of the institutional involvement and support.
The idea is that these agreements will promote preparation of an integrated work plan and also integration of programme outputs and activities within the institutional correspondent operative plans.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

The amount of funding requested (US$ 9,952,131) is considered valid and reasonable:

- The Programme scope encompasses interventions both at the local level (CHVRW and SMRVW) and the national level.
- The basis of the Programme is to strengthen the water-food-energy-climate nexus, resulting in a multisectoral approach, which is more complex in terms of the expected interconnected results and the number of activities to actually enable those synergies.
- The Programme includes a balanced suite of implementation of adaptation measures at the local level (water storage and irrigation systems; conservation activities through agroforestry; sustainable cattle raising/ASP project; installation and operation of EWSs), complemented by technical analysis and production of operative and knowledge products (business plans, water security district plans, technical notes, water foot print analysis, systematization documents, Adaptation M&E protocol, adaptation knowledge platform, among others)
- The Programme devotes a significant amount of financial resources to the strengthening of the current hydro meteorological network, evolving into a National System of Climate Data, operatively connected with the Ministry of Agriculture through a special node.
- Adaptation measures described have been budgeted taking into consideration orders of magnitude (cost figures) based in previous interventions of the implementing partners (Fundación Natura, Min. of Environment; ETESA, Ministry of Agriculture). Unitary costs have been revised to present accurate orders of magnitude to each component.

J. Describe how the sustainability of the project/programme outcomes has been taken into account when designing the project / programme.

Sustainability of programme outcomes particularly relies in the fact that the proposed lines of action are part of current explicit institutional planning and operative plans. Based on this, the programme reasoning is that the results will serve as building blocks of future institutional efforts to cope with climate change.

Also sustainability of programme outputs is envisioned as the result of positive socio-economic results derived from the implementation of productive good practices and promoting stakeholders appropriation at the farm owner level. At the national scale, the hypothesis is that as a result of the programme actions, authorities and communities will perceive an improvement in water governance as a consequence of added transparency in the decisions to grant water rights (concessions and permits), promoting the permanence of the adaptation measures implemented by the programme.

Although a detailed sustainability analysis shall be presented with the full proposal document, it is important to mention that the proposed activities at both watersheds can be sustained overtime due to the alignment with the national and local agenda for climate change. This programme is connected with priorities established by the

National Climate Change Committee, as well as the priorities identified by the recently established watershed committees at Chiriquí Viejo and Santa María.

Furthermore, the programme proposes the establishment of an advisory committee for the National Climate Change Committee, to follow up on the advances, results and impacts of the proposed activities, as well as lessons learned for future interventions.

Regarding the socio-economic aspects of the proposed activities, all of them have been designed to develop and install climate-smart / best practices that will be able to continue after the program ends. In this regard, it is especially important to note that the agriculture, cattle-rising, agri-business, water harvest, gallery forests and related activities will be implemented with the technical assistance of the Ministry of Agriculture Development and Ministry of Environment, both of which have proven experience in extension initiatives to ensure sustained results beyond the programme end.

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

As part of the concept design, an analysis was developed to assess environmental and social impacts and risks. Further analysis will be carried out as part of the process for development of full proposal.

RISKS

The following risks have been identified as described below; however, for the implementation of the proposed program it will be used the risk analysis matrix which was approved as part of the accreditation process of Fundación Natura as a NIE.

Table 9. Overview of the risks identified as being relevant to the project / program and their proposed mitigation measures

RISKS	MITIGATION MEASURES
1. Lack of receptivity to the information and activities generated by the program due to absence of awareness, among the beneficiary institutions and stakeholders, about the climate related origin of the problem, instead of considering it is a result of	• A baseline survey will be conducted on the level of awareness in the target population about impacts and the climatic cause of the problem to be addressed by the program. • From the survey data results, information materials will be generated and distributed to begin filling the knowledge gaps identified. • From the beginning, during the programmed inception workshops, it will be clearly stated that the program is not intended to resolve the conflict, but to provide technical

RISKS	MITIGATION MEASURES
deficient management of natural resources.	information for the discussion that will address this conflict. From day 1, meetings and workshops will be held, and printed materials distributed to inform stakeholders about the objectives and what the program will and will not address.
2. The program fails to connect with public policy.	• The program will generate specific inputs to support the public policy process (a zoning map of agricultural production including geographical distribution and crops types, based on climate variability; recommendations to improve the process of granting water concessions; guidelines for funding activities to adapt to climate change; technical information for restoring hydrological cycle in vulnerable areas; district plans for water security; a monitoring and evaluation tool that will serve the MiAmbiente to start evaluating the progress of other adaptation efforts that are being implemented in the country). • The program will work with existing multi-sectorial agencies (for example, the National Committee on Climate Change, the Technical Secretariat of Energy). • The knowledge and information products from the program will be available for inter-sectorial technical discussion tables. • From the beginning, during the programmed inception workshops, it will be clearly stated the scope and objectives of the program.
3. The management of conflict for water uses –for example, agriculture and hydropower generation.	• From the beginning, during the programmed inception workshops, it will be clearly stated that the program is not intended to resolve the conflict, but to provide technical information for the discussion that will address this conflict. From day 1, meetings and workshops will be held, and printed materials distributed to inform stakeholders about the objectives and what the program will and will not address. • Sectorial technical discussion tables will be able to use -as reference- the knowledge and information products from the program. • There will be continued technical advice in conflict management throughout the program implementation.

RISKS	MITIGATION MEASURES
4. The Adaptation Programme is perceived by external audiences as a MiAmbiente driven process, since it is closely related to other climate change processes leaded by the Ministry.	• In a very early stage of the Adaptation Programme implementation (inception phase), design and disseminate a corporative image (logo) of the Programme, as part of the communications strategy. This could be done, for example, applying a participative approach, promoting a contest in the Chiriqui Viejo and Santa Maria communities or similar activity. • Emphasize the role and participation of the Climate Change National Committee during all the programme stages (as opposed to make visible only MiAmbiente and MIDA`s participation) • Through the Communications Strategy, strengthen Fundacion Natura`s role as Programme leader accordingly to its mandate as NIE. This means, defining visibility of Fundacion Natura and the other programme main partners in all programme activities, documents, publications. Also emphasizing the role of the local beneficiaries and partners. • Use of the climate change adaptation portal (output 4.5), to promote broad participation of sectors, non-government stakeholders, academia, and shared ownership of the Programme activities and results. • The Adaptation Programme` s work plan should reflect the importance and balance among all partners activities and roles. This should be permanently reviewed as part of the M&E protocol.

Table 10. Overview of the environmental and social impacts and risks identified as being relevant to the project / program

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law		Shall the final design of each intervention demands an environmental impact assessment[40], this will be performed for development of water harvesting systems, irrigation systems, and construction of infrastructures related to the early warning systems and the National System for Climatic Data. Preliminary no category 3 EIAs are envisioned. In addition, for development of improved farming practices, all regulations regarding fertilization or waste management will be met.
Access and Equity		Regarding the proposed capacity building activities, there could be a risk of failing to train all relevant population targets (including among the most vulnerable population). To prevent this, the events will be thoroughly announced, with emphasis among this part of the population. During the process for selection of intervention sites (example: for irrigation, farm planning), a set of criteria will be carefully designed and applied in order to choose those that will result in the best outcome for the program purposes. Regarding equitable distribution of benefits, a key aspect will be to find out gender-based barriers to full participation for each specific group of women and men. The programme strategy to do this and overcome the barriers for each group include: a) conducting a

[40] According to Executive Decree 123 of 14 August 2009, by which it is regulated chapter 2 of Title IV of Law 41 of 1 July 1998, General of Environment of the Republic of Panama, and abolishes the Executive Decree 209 of 5 September 2006.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
		social/gender overview to be very aware of the context and to determine the factors affecting women and men (this specific analysis will be included in the VIAs (2.1);b) development of indicators that will help to measure how effectively the project is addressing the different needs, interests and resources of both women and men (as beneficiaries, workers and citizens). This provision will be a key element when designing the M&E protocol included in output 3.4
Marginalized and Vulnerable Groups		During the process for formulation of full proposal, a complete analysis is being made in order to prevent any risk of generating and adverse impact on marginalized / vulnerable groups. This Programme is not targeting indigenous communities particularly. The targeted direct beneficiaries are vulnerable communities of local farmers located in the CHVW and the SMRW, including the prioritized sub-watersheds (Río Gallito and Río Caisan) engaged with agriculture and livestock production, other major users of water resources including hydro energy stakeholders and microfinance institutions. Government and non-government institutions will benefit of access to climate data and specialized training for climate change science and action. Indigenous communities are being directly targeted regarding climate change dimension through the REDD+ Programme (ONU REDD, UNDP).
Human Rights	No initiatives are identified whose execution is misaligned with	

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
	the established international human rights. Project objectives, on the contrary, promote basic human rights with activities that will help ensure in the mid and long term a sustainable and equitable access to water, better livelihoods, built capacity and access to information	
Gender Equity and Women's Empowerment		During the process for formulation of full proposal, a complete analysis is being made in order to ensure promotion of gender equity, and that women are enabled to participate fully and equally without suffering any adverse effects for doing so. The action mentioned above regarding conducting a social/gender overview to be very aware of the context and to determine the factors affecting women and men (this specific analysis will be included in the VIAs) and including gender specific indicators in the M&E protocol is particularly related with this principle.
Core Labour Rights		
Indigenous Peoples	The program proposed does not include indigenous	Even so, during the process for formulation of full proposal, a further analysis is being made in order to ensure the proposed program guarantees

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
	people's territories. Thus, no initiatives have been identified whose orientation or execution disrespects the rights and responsibilities of indigenous groups.	compliance for this principle; that is, under the assumption that any group of indigenous people's families should enter the program's geographical focus areas, and become indirectly affected by the program´s activities. (see comments to the principle of *Marginalized and Vulnerable Groups)*
Involuntary Resettlement	Resettlement is not envisaged under this program´s activities. No initiative has been identified with orientation or execution requiring involuntary resettlement.	
Protection of Natural Habitats		During the process for formulation of full proposal, a complete analysis is being made in order to ensure the proposed program does not encourage, in any form, conversion or degradation of natural habitats, critical areas known and protected for special purposes according to national laws. The project does not encourage conversion or habitat degradation; by contrast, it enhances protection of natural habitats by facilitating the implementation of strategies prioritized in conservation area planning processes, and for areas with significant conservation values, associated to protected areas.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Conservation of Biological Diversity		The proposed activities are focusing on enhancing protection of natural habitats by facilitating the implementation of strategies prioritized in conservation area planning processes, and for areas with significant conservation values, associated to protected areas. No risk has been identified that threatens integrity of biological diversity. Nonetheless, during the process for formulation of full proposal, a further analysis will be made in order to ensure the proposed program guarantees compliance for this principle.
Climate Change	None of the proposed initiatives has been identified as potential source of, or cause, unjustified greenhouse gases. On the contrary, some of the proposed interventions will lead to greenhouse gas reduction	
Pollution Prevention and Resource Efficiency	So far, none of the proposed initiatives has been identified as huge energy demanding. Furthermore, no initiatives have been identified as	During the process for formulation of full proposal, a complete analysis is being made in order to identify potential impacts –regarding resource efficiency- for each component.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
	bigconsumers of natural resources and therefore would require measures for their efficient use. On the contrary, some initiatives are oriented towards the better use of available resources, especially water. Also, no initiative has been identified that generates solid waste that requires any treatment.	
Public Health		Some of the agricultural activities proposed could generate health risks if they fail to comply with pertinent national regulations (for example, during use of fertilizers). To avoid this, executing organizations and beneficiaries will be required to ensure, by formal means (contractual clause or agreement), compliance with the laws and to take any further measures in their power to avoid risks on public health. In addition, co-benefits in health sector are envisioned related to improved water management skills at the local level, contributing to efforts to fight *Aedes*

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
		aegypti propagation related diseases (dengue and zika)
Physical and Cultural Heritage	None of the proposed activities pose a risk that there will be alteration or damage to sites or cultural resources with natural or scenic value.	Despite of this, during the process for formulation of full proposal, a further analysis is being made in order to ensure the proposed program guarantees full compliance for this principle.
Lands and Soil Conservation	None of the proposed initiatives has been identified as causing soil degradation or loss of productive lands.	Some of the proposed activities are oriented towards soil conservation or improvement of productive lands. All technical guidelines from Ministry of Agriculture Development will be observed during implementation of agricultural practices to avoid any possible risk on this subject.

According to the ESP guidelines and the identified risks, the proposed programme is considered to fall in category B (programmes/projects with potential adverse impacts that are less adverse than Category A) with potential small adverse environmental or social impacts that would be easily mitigated. The potential impacts would be identified jointly with key stakeholders during the consultation process for the full proposal development, in order to include in the project implementation arrangement and actions to prevent or mitigate them through a risk management plan. By contrast, it is clear that the programme aims to promote positive socio-economic impacts: contribution to solving existing conflicts among water users by generating and providing open access to climate data to users and regulators; promotion of income generating activities and livelihood improvement through climate sensitive productive practices. From the environmental perspective, the programme supports the maintenance of ecosystem services provision through promotion of conservation and restoration activities on the ground, based in previous conservation area planning processes; improving sustainable use of natural resources through promotion of climate smart agriculture practices (outputs 1.2, 1.3, 1.4) and reflexive analysis regarding water concessions for hydro energy development, using climate data as evidence. However, it is anticipated that the project takes into consideration some risks with their mitigation measures (see in section K table 9 - Overview of the risks identified as being relevant to the project /

program and their proposed mitigation measures; and 10 - Overview of the environmental and social impacts and risks).

A most completed detail of those risks ant its mitigation measures is being assessed and validated during the full proposal consultation process underway as of April 2016.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme implementation.

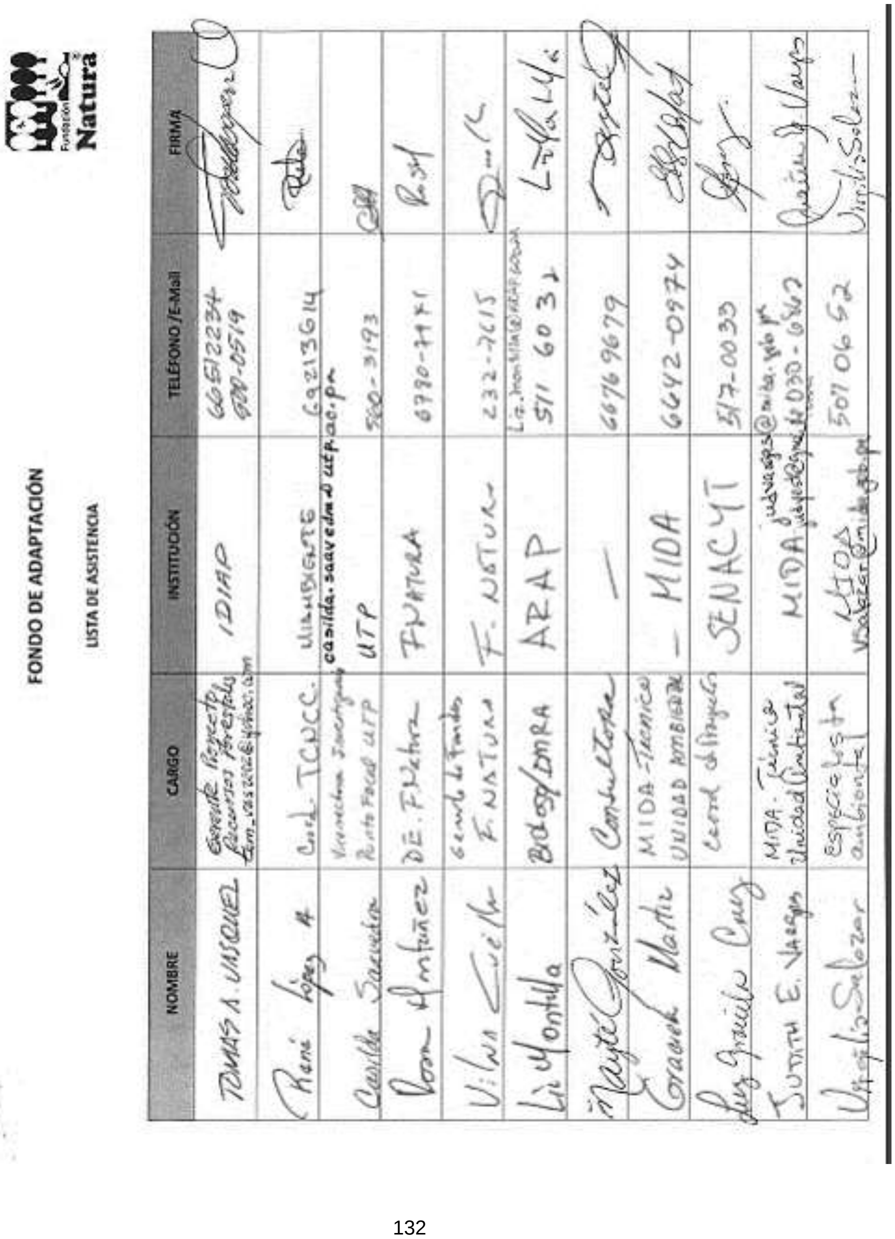
Institutional arrangements for Programme implementation include:

a) MoU/Collaborative agreement signed among F. Natura, Ministry of Environment, Ministry of Agriculture and ETESA as programme implementation partners. The purpose of this document is to express the interest of the 4 entities to advance climate change adaptation action in Panama, based in the Adaptation Programme components and results. The institutions recognize that the programme activities and results are part of their interinstitutional planning strategies and goals. The institutions express their willingness to provide technical guidelines and support to implement the programme approved activities by the AF and commit to devote the necessary institutional resources.
b) Governing body of the program: Board of Trustees of Natura including its special committees.
c) Technical Advisory Committee (Advisory Committee) formed by local/international experts in climate change adaptation to provide technical/peer to peer recommendations to improve programme implementation and impact. Ad honorem participation; members will be jointly identified by the programme partners.
d) Implementation contracts managed by Fundación Natura with implementing partners, through public-open calls.
e) Periodic informative events to present programme advances, lessons learned and necessary adjustments in light of national and local circumstances, if needed.

The program for current consultation process during April 2016 is as follows:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
4	5	6	7	8	9	10
National Committee for Climate Change Presentation and discussion meeting		Meeting with personnel from the Ministry of Agriculture Development / Environmental Unit		Discussion meeting with SINAPROC		
11	12	13	14	15	16	17
Submission of proposal to Adaptation Fund with results to date			Working meeting with the Technological University of Panama	Working meeting with ETESA		
18	19	20	21	22	23	24
		Working meeting with the MIDA-regional specialist staff	Working meeting with the MIDA-regional specialist staff			
25	26	27	28	29	30	
	Public Consultations at the ChVRW		Public Consultations at the SMRW	National Committee for Climate Change Workshop and final consult		

The list of participants for some of the meetings held so far (including with NCCC and SINAPROC) are shown as follows:



FONDO DE ADAPTACIÓN

LISTA DE ASISTENCIA

NOMBRE	CARGO	INSTITUCIÓN	TELÉFONO /E-Mail	FIRMA
TOMAS A. VASQUEZ	Gerente Proyecto Recursos Forestales tom_vasquez@yahoo.com	IDIAP	66512234 500-0519	[signature]
René López A	Coord. TCNCC.	MIAMBIENTE	69213614	[signature]
Casilda Saavedra	Vicerrectora Investigación Punto Focal UTP	casilda.saavedra@utp.ac.pa UTP	560-3193	[signature]
Rosa Antúnez	DE. F.Natura	FNATURA	6780-7771	[signature]
Vilma Cuéllar	Gerente de Fondos F.NATURA	F. NATURA	232-7615	[signature]
Liz Montilla	Bióloga/DMRA	ARAP	Liz.montilla@arap.gob.pa 511 6032	[signature]
Mayté González	Consultora	—	6676 9679	[signature]
Graciela Martiz	MIDA - Técnico UNIDAD AMBIENTAL	— MIDA	6642-0974	[signature]
Luz Graciela Cruz	Coord. de Proyecto	SENACYT	517-0033	[signature]
JUDITH E. VARGAS	MIDA - Técnica Unidad Ambiental	MIDA juvargas@mida.gob.pa juvargas@gmail.com	6030-6867	[signature]
Virgilio Salazar	especialista ambiental	MIDA vsalazar@mida.gob.pa	507 06 52	[signature]

NOMBRE	CARGO	INSTITUCIÓN	TELÉFONO/E-Mail	FIRMA
DIEGO GONZALEZ	GERENTE TECNICO	HIDROMET - ETESA	501 3849 dgonzalez@etesa.com.pa	
EDILBERTO ESQUIVEL	DIRECTOR DE HIDROMETEOROLOGIA	HIDROMET - ETESA.	501 3849 eesquivel@etesa.com.pa	
ERIC DE YEAZA	COORDINADOR DE REGIONALES	DDAN	6090-8100 edeyeaza@miambiente.gob.pa	
Héctor A. Rodríguez	TECNICO/ANALISTA DEPTO. ELECTRICIDAD E HIDROCARBUROS	SECRETARIA NACIONAL DE ENERGIA/MINISTERIO DE LA PRESIDENCIA	227-9976 hrodriguez@energia.gob.pa	
Mirta Benítez	Asesora CC	MI AMBIENTE	mbenitez@miambiente.gob.pa	

FONDO DE ADAPTACIÓN

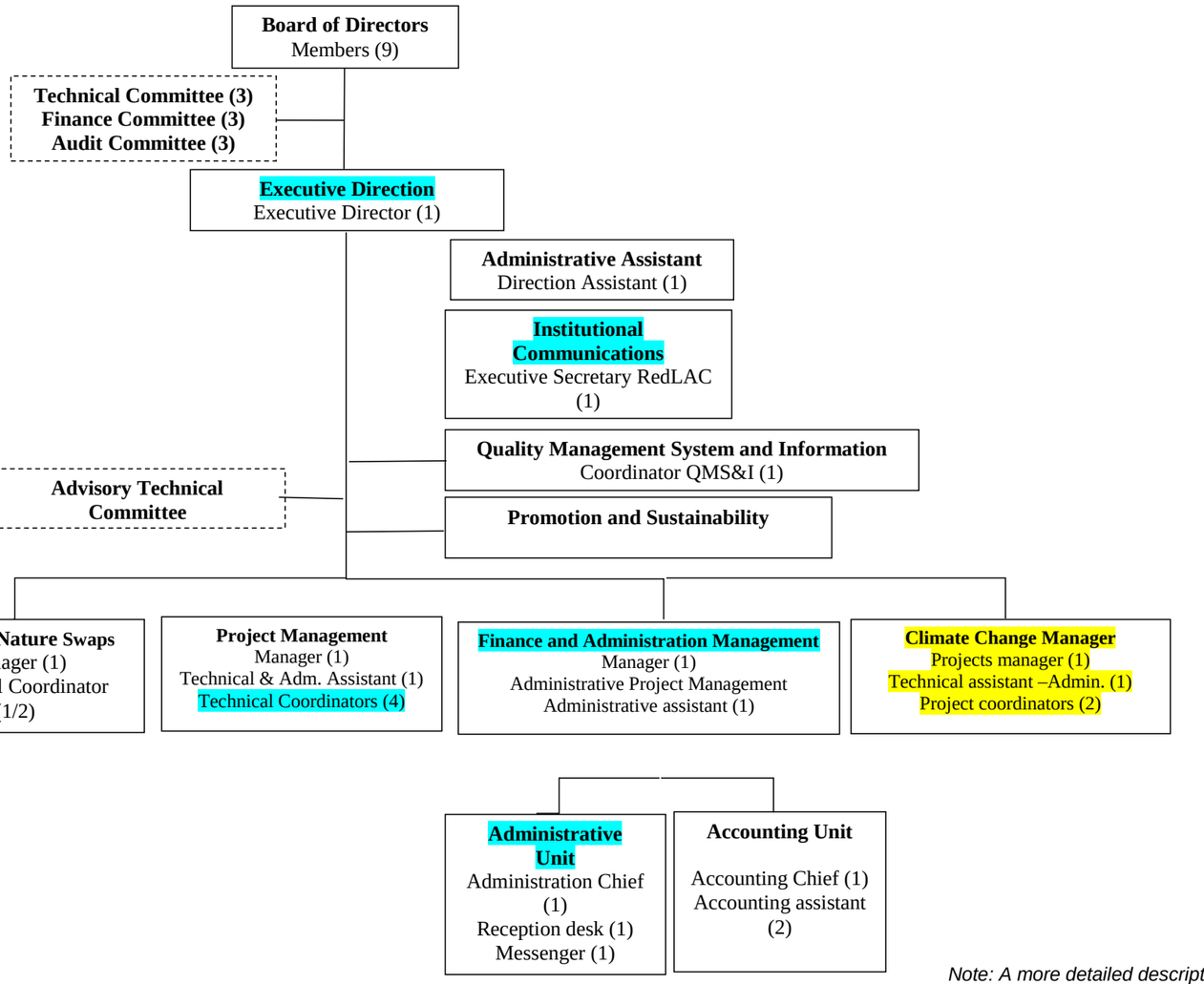
LISTA DE ASISTENCIA

NOMBRE	CARGO	INSTITUCIÓN	TELÉFONO / E-MAIL	FIRMA
Yira M. Campos B.	Dirección de Prevención y Mitigación de Desastres	SINAPROC	316-3255/56 6631-9048 yiracamposb@hotmail.com	[illegible]
Rafael Bonillo C	Director de Cooperación Técnica Internacional	SINAPROC	316-3218 6747-0678 (cell) ctisinaproc@gmail.com	[illegible]
Juan Carlos Rivas	Asistente de la Dirección de Coop. Técnica Internacional	SINAPROC	316 3276 ctisinaproc@gmail.com	[illegible]
Lorena Vargas	Analista de CC	MIAMBIENTE	500-08-02 lvargas@miambiente.gob.pa	[illegible]
Mirta E. Benítez	Analista Cambio Climático MI	MI AMBIENTE	mbenitez@miambiente.gob.pa	[illegible]
Rosa Montañez	Directora Ejecutiva	F. NATURA	rmontanez@naturapanama.org	[illegible]
Vilma Cuéllar	Comité de Fondo	F. NATURA	vcuellar@naturapanama.org	[illegible]
[illegible]	Coordinadora nacional	Sinaproc Coop.	316-3241 316-	[illegible]

Although, as the consultation process is still underway, implementation arrangement by Fundación Natura discussed so far include the following:

ADAPTATION FUND – NATURA FOUNDATION

Institutional arrangement



AF Project staff
Support for AF Project

Note: A more detailed description of the implementation arrangements will be provided upon consultation completion

B. Describe the measures for financial and project / programme risk management.

To this end, Fundación Natura will implement the risk analysis model as included in its standard operating procedures. See tables No. 9 and 10.

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

See tables No. 9 and 10.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

To ensure successful implementation of all programs / projects, Fundación Natura operates according to a detailed procedure, which will be used for the monitoring and evaluation of the proposed AF program. A general budget is provided below.

M&E				
Baseline survey	20,000			20,000
Quarterly technical and financial monitoring (travel expense, fuel, local transportation)	8,440	8,440	8,440	25,320
Mid term evaluation		30,000		30,000
Final evaluation			100,000	100,000
Audit	30,000	30,000	30,000	90,000
Viajes Misión de supervisión del programa y las reuniones del Comité Directivo	5,000	5,000	5,000	15,000
Total	**63,440**	**73,440**	**143,440**	**280,320**

Procedure

1. PURPOSE:

To establish the steps observed by NATURA Foundation for follow up of sub-projects in order to ensure the successful execution of allocated sub-projects.

2. SCOPE:

Responsible for the procedure: Project Manager.
This procedure is applicable to the Trustees Board, the Executive Director, the Executive Director Assistant, the Project Manager, the Administration and Finances Manager, the

Project Coordinator, the Administrative Assistant, Accounting and Receptionist; goes from the organization and undertaking of the installation visit by the Project Coordinator up to when the Administrative Assistant receives notice of receipt of Note and Report with sub-projects' performance comments, by the Executing Agency.

3. RELATED PROCEDURES AND OTHER DOCUMENTS:

Documentation Level	***Code***	***Related Documents***
ISO 9001 Standard	*7.5.1*	*Control of the production and service provision*
Management Manual:	*M-GO-2*	*Production and service provision*
This procedure		
Work instructions:	*I-GO-10.1* *I-GO-10.2* *I-GO-10.3* *I-GO-10.4*	*Installation Visit* *Revision of the Quarterly Technical and Financial Report and of the request for payment* *Penalty for noncompliance in report delivery* *Technical and administrative monitoring of the sub-project*
Records:	*F-GO-10.1.1* *D* *D* *D* *F-GO-10.0.1* *D* *F-GO-10.4.1* *F-GO-10.0.2*	*Visit of Installation Minutes* *Quarterly Technical Report* *Quarterly Financial Report* *Request for Disbursement* *Note of Comments to the Quarterly Reports or/and Request for Disbursement* *Payment Control Sheet and Financial Plan* *Sub-project's technical and administrative monitoring report* *Note and Report with comments to sub-project's performance*
External documentation:	*N/A*	*N/A*
Related MS documentation:	*P-GO-9* *P-GO-11* *P-GO-14*	*Contracting* *Sub-projects evaluation* *Accountability*

4. PROCEDURE:

Note 1: *This procedure is not applicable to the Annual Operational Plan and Budget presented by the National Environmental Authority.*

4.1. Once the Administrative Assistant sends the notarized contract and receives notification of receipt from the Executing Agency, informs the Project Coordinator who organizes and

*carries out the installation visit, according to **I-GO-10.1 Installation Visit** then prepares the **Installation Visit Minutes, F-GO-10.1.1**, uploads the digital file to the corresponding activity in SIIAP and informs the Project Management.*

*4.2. The Receptionist receives from the Executing Agency: **D-Quarterly Technical Report**, **D-Quarterly Financial Report**, **D-Request for Disbursement** and sends them to the Administrative Assistant, who records the entry and uploads the progress report in SIIAP during the sub-project's monitoring phase with input data from the technical and financial reports and during the sub-project's supervision and control phase with the input data from the Request for Disbursement.*

*4.3. The Project Coordinator revises the Technical and Financial Report and the Request for Disbursement, according to instructions: **I-GO-10.2 Revision of the Quarterly Technical and Financial Reports and Request for Disbursement** and **I-GO-10.3 Penalty for Noncompliance in Report Delivery**, then proceeds as per case:*

***Note 2:** Technical and financial quarterly reports from Executing Agency are due 15 calendar days prior to the termination of the reported quarter and shall be submitted to NATURA Foundation 7 calendar days prior the end of the reported quarter.*

4.3.1. If the Project Coordinator has comments to any of the documents in item 4.2; goes to 4.4.

4.3.2. If the Project Coordinator has no comments to any of the documents in 4.2; goes to 4.6.

*4.4. The Project Coordinator prepares prints and signs the **Note of Comments to Quarterly Reports and/or Request for Disbursement, F-GO-10.0.1** and sends it to the Administrative Assistant.*

4.5. The Administrative Assistant delivers then Note of Comments to Quarterly Reports and/or Request for Disbursement, F-GO-10.0.1, gives follow up to the receipt and to the response of respondent to them; goes to 4.2.

*4.6. The Project Coordinator prepares a quarterly report for donors and sends it to the Project Management for it to be considered in **Accountability, P-GO-14**, files the technical and financial reports; goes to 4.7 for carrying out the payment to the organization and goes to 4.15 for monitoring.*

*4.7. The Project Coordinator prepares the **Request for Payment, F-GO-9.2.1**, according to **I-GO-9.2 Request for Payment**, submits Request for Payment to the Project Management, who signs it in approval by the superior in line, the Project Coordinator sends the Administrative Assistant the Request for Payment together with the Request for Disbursement of the Executing Agency.*

4.8. The Administrative Assistant sends the Request for Payment and Request for Disbursement and updates their disbursement status in SIIAP.

*4.9. Accounting compares the stipulated amount in the request for payment to the request for disbursement and the modified budget (the period indicated in the request for disbursement) of the sub-project. If all documentation is in compliance, accounting updates **D-Disbursement Control Sheet and Financial Plan**, prepares **D-Prepared Payment**, fills out the information in the Request for Payment and files them in the disbursement files, and then sends the file to the Administration and Finances Management and registers the file exit.*

***Note 3:** If Accounting finds and discrepancy between the documents verified, it informs the Administrative Assistant, who will correct the discrepancy together with the Project Coordinator and if necessary with the Project Manager and/or respondent.*

4.10. The Administration and Finance Management verifies the file and marks the D-Payment prepared in conformity with the documentation and forwards to accounting where it they register file entry, and send it to the Executive Direction and register file exit.

4.11. The Executive Direction Assistant sends the Executive Director the file, and the Director marks the prepared D-Payment in conformity and sends it to the Executive Direction Assistant, who coordinates the delivery of the full file to the President of the Board of Trustees who verifies the documentation and sign payment.

***Note 4:** When the payment amount requires two signatures the Executive Direction Assistant will coordinate the delivery of the contract file to another member of the Board of Trustees signatory of the bank account from which the payment is to be withdrawn and then he shall proceed with verifying and signature.*

4.12. The Executive Direction Assistant received the file with the signed payment and sends it to Accounting.

4.13. Accounting executes disbursement in favor of the Executing Agency and informs via email to the Project Management, the Administrative Assistant and the Project Coordinator.

4.14. The Administrative Assistant informs the Executing Agency that the disbursement has been executed and registers it in SIIAP the disbursement of 100% with the date on which it was informed to the Executing Agency.

*4.15. The Project Coordinator prepares and carries out the Sub-project monitoring, according to instructions **I-GO-10.5 Sub-project technical and administrative monitoring** and prepares the **Sub-project technical and administrative monitoring Report, F-GO-10.5.1** and sends it to the Project Management. Updates in SIIAP: status of the monitoring activity and uploads digital monitoring report to monitoring activity and updates the progress status on each' sub-project outcome.*

4.16. The Project Management revises the technical and administrative monitoring Report for the sub-project and if it has any comments or suggestions informs them the Project Coordinator who will include them in the sub-project technical and administrative Report.

4.17. The Project Coordinator prepares, prints and signs the ***Note and Report with comments to sub-project's performance, F-GO-10.0.2*** *to be considered by the Executing Agency in the next technical and financial report and sends it to the Administrative Assistant. Uploads the note and report with comments to sub-project's performance in SIIAP in the corresponding monitoring activity.*

Note 5: *In the revision of the next-to-last technical and financial report, the Project Coordinator includes in the note a reminder for finishing the works and about the delivery of final technical and financial reports.*

4.18. The Administrative Assistant delivers the Note and Report with comments to sub-project's performance and gives follow up to the receipt by the Executing Agency.

END OF PROCEDURE

E. Include a results framework for the project proposal, including milestones, targets and indicators.

See tables included in the following section F.

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

Project Objectives	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
1. Increased climate change and variability adaptation capacity in agriculture, livestock, and energy production sectors	- Number of risk exposed population with climate-resilient sources of income and adapted livelihoods	AF Outcome 6. Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.1 Percentage of households and communities having more secure access to livelihood assets 6.2 Percentage of targeted population with sustained climate-resilient alternative livelihoods	4,301,131
2. Established climate resilient water management instruments with integrated and community based approach	- Number of communities with improved and sustainable access to water and natural resources in a changing climate scenario - Sectorial technical discussion tables using -as reference- the knowledge and information products from the project	AF Outcome 4. Increased adaptive capacity within relevant development sector services and infrastructure assets	4.1. Responsiveness of development sector services to evolving needs from changing and variable climate	515,000
3. Strengthened local-national capacity for monitoring and decision making to reduce and respond to risks associated with climate change	- Number of people at community and institutional levels with systems and tools to make informed decisions to reduce risks and losses due to climate-related events - Number of tailor-	AF Outcome 1. Reduced exposure to climate-related hazards and threats AF Outcome 2. Strengthened institutional capacity to reduce risks associated with climate-induced	1. Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis 2.1 Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	2,851,000

Project Objectives	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
	made tools to support production decisions (apps, calendar)	socioeconomic and environmental losses		
4. Awareness raised and knowledge exchange platform established to respond to, and mitigate impacts of climate-related events from local and national scope	- Number of people at community and institutional levels with skills to make informed decisions to reduce risks and losses due to climate-related events - Knowledge exchanges and successful information dissemination rates through the Portal for Climate Change Adaptation in Panama and related information products, by type of target group	AF Outcome 3. Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level AF Outcome 2. Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	3. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses 2.1 Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	766,870

Project Outcome(s)	Project Outcome Indicator(s)	Project Output(s)	Proposed activities	Fund Output	Fund Output Indicator	Grant Amount (USD)
Enhanced climate change resilience for improved food, water, and energy security in target watersheds	- No. of people with improved access to water from water harvest systems implemented - Percentage of targeted population with climate-smart farming solutions implemented - Income increase by source in targeted population	P Output 1.1 Concrete adaptation measures implemented for household water security P Output 1.2 Pilot climate-smart farming projects implemented P Output 1.3 Pilot diversified financing and income source models implemented in vulnerable population areas P Output 1.4 Concrete adaptation measures implemented for sustainable cattle ranching P Output 1.5 Enhanced sectorial support through climate financing instruments	• Install at least 50 water harvest systems, 25 in each of the watersheds (SMRW and CHVRW). Train beneficiaries on the installation, use, and maintenance of water harvest systems. • Establish irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. This includes: irrigation needs diagnostic; installation of pilot low cost irrigation system; technical assistance to farmers and companies for the implementation of the irrigation system; and monitoring and evaluation. It also includes -at Divalá-, a complement to the irrigation system consisting of an analysis of the water footprint for rice crops, which will allow identification of technological schemes for climate-smart rice production. • Implement the strategic action of establishing reforestation (for protection of watercourse) and agroforestry - soil conservation systems, at 10 farms along 6000 lineal meters of streams of the Caisan river (CHVRW). This activity includes identification of farms according to results from the Vulnerability Analysis, Farm Management Plan (with identification of species, crops/area zonification, costs); and the design and establishment of gallery forest, as well as the agroforestry systems. • Implemented the strategic action of creating capacities for operating orchid and “naranjilla” crops, as well as establishing the correspondent commercialization scheme at CRSM. It includes training on establishment and management of orchid and “naranjilla” crops; design of business plans; development/improvement of seedling nurseries; advice and technical assistance for commercialization. • Sustainable cattle ranching project implemented at SMRW, covering cover 800 has. • Reviewed current credit products offered to agriculture and energy sectors. • Developed 4 business plans (2 for each	AF Output 6. Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1 No. and type of adaptation assets (tangible and intangible) created or strengthened in support of individual or community livelihood strategies 6.1.2 Type of income sources for households generated under climate change scenario	4,301,131

Project Outcome(s)	Project Outcome Indicator(s)	Project Output(s)	Proposed activities	Fund Output	Fund Output Indicator	Grant Amount (USD)
			watershed) to establish and operate mini-hydro energy projects, including the correspondent farm management plan, informative prospectus to access financing sources for climate change adaptation activities, and technical assistance offered to obtain such financing. • Socialized the concept of Microfinance, based on ecosystems and climate change adaptation. It includes: Development of Microfinance Institutions mapping for both watersheds; Informative/instructional meetings on Microfinance for Ecosystem-based Adaptation (MEbA) with Microfinance Institutions, and identification of those interested/willing to participate in the training and technical assistance, • Selection of 2 Microfinance Institutions (one at each watershed) to develop the training and technical assistance in order to design and offer one finance product.			
Improved water governance and natural resources management in prioritized watersheds	- No. of water security instruments developed for implementation by districts that respond to climate-induced challenges - No. of people benefiting from management instruments designed and approved by incumbent authorities, which allow improved and sustainable access to water resources in a changing climate scenario	P Output 2.1 Analysis for climate change vulnerability done in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds P Output 2.2 Developed technical criteria for granting water use concessions and permits in order to reduce/avoid conflicts among users and increase ecosystem resilience in response to climate-induced stress	• Update SMRW Management Plan, incorporating the climate change dimension. It must include the analysis of current tendencies, future scenarios, potential socioeconomic impacts on the watershed, and duly prioritized adaptation measures. • Analyze vulnerability of the CHVRW, and validate/adjust climate change adaptation measures identified by the Adaptation Program outlined in the watershed Management Plan • Identify the hydrological balance and environmental flow for the SMRW, specifically at the Gallito river micro-watershed. • Identify the hydrological balance and environmental flow of the CHVRW, specifically at the Caisán river micro-watershed • Develop a technical document with criteria with incumbent authorities to consider during the process of granting water use permits for agriculture and power generation -based on	AF Output 4. Vulnerable development sector services and infrastructure assets strengthened in response to climate change impacts, including variability AF Output 1.1 Risk and vulnerability assessment conducted and updated	4.1.1 No. and type of development sector services modified to respond to new conditions resulting from climate variability and change (by type and scale) 1.1 No of projects/programmes that conduct and update risk and vulnerability	515,000

Project Outcome(s)	Project Outcome Indicator(s)	Project Output(s)	Proposed activities	Fund Output	Fund Output Indicator	Grant Amount (USD)
		P Output 2.3 Increased hydrological security in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds, in line with advances of the National Plan for Water Security	information and findings from the environmental flows analysis and climate data. • Review current concessions on both watersheds, based on the technical document, in order to determine recommendations for improving or restoring the water cycle. • Design 2 district plans for water security, incorporating climate information (1 at each watershed, SMRW and CHVRW). • Complement current technical analysis to elaborate a new national map for agriculture and livestock production in the country, based on climate and water management data generated by the program.		assessments (by sector and scale)	
Increased preparedness in target watersheds and reduced risk for disasters among vulnerable communities nationwide Improved access to data for informed, timely decision-making regarding climate variability risks	- No. of communities and population prepared with EWS for floods and drought risks - No. of institutions with access to upgraded hydro-agro meteorological information - Assessment tool developed to determine program´s adaptation measures effectiveness; people trained to use it	P Output 3.1 Designed and in operation the National System for Climate Data (NSCD), by upgrading ETESA´s existing network for recording climatic information from hydrographic watersheds P Output 3.2 Established an early warning system to identify in advance, the necessary measures in case of hydro-climatic events that could affect food production and power generation P Output 3.3 The NSCD interfaced and equipped with a joint	• Implement the sound warning system at the communities included in the CHVRW early warning system; and complete signposts along communities at risk areas. This EWS is focused on floods. • Implement an early warning system for floods and droughts at the SMRW. • Workshops and simulations to train technical staff and communities on the early warning system. • Design and operation of the National System for Climate Data, by upgrading ETESA´s existing network for recording hydro-agro meteorological information from hydrographic watersheds. • Interface and equip the system with joint node, with the Ministry of Agriculture Development, to generate and manage climatic information. • Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program. This includes program inception workshops with public and nongovernmental relevant stakeholders (at least three workshops). *This program will serve MiAmbiente in starting	AF Output 1.1 Risk and vulnerability assessment conducted and updated AF Output 2. Strengthened capacity of national and sub-national centers and networks to respond rapidly to extreme weather events	1.2 No. of early warning systems (by scale) and no. of beneficiaries covered 2.1.2 No. of targeted institutions with increased capacity to minimize exposure to climate variability risks (by type, sector, and scale)	2,851,000

Project Outcome(s)	Project Outcome Indicator(s)	Project Output(s)	Proposed activities	Fund Output	Fund Output Indicator	Grant Amount (USD)
		node, with the Ministry of Agriculture Development, to generate and manage climatic information P Output 3.4 Designed a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program and national efforts*	to evaluate progress of other adaptation efforts being implemented in the country.			
Improved institutional capacity, knowledge management, and awareness on climate change adaptation	- No. of people aware of target watersheds´ vulnerability analyses - No. of population participating in adaptation measures - No. of people with strengthened capacities for climate data analysis and processing, for different sectors - No. of people with strengthened capacities on water resources management by incorporating climate change adaptation	P Output 4.1 Improved awareness of watersheds vulnerability and participation of population groups in adaptation measures P Output 4.2 Strengthened professional capacities for the climate data analysis and processing, for different sectors involved P Output 4.3 Strengthened	• Socialize the SMRW and CHVRW vulnerability analyses to facilitate the implementation of identified adaptation measures • Offer a Climate Modelling Course with special emphasis on future scenarios impacting food-energy generation activities (at least 40 participants). • Offer an international course on Adaptation to Climate Change: Role of Ecosystem Services (40 participants nationwide, including stakeholders in the two prioritized watersheds). • Offer an international course on participatory and integrated watershed management emphasizing conflict management skills (40 participants nationwide, including stakeholders in the two prioritized watersheds). • Offer an international course on ecosystem-based adaptation at marine-coastal zones. (20 participants)	AF Output 3. Targeted population groups participating in adaptation and risk reduction awareness activities AF Output 2. Strengthened capacity of national and sub-national centers and networks to respond rapidly	3.1 No. of news outlets in the local press and media that have covered the topic. 2.1.1 No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender)	766,870

Project Outcome(s)	Project Outcome Indicator(s)	Project Output(s)	Proposed activities	Fund Output	Fund Output Indicator	Grant Amount (USD)
	approach - No. of people reached by systematization and dissemination of climate changes adaptation experiences nationwide - Statistics of use of the Portal for Climate Change Adaptation in Panama	professional capacities on water resources management by incorporating climate change adaptation approach P Output 4.4 Systematized and disseminated experiences on climate changes adaptation, nationwide P Output 4.5 Portal for Climate Change Adaptation in Panama, implemented	• Mapping and analysis of projects / initiatives undertaken. A technical and practical document that will be available in print and digital format will be developed. • 10 workshops will be held at national level (1 per province) to present the document. • Design and operation of the Portal for Climate Change Adaptation in Panama. • Compilation and synthesis of materials for different audiences on adaptation to climate change. • Training on the use of the portal for different audiences (producers, institutions, academic, etc.). • Communication strategy and systematization of experiences from the program. • Establishment of an advisory technical committee within the Climate Change National Committee to orient the program´s knowledge management process (output 4). • Experience exchanges activities at the local level, including at least one international pasantía (guided visit).	to extreme weather events		

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
1. Increase climate change and variability adaptation capacity in agriculture, livestock, and energy production sectors						
Output 1.1	Concrete adaptation measures implemented for household water security	a) Install at least 50 water harvest systems, 25 in each of the watersheds (SMRW and CHVRW). Train beneficiaries on the installation, use, and maintenance of water harvest systems.	116,600	103,300	11,500	231,400
		Total	**116,600**	**103,300**	**11,500**	**231,400**
Output 1.2	Pilot climate-smart farming projects implemented	a) Implement the strategic action of establishing reforestation (for protection of watercourse) and agroforestry - soil conservation systems, at 10 farms along 6000 lineal meters of streams of the Caisan river (CHVRW). This activity includes identification of farms according to results from the Vulnerability Analysis, Farm Management Plan (with identification of species, crops/area zonification, costs); and the design and establishment of gallery forest, as well as the agroforestry systems.	315,295	478,536	60,000	853,831

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		b) Establish irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. This includes: irrigation needs diagnostic; installation of pilot low cost irrigation system; technical assistance to farmers and companies for the implementation of the irrigation system; and monitoring and evaluation. It also includes -at Divalá-, a complement to the irrigation system consisting of an analysis of the water footprint for rice crops, which will allow identification of technological schemes for climate-smart rice production.	155,600	333,456	10,000	499,056
		Irrigation needs assessment	15,000			15,000
		Total	**470,895**	**811,992**	**70,000**	**1,352,887**
Output 1.3	Pilot diversified financing and income source models implemented in vulnerable population areas	a) Implement the strategic action of creating capacities for operating orchid and "naranjilla" crops, as well as establishing the correspondent commercialization scheme at CRSM. It includes training on establishment and management of orchid and "naranjilla" crops; design of business plans; development/improvement of seedling nurseries; advice and technical assistance for commercialization.	253,000	141,664	32,500	427,164
		Total	**253,000**	**141,664**	**32,500**	**427,164**
Output 1.4	Concrete adaptation measures implemented for sustainable cattle ranching	a) Sustainable cattle ranching project implemented at SMRW, covering cover 800 has.	747,700	1,175,700	146,280	2,069,680
		Total	**747,700**	**1,175,700**	**146,280**	**2,069,680**
Output 1.5	Enhanced sectorial support through climate financing instruments	a) Review current credit products offered to agriculture and energy sectors.	0	10,000	0	10,000

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		b) Develop 4 business plans (2 for each watershed) to establish and operate mini-hydro energy projects, including the correspondent farm management plan, informative prospectus to access financing sources for climate change adaptation activities, and technical assistance offered to obtain such financing.	0	75,000	0	75,000
		c) Socialize the concept of Microfinance, based on ecosystems and climate change adaptation. It includes: Development of Microfinance Institutions mapping for both watersheds; Informative/instructional meetings on Microfinance for Ecosystem-based Adaptation (MEbA) with Microfinance Institutions, and identification of those interested/willing to participate in the training and technical assistance, - Selection of 2 Microfinance Institutions (one at each watershed) to develop the training and technical assistance in order to design and offer one finance product.	0	129,000	6,000	135,000
		Total	**0**	**214,000**	**6,000**	**220,000**
		TOTAL	**1,588,195**	**2,446,656**	**266,280**	**4,301,131**
2. Establish climate resilient water management instruments with integrated and community based approach						
Output 2.1	Analysis for climate change vulnerability done in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds.	a) Update SMRW Management Plan, incorporating the climate change dimension. It must include the analysis of current tendencies, future scenarios, potential socioeconomic impacts on the watershed, and duly prioritized adaptation measures.	180,000	0	0	180,000

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		b) Analyze vulnerability of the CHVRW, and validate/adjust climate change adaptation measures identified by the Adaptation Program outlined in the watershed Management Plan.	100,000	0	0	100,000
		Total	**280,000**	**0**	**0**	**280,000**
Output 2.2	Developed technical criteria for granting water use concessions and permits in order to reduce/avoid conflicts among users and increase ecosystem resilience in response to climate-induced stress	a) Identify the hydrological balance and environmental flow for the SMRW, specifically at the Gallito river microwatershed.	45,000	0	0	45,000
		b) Identify the hydrological balance and environmental flow of the CHVRW, specifically at the Caisán river microwatershed.	45,000	0	0	45,000
		c) Develop a technical document with criteria to consider during the process of granting water use permits for agriculture and power generation -based on information and findings from the environmental flows analysis and other existing information at national level	10,000	15,000	0	25,000
		d) Review current concessions on both watersheds, based on the technical document, in order to determine recommendations for improving or restoring the water cycle.	7,000	8,000	0	15,000
		re	**107,000**	**23,000**	**0**	**130,000**
Output 2.3	Increased hydrological security in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds, in line with advances of the National Plan for Water Security	a) Design 2 district plans for water security, incorporating climate information (1 at each watershed, SMRW and CHVRW).	10,000	20,000	0	30,000
		b) Complement current technical analisys to elaborate a new national map for agriculture and livestock production in the country, based on climate and water management data generated by the program.	15,000	60,000	0	75,000

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		Total	**25,000**	**80,000**	**0**	**105,000**
		TOTAL	**412,000**	**103,000**	**0**	**515,000**
3. Strengthened local-national capacity for monitoring and decision making to reduce and respond to risks associated with climate change						
Output 3.1	Designed and in operation the National System for Climate Data (NSCD), by upgrading ETESA´s existing network for recording climatic information from hydrographic watersheds	a) Design and operation of the National System for Climate Data, by upgrading ETESA´s existing network for recording hydro-agro meteorological information from hydrographic watersheds.	1,420,000	530,000	50,000	2,000,000
		Total	**1,420,000**	**530,000**	**50,000**	**2,000,000**
Output 3.2	Established an early warning system to identify in advance, the necessary measures in case of hydro-climatic events that could affect food production and power generation	a) Implement the sound warning system at the communities included in the CHVRW early warning system; and complete signposts along communities at risk areas. This EWS is focused on floods.	0	105,000	5,000	110,000
		b) Implement an early warning system for floods and droughts at the SMRW.	0	170,000	10,000	180,000
		c) Workshops and simulations to train technical staff and communities on the early warning system.	0	35,000	16,000	51,000
		Total	**0**	**310,000**	**31,000**	**341,000**
Output 3.3	The NSCD interfaced and equiped with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information	a) Interface and equip the NSCD with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information.	0	380,000	20,000	400,000
		Total	**0**	**380,000**	**20,000**	**400,000**

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
Output 3.4	Designed a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program and national efforts*	a) Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program. This includes program inception workshops with public and nongovernmental relevant stakeholders (at least three workshops). *This program will serve MiAmbiente in starting to evaluate progress of other adaptation efforts being implemented in the country.	30,000	60,000	20,000	110,000
		Total	**30,000**	**60,000**	**20,000**	**110,000**
		TOTAL	**1,450,000**	**1,280,000**	**121,000**	**2,851,000**
4. Rise awareness and establish a knowledge exchange platform to respond to, and mitigate impacts of climate-related events from local and national scope						
Output 4.1	Improved awareness of watersheds vulnerability and participation of population groups in adaptation measures	a) Technical working sessions with key implementing partners and project staff to define WorkPlan, coordination arrangements and kick off meetings/requirements. These activity also includes the development and facilitation of training sessions with key project staff and partners about the nexus approach to water–energy–food security as an option for adaptation to climate change.	15,000	0	0	15,000

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		b) Inception workshops with local and national stakeholders to present the approved programme; revisit programme rationale, scope, define shared visions and operational arrangements for programme implementation. At least 2 local workshops, one for each watershed with local stakeholders. One national workshop with government and civil society stakeholders to present the Programme, identify sinergies with other ongoing adaptation efforts/initiatives and define operational and coordination aspects.	34,000	0	0	34,000
		c) Socialize the SMRW and the CHVW vulnerability analysis to facilitate the implementation of identified adaptation measures.	132,000	0	0	132,000
		Total	**181,000**	**0**	**0**	**181,000**
Output 4.2	Strengthened professional capacities for the climate data analysis and processing, for different sectors involved	a) Offer a Climate Modelling Course with special emphasis on future scenarios impacting food-energy generation activities (at least 45 participants).	0	85,000	0	85,000
		b) Offer an international course on Adaptation to Climate Change: Role of Ecosystem Services (45 participants nationwide, including stakeholders in the two prioritized watersheds).	75,000	0	0	75,000
		Total	**75,000**	**85,000**	**0**	**160,000**
Output 4.3	Strengthened professional capacities on water resources management by incorporating climate change adaptation approach	a) Offer an international course on participatory and integrated watershed management emphasizing conflict management skills (40 participants nationwide, including stakeholders in the two prioritized watersheds).	80,000	0	0	80,000

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		b) Offer an international course on ecosystem-based adaptation at marine-coastal zones. (20 participants)	0	35,000	0	35,000
		Total	**80,000**	**35,000**	**0**	**115,000**
Output 4.4	Systematized and disseminated experiences on climate changes adaptation, nationwide	a) Mapping and analysis of projects / initiatives undertaken. A technical and practical document that will be available in print and digital format will be developed.	0	25,000	0	25,000
		b) Ten workshops will be held at national level (1 per province) to present the document.	0	0	15,000	15,000
		Total	**0**	**25,000**	**15,000**	**40,000**
Output 4.5	Portal for Climate Change Adaptation in Panama, implemented	a) Communication strategy and systematization of experiences from the program.	90,000	0	0	90,000
		b) Design and operation of the Portal for Climate Change Adaptation in Panama.	13,000	4,000	4,000	21,000
		c) Compilation and synthesis of materials for different audiences on adaptation to climate change.	5,000	32,000	10,000	47,000
		d) Training on the use of the portal for different audiences (producers, institutions, academia, etc.).	10,000	20,000	10,000	40,000
		e) Establishment of an advisory technical committee within the Climate Change National Committee to orient the program´s knowledge management process.	6,000	8,000	5,000	19,000
		f) Experience exchanges activities at the local level, including at least one international technical guided visit.	0	38,700	15,170	53,870
		Total	**124,000**	**102,700**	**44,170**	**270,870**
		TOTAL	**460,000**	**247,700**	**59,170**	**766,870**
		Total Direct Costs	**3,910,195**	**4,077,356**	**446,450**	**8,434,001**

Output No.	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		Total EE (9.5%)				801,230
		Total NIE (8.5%)				716,890
		GRAND TOTAL				9,952,121

BUDGET ON THE IMPLEMENTING ENTITY MANAGEMENT FEE USE

Budget lines Adaptation Fund Program					
		Year 1	Year 2	Year 3	Total ($)
Project execution costs					
Program operational costs		116,788	69,288	69,288	**255,364**
General and administrative costs		63,736	58,736	58,736	**181,207**
M&E		63,440	73,440	143,440	**280,320**
	Total	**243,963**	**201,463**	**271,463**	**716,890**

H. Include a disbursement schedule with time-bound milestones.

Program time table and disbursement schedule are presented as follows:

Program Implementation Timetable

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
Op	**Establish program team; induction to the program**												
Op	**Periodic meetings for program implementation follow up with staff and stakeholders**												
Op	**Program implementation monitoring and evaluation**												
Output 1.1	**Concrete adaptation measures implemented for household water security**												
O 1.1 a	Install at least 50 water harvest systems, 25 in each of the watersheds (SMRW and CHVRW). Train beneficiaries on the installation, use, and maintenance of water harvest systems.												
	i- Diagnostic												
	ii- Installation of water harvest systems												
	iii- Systems maintenance												
	iv- Systematization of experiences and technical guides to implement water harvest system as climate change adaptation measure												
	v- Training on hydrological cycle and IWRM, methodology for water harvest system installation and basic concepts on climate change												
Output 1.2	**Pilot climate-smart farming projects implemented**												
O 1.2 a	Implement the strategic action of establishing reforestation (for protection of watercourse) and agroforestry - soil conservation systems, at 10 farms along 6000 lineal meters of streams of the Caisan river (CHVRW). This activity includes identification of farms according to results												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
	from the Vulnerability Analysis, Farm Management Plan (with identification of species, crops/area zonification, costs); and the design and establishment of gallery forest, as well as the agroforestry systems.												
	i- Ten farm management plans and soil analyses												
	ii- Identify water recharge zones to be restored/protected												
	iii- Implementation of agroforesty and soil conservation systems in ten farms												
	iv- Establish galery forest alogn 6000 lineal meters of streams of the Caisan river (CHVRW)(nurseries, establishment, and maintenance)												
	v- Training plan												
O. 1.2 b	Establish irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. It also includes -at Divalá-, a complement to the irrigation system consisting of an analysis of the water footprint for rice crops, which will allow identification of technological schemes for climate-smart rice production.												
	i- Irrigation needs assessment												
	ii- Installation of pilot low cost irrigation system												
	iii- Maintenance												
	iv- Technical assistance to farmers and companies for implementation of the system												
	v- Training plan (4 workshops and 2 exchanges)												
	vi- Water footprint analsys for rice crops to identify technological schemes for climate-smart rice production												
Output 1.3	**Pilot diversified financing and income source models implemented in vulnerable population areas**												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
O 1.3 a	Implement the strategic action of creating capacities for operating orchid and "naranjilla" crops, as well as establishing the correspondent commercialization scheme at CRSM. It includes training on establishment and management of orchid and "naranjilla" crops; design of business plans; development/improvement of seedling nurseries; advice and technical assistance for commercialization.												
	i- Development / improvements of nurseries												
	ii- Design of business plans												
	iii- Training on orchid and naranjilla crops management												
	iv- Establish commercialization scheme												
	v- Technical assistance												
Output 1.4	**Concrete adaptation measures implemented for sustainable cattle ranching**												
O 1.4 a	Sustainable cattle ranching project implemented at SMRW, covering cover 800 has.												
	i- Develop Farm Management Plans (sustainable cattle ranching)												
	ii- Implementation of technical solutions (catt												
	iii- Maintenance												
	iv- Implementation of training plan												
Output 1.5	**Enhanced sectorial support through climate financing instruments**												
O 1.5 a	Review current credit products offered to agriculture and energy sectors.												
	i- Analysis and technical recommendations on climate financing instruments												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
O 1.5 c	Socialize the concept of Microfinance, based on ecosystems and climate change adaptation. * To complete this activity, the program will take into consideration the experiences and products developed in the context of the MEbA project at Perú and Colombia.												
	i- Mapping of microfinance institutions on both watersheds												
	ii- Meetings on MEbA with microfinance institutions												
	iii- Training and technical assistance												
	iv- Promotion and establishment of pilot MEbA project												
	v- Monitoring and evaluation												
O 1.5 b	Develop 4 business plans (2 for each watershed) to establish and operate mini-hydro energy projects, including the correspondent farm management plan, informative prospectus to access financing sources for climate change adaptation activities, and technical assistance offered to obtain such financing.												
	i- Develop business plans and deliver technical assistance to obtain financing for mini-hydro energy projects												
Output 2.1	**Analysis for climate change vulnerability done in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds**												
O 2.1 a	Update SMRW Management Plan, incorporating the climate change dimension. It must include the analysis of current tendencies, future scenarios, potential socioeconomic impacts on the watershed, and duly prioritized adaptation measures.												
O 2.1 b	Analyze vulnerability of the CHVRW, and validate/adjust climate change adaptation measures identified by the Adaptation Program outlined in the watershed Management Plan.												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
Output 2.2	**Developed technical criteria for granting water use concessions and permits in order to reduce/avoid conflicts among users and increase ecosystem resilience in response to climate-induced stress**												
O 2.2 a	Identify the hydrological balance and environmental flow for the SMRW, specifically at the Gallito river microwatershed.												
O 2.2 b	Identify the hydrological balance and environmental flow of the CHVRW, specifically at the Caisán river microwatershed.												
O. 2.2 c	Develop a technical document with criteria to consider during the process of granting water use permits for agriculture and power generation -based on information and findings from the environmental flows analysis and other existing information at national level												
	i. Develop a technical document with criteria to consider during the process of granting water use permits for agriculture and power generation -based on information and findings from the environmental flows analysis and other existing information at national level												
O. 2.2 d	Review current concessions on both watersheds, based on the technical document, in order to determine recommendations for improving or restoring the water cycle.												
	i- With results from 2.2.c output, develop a technical document with recommendations to improve/restore water cycle in program intervention areas												
Output 2.3	**Increased hydrological security in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds, in line with advances of the National Plan for Water Security**												
O 2.3 a	Design 2 district plans for water security, incorporating climate information (1 at each watershed, SMRW and CHVRW).												
O 2.3 b	Complement current technical analisys to elaborate a new national map for agriculture and livestock production in the country, based on climate and water management data generated by the program.												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
	i- Develop a national map for agriculture and livestock production with updated data on climate and water management												
Output 3.1	**Designed and in operation the National System for Climate Data (NSCD), by upgrading ETESA´s existing network for recording climatic information from hydrographic watersheds**												
O 3.1 a	Design and operation of the National System for Climate Data, by upgrading ETESA´s existing network for recording hydro-agro meteorological information from hydrographic watersheds.												
	i- Rapid assessment of the current national network, as well as of the capacities in hydrometeorology												
	ii- Acquisition and installation of new network station												
	iii- Operation												
Output 3.2	**Established an early warning system to identify in advance, the necessary measures in case of hydro-climatic events that could affect food production and power generation**												
O 3.2 a	Implement the sound warning system at the communities included in the CHVRW early warning system; and complete signposts along communities at risk areas. This EWS is focused on floods.												
	i- EWS diagnostic												
	ii- Acquisition and installation of the sound early warning system												
	iii- Complete signposts along communities at risk areas												
	iv- Maintenance												
O 3.2 b	Implement an early warning system for floods and droughts at the SMRW.												
	i- Design the EWS for the SMRW for drought and floods												
	ii- Acquisition and installation of the early warning system												
	iii- EWS maintenance												
O 3.2 c	Workshops and simulations to train technical staff and communities on the early warning system.												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
	i- Training and simulations plan												
Output 3.3	**The NSCD interfaced and equiped with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information**												
O 3.3 a	Interface and equip the NSCD with a joint node, with the Ministry of Agriculture Development, to generate and manage climatic information.												
	i- Purchase of equipment (computers, printers, etc.)												
	ii- Training Plan for technicians and farmers												
Output 3.4	**Designed a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program and national efforts***												
3.4 a	Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program. This includes program inception workshops with public and nongovernmental relevant stakeholders (at least three workshops). *This program will serve MiAmbiente in starting to evaluate progress of other adaptation efforts being implemented in the country.												
	i- Design and implementation of a monitoring and evaluation system to assess effectiveness of climate change adaptation measures implemented by the program as well as other initiatives at national level												
Output 4.1	**Improved awareness of watersheds vulnerability and participation of population groups in adaptation measures**												
O 4.1 a	Technical working sessions with key implementing partners and project staff to define WorkPlan, coordination arrangements and kick off meetings/requirements. These activity also includes the development and facilitation of training sessions with key project staff and partners about the nexus approach to water–energy–food security as an option for adaptation to climate change												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
	i- Working sessions with the program´s technical staff and key implementing partners												
O 4.1 b	Inception workshops with local and national stakeholders to present the approved programme; revisit programme rationale, scope, define shared visions and operational arrangements for programme implementation. At least 2 local workshops, one for each watershed with local stakeholders. One national workshop with government and civil society stakeholders to present the Programme, identify sinergies with other ongoing adaptation efforts/initiatives and define operational and coordination aspects.												
	i- National workshop to present approved AF program												
	ii- Workshops (2) to present approved AF program: 1 at each watershed												
	iii- Informative documents about the program												
O 4.1 c	Socialize the SMRW and the CHVW vulnerability analysis to facilitate the implementation of identified adaptation measures.												
	i- Socialize vulnerability analysis to facilitate the implementation of identified adaptation measures												
Output 4.2	**Strengthened professional capacities for the climate data analysis and processing, for different sectors involved**												
O 4.2 a	Offer a Climate Modelling Course with special emphasis on future scenarios impacting food-energy generation activities (at least 45 participants).												
O 4.2 b	Offer an international course on Adaptation to Climate Change: Role of Ecosystem Services (45 participants nationwide, including stakeholders in the two prioritized watersheds).												
Output 4.3	**Strengthened professional capacities on water resources management by incorporating climate change adaptation approach**												
O 4.3 a	Offer an international course on participatory and integrated watershed management emphasizing conflict management skills (40 participants nationwide, including stakeholders in the two prioritized watersheds).												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
O 4.3 b	Offer an international course on ecosystem-based adaptation at marine-coastal zones. (20 participants)												
Output 4.4	**Systematized and disseminated experiences on climate changes adaptation, nationwide**												
O 4.4 a	Mapping and analysis of projects / initiatives undertaken. A technical and practical document that will be available in print and digital format will be developed.												
	i- Development of document												
	ii- Document printing												
O 4.4 b	Ten workshops will be held at national level (1 per province) to present the document.												
	i- Workshops to disseminate experiences from the AF program implemented												
Output 4.5	**Portal for Climate Change Adaptation in Panama, implemented**												
O 4.5 a	Communication strategy and design of a plan for systematization of experiences from the program.												
	i. Design and implement communications strategy												
O 4.5 b	Design and operation (updating and maintenance) of the Portal for Climate Change Adaptation in Panama.												
	i- Design and implement the Portal for Climate Change Adaptation in Panama												
	ii- Update and maintenance												
O 4.5 c	Compilation and synthesis of materials for different audiences on adaptation to climate change												
	i- Develop knowledge products from the program; and compilation and synthesis of materials for different audiences on adaptation to climate change												
O 4.5 d	Training on the use of the portal for different audiences (producers, institutions, academia, etc.).												
	i- Training for different audiences on the use of portal												

Output / operational	Activities	Year 1				Year 2				Year 3			
		Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
		1	2	3	4	5	6	7	8	9	10	11	12
O 4.5 e	Establishment of an advisory technical committee within the Climate Change National Committee to orient the program´s knowledge management process.												
	i- Establishment of an advisory technical committee within the Climate Change National Committee to orient the program´s knowledge management process.												
O 4.5 f	Experience exchanges activities at the local level, including at least one international technical guided visit:												
	i- Exchange for agriculture-cattle raising-pasture-forestry / and irrigation systems ii- Exchange for EWS iii- Farmer-to-farmer exchange at SMRW and ChVRW												

Disbursement Schedule

Schedule date	Upon Agreement Signature	Year 2	Year 3	Total
	Second semester 2016 (August 2016, tbc)	August 2017 (e)	August 2018 (e)	
Program Funds	**3,910,195**	**4,077,356**	**446,450**	**8,434,001**
NIE fee	**243,963**	**201,463**	**271,463**	**716,890**
Total	**4,154,158**	**4,278,819**	**717,913**	**9,150,890**

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[41] *Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:*

(Enter Name, Position, Ministry) *Emilio Sempris* *Deputy Minister* *Ministry of Environment*	Date*: (Month, day, year)* *01, 07, 2016*

B. Implementing Entity certification *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Rosa Montañez *Fundación Natura - PANAMA* Implementing Entity Coordinator	
Date: *April 11th, 2016*	Tel. and email:(507) 232-9773 rmontanez@naturapanama.org info@naturapanama.org
Project Contact Person: Rosa Montanez / Vilna Cuellar	
Tel. And Email: (507) 232-8773 vcuellar@naturapanama.org	

6. Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

Fundación Natura
Fundación para la Conservación de los Recursos Naturales

MINISTERIO DE AMBIENTE
UNIDAD DE CAMBIO CLIMÁTICO
Recibido: ___ Fecha: 4/8/16

Panamá, 7 de abril de 2016
FN-DE-062

MINISTERIO DE AMBIENTE
RECIBIDO
POR: ___
FECHA: 11/4/16
Secretaria General

S.E.
Licda. Mirei Endara
Ministra
Ministerio de Ambiente
En Su Despacho

Respetada Ministra,

Por este medio le comunicamos que el Fondo de Adaptación aprobó el concepto de propuesta titulado "*Adaptación al cambio climático a través de manejo integrado del agua en Panamá*", presentado el 11 de enero del presente año por la Fundación Natura, en su calidad de Agencia Nacional Implementadora de Panamá para el Fondo de Adaptación. Adjuntamos nota Ref: 2016/15 del 28 de marzo con la decisión del Fondo de Adaptación, con base en la cual estamos procediendo a elaborar la propuesta completa y el proceso de consulta ampliado a fin de presentar la versión final en el ciclo de abril.

Por otra parte, le informamos que el concepto ya fue presentado y acogido por el Comité de Cambio Climático de Panamá y cuenta a la fecha con el aval y aportes técnicos por parte del Ministerio de Desarrollo Agropecuario (MIDA), la Empresa de Transmisión Eléctrica S.A. (ETESA) y el Sistema Nacional de Protección Civil (SINAPROC).

En las semanas próximas se estarán realizando las consultas a nivel local y con otros actores claves, mismas que se están coordinando con en conjunto con la contraparte designada por el Ministerio de Ambiente.

Atentamente,

Rosa I. Montañez G.
Directora Ejecutiva

C.c. Licdo. Emilio Sempris- Viceministro de Ambiente-Ministerio de Ambiente.
Ing. Rosalena Lindo – Unidad de Cambio Climático – Ministerio de Ambiente.
Licdo. René López- Unidad de Cambio Climático -Ministerio de Ambiente.

Adj. Nota y observaciones. Ref: 2016/15- Adaption Fund.
Concepto de propuesta presentado el 11 de enero de 2016.

MINISTERIO DE AMBIENTE
RECIBIDO
POR: ___
FECHA: 8/4/16
Secretaria General

ADAPTATION FUND

MINISTERIO DE AMBIENTE

Carta de Endose del Gobierno

01 de febrero de 2016
DM-0184-2016

Para: El Fondo de Adaptación
c/o Secretaría del Fondo de Adaptación
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Asunto: Apoyo a la propuesta de programa titulada **'Adaptación al cambio climático por medio de la gestión integrada del agua en Panamá'**

En mi calidad de Autoridad Nacional Designada de Panamá para el Fondo de Adaptación, confirmo que, la propuesta de programa previamente mencionada, va acorde con las prioridades del gobierno nacional de implementar actividades de adaptación para reducir riesgos e impactos adversos del cambio climático en Panamá.

Por consiguiente, me complace apoyar dicha propuesta de programa con el apoyo del Fondo de Adaptación. De aprobarse la misma será implementada por Fundación Natura y ejecutada por el Ministerio de Ambiente, en coordinación con el Ministerio de Agricultura y la Empresa de Transmisión Eléctrica S.A. (ETESA).

Atentamente,

Emilio Sempris
Viceministro de Ambiente

REPÚBLICA DE PANAMÁ
DESPACHO DEL VICEMINISTRO
MINISTERIO DE AMBIENTE

ES/FW/RL/VI

C.c Licda. Rosa Montañez – Directora de la Fundación Natura.

REPÚBLICA DE PANAMÁ

Ministerio de Desarrollo Agropecuario
Despacho del Ministro

Panamá, 5 de febrero de 2016
DM-0656-2016

Señores
FUNDACIÓN NATURA/FONDO DE ADAPTACIÓN
E. S. D.

Estimados Señores:

Por este medio expresamos, que el Ministerio de Desarrollo Agropecuario (MIDA) en su planificación institucional ha priorizado la incorporación de la dimensión de cambio climático en todos los programas que lleva adelante la institución. Esto contempla el diseño e implementación de medidas a nivel nacional, para enfrentar la sequía, que afecta negativamente al sector agropecuario; la participación activa del MIDA en el Comité Nacional de Cambio Climático de Panamá y en la elaboración del Plan Nacional de Seguridad Hídrica; la definición de una hoja de ruta, para fortalecer nuestra Unidad Ambiental transformándola en una Unidad de Cambio Climático, Gestión de Riesgo y Gestión Ambiental, entre otras acciones.

Desde 2014, hemos efectuado consultas a nivel nacional para identificar líneas y acciones estratégicas para avanzar hacia una agricultura climáticamente inteligente. En este contexto, hemos participado con insumos en el proceso de elaboración de la propuesta "Adaptación al cambio climático a través del manejo integrado del agua en Panamá" para el Fondo de Adaptación, que incluye componentes específicos de adaptación para el sector agropecuario en áreas vulnerables, tanto en el área del Arco Seco Cuenca del Rio Santa María, como en la Provincia de Chiriquí, Cuenca del Río Chiriquí Viejo, ambas áreas claves para la producción y la seguridad alimentaria nacional.

Las líneas de acción propuestas que se han presentado al Fondo de Adaptación están alineadas con las prioridades institucionales. La coordinación y complementariedad entre las actividades del Programa de Adaptación y las del Ministerio, será clave para fortalecer la resiliencia climática del sector productivo agropecuario nacional.

Atentamente,

JORGE ARANGO ARIAS
Ministro

JAA/gm

Panamá, Altos de Curundu, calle Manuel E. Melo, edificio 576
Apartado Postal 5390 Zona 5, Panamá. Página Web: www.mida.gob.pa
Teléfonos: (507) 507-0600, 507-0606 Fax: (507) 232-5045

MINISTERIO DE GOBIERNO
SISTEMA NACIONAL DE PROTECCIÓN CIVIL
DIRECCION GENERAL

Panamá, 8 de abril de 2016
SINAPROC-CTI-50

Señores
Fundación Natura / Fondo de Adaptación
E. S. D.

Estimados Señores:

El Sistema Nacional de Protección Civil (SINAPROC), entidad nacional responsable de planificar, investigar, dirigir, supervisar y organizar las políticas y acciones dirigidas a determinar la peligrosidad que puedan causar los desastres naturales y antropogénicos, ha incluido la dimensión de cambio climático como un eje fundamental de la institución. Esto se evidencia en la Política Nacional de Gestión Integral de Riesgo que tiene como una de sus ejes articuladores el de Ambiente y Cambio Climático, a través de la armonización del marco de políticas y estrategias en riesgo-agua-ambiente y la incorporación del enfoque de gestión de riesgos en el cambio climático. Así, desde 2011 se ha priorizado el "fortalecer los sistemas de alerta temprana y ampliar la cobertura en áreas prioritarias (objetivo operativo 3.4) y fortalecer las capacidades para la planificación de la adaptación al cambio climático con criterios de reducción de riesgos de desastres (objetivo operativo 4.2.)

En este contexto, los esfuerzos que se realicen para fortalecer y ampliar los sistemas de alerta temprana de sequía e inundaciones en áreas vulnerables al cambio climático, como lo son las cuencas del Río Chiriquí Viejo y el Río Santa María, son altamente necesarios y están alineados con las acciones que lleva adelante nuestra institución.

El apoyo del Fondo de Adaptación para ampliar los sistemas de alerta temprana existentes, a través de un programa de adaptación al cambio climático mediante el manejo integrado del agua, sería un apoyo significativo a los esfuerzos que realizan las instituciones panameñas que conforman la Plataforma Nacional de Gestión de Riesgo, para disminuir la vulnerabilidad y aumentar la resiliencia ante el cambio climático a nivel nacional y local.

Atentamente,

SISTEMA NACIONAL DE PROTECCIÓN CIVIL

JOSÉ DONDERIS MIRANDA
Director General

EMPRESA DE TRANSMISION ELECTRICA, S.A.

ETE-DHM-013-2016
17 de febrero de 2016

Señores
Fundación Natura
Fondo de Adaptación
E. S. D.

Estimados Señores:

Por este medio expresamos que la Empresa de Transmisión Eléctrica, S. A. (ETESA), a través de la Dirección de Hidrometeorología, responsable de manejar y operar la red de estaciones meteorológicas existentes en la República de Panamá, ha priorizado en su planificación institucional el fortalecimiento y ampliación de la red de estaciones meteorológicas para cubrir todo el territorio nacional y fortalecer la capacidad de generación de datos hidrometeorológicos y climáticos, especialmente en áreas de alta vulnerabilidad climática, entre las que se cuentan las cuencas de los ríos Chiriquí Viejo y Santa María, entre otras.

En este sentido, ETESA ya ha iniciado el proceso de ampliación y fortalecimiento de la red, con la adquisición de 30 estaciones meteorológicas tipo A de transmisión satelital. En el marco de esta planificación institucional, tenemos debidamente identificados y cuantificados los requerimientos adicionales para la consolidación de la red.

Con el propósito de avanzar en dicha consolidación de la red, ETESA ha participado con insumos técnicos en el proceso de elaboración de la propuesta "Adaptación al cambio climático a través del manejo integrado del agua en Panamá" para el Fondo de Adaptación, que incluye un componente específico para el diseño y operación de un sistema nacional de datos climáticos, fortaleciendo la red actual de hidrometeorología manejada por ETESA.

La coordinación y complementariedad entre las actividades de ese Programa de Adaptación y las acciones de ETESA, será clave para fortalecer la capacidad de generación y procesamiento de data climática y con ello proveer información técnica-científica para apoyar la toma de decisiones del sector público y privado en un contexto de cambio climático.

Atentamente,

EDILBERTO B. ESQUIVEL MARCONI
Director de Hidrometeorología

Edificio Sun Tower Mall, Piso 3.
Teléfonos: 501-3800, 501-3900 – Fax: 501-3508 - CND: 230-8100 - Tumba Muerto: 501-6900.
Apartado Postal 0816-01552 - Panamá, República de Panamá.

FUNDACIÓN PARA EL DESARROLLO INTEGRAL COMUNITARIO Y
CONSERVACIÓN DE LOS ECOSISTEMAS EN PANAMÁ
(FUNDICCEP)
Cerro Punta, Chiriquí, República de Panamá * Teléfono – Fax (507) 771-2171
Email: fundiccep@cwpanama.net / amisconde@cwpanama.net

Chiriquí - Panamá, 5 de febrero de 2016.

Señores
Fundación Natura / Fondo de Adaptación
E. S. D.

Estimados señores:

La Fundación para el Desarrollo Integral, Comunitario y Conservación de los Ecosistemas de Panamá (FUNDICCEP), organización que lidera programas ambientales de conservación y protección de áreas protegidas, acciones sociales y comunitarias para promover el desarrollo sostenible, participó activamente como implementador, facilitador y actor en el proceso de elaboración, consulta y validación del plan de conservación (PCA) de la subcuenca del río Caisán en la cuenca del río Chiriquí Viejo.

Al respecto, evidenciamos que a la fecha las condiciones de amenaza y presiones a la cuenca del Río Chiriquí Viejo, incluyendo aspectos asociados a los efectos de cambio climático, las amenazas por los desarrollos hidroeléctricos múltiples y otros usos del agua, se mantienen en la actualidad, poniendo en riesgo la integridad del ecosistema y las comunidades. En este contexto, la posibilidad que acciones de conservación y manejo identificadas en el PCA para la subcuenca de Caisán y en el Plan de Manejo de la Cuenca del Río Chiriquí Viejo, sean implementadas con apoyo de recursos del Fondo de Adaptación a través de la propuesta de un programa de adaptación al cambio climático mediante el manejo integrado del agua, es una oportunidad para consolidar esfuerzos actuales de conservación y uso sostenible de los recursos, para los cuales lamentablemente no se cuenta actualmente con recursos financieros, humanos y equipamiento suficiente.

Consideramos que establecer la conservación y restauración del ecosistema boscoso que protege las fuentes de agua, el fomento de proyectos pilotos productivos entre los agricultores y ganaderos, el desarrollar investigación científica y monitoreo y así como intensificar las acciones de sensibilización, son medidas necesarias para adaptarse y mitigar los efectos del cambio climático que se siguen considerando como altamente prioritarias.

Nuestra organización es un actor local en la Cuenca del Río Chiriquí Viejo, que reitera su interés y apoyo a los esfuerzos de manejo de recursos naturales y adaptación al cambio climático, en particular las acciones que se incluyan en el concepto de un programa de adaptación al cambio climático mediante el manejo integrado del agua. Por tanto, expresamos nuestro interés de participar en la fase ampliada de formulación de la propuesta completa del proyecto y la posterior implementación en el campo, liderado por la Fundación Natura como entidad nacional implementadora ante el Fondo de Adaptación.

Atentamente,

Damaris Sánchez
Directora de Proyectos

"Mejorar la Calidad de Vida con el Equilibrio del Desarrollo y la Conservación"

AMIPARQUE

Santa Fe, 5 de Febrero de 2016.
APNSF-002-16.

SEÑORES
FUNDACIÓN NATURA / FONDO DE ADAPTACIÓN
PRESENTE.-

Estimados señores:

La Asociación Amigos del Parque Nacional Santa Fe (AMIPARQUE), grupo ambientalista que vela por la promoción, conservación y el manejo adecuado del Parque Nacional Santa Fe y la cuenca alta del rio Santa María, participó activamente como actor externo en el proceso de elaboración del plan de conservación (PCA) de la microcuenca del río Gallito en la cuenca alta del río Santa María. Además de participar en dicho proceso, colaboramos en la implementación de un Programa de Educación Ambiental que se realizó en el contexto del proceso del PCA.

Las condiciones de amenaza y presiones a la microcuenca que se identificaron, incluyendo los temas de cambio climático y amenazas por los desarrollos hidroeléctricos, se mantienen en la actualidad, poniendo en riesgo la integridad del ecosistema y las comunidades. En este contexto, la posibilidad que acciones de conservación y manejo identificadas en el PCA de la microcuenca Gallito y en el Plan de Manejo de la Cuenca del río Santa María, sean implementadas con apoyo de recursos del fondo de adaptación a través de la propuesta de un programa de adaptación al cambio climático mediante el manejo integrado del agua, es una oportunidad para consolidar los esfuerzos actuales de conservación y uso sostenible de los recursos, para los cuales lamentablemente no se cuenta actualmente con recursos financieros, humanos y equipamiento suficiente.

Consideramos que "la necesidad de intensificar las acciones de sensibilización sobre las medidas necesarias para adaptarse y mitigar los efectos del cambio climático", estrategia N° 1 del PCA, se considera altamente prioritaria, porque las comunidades locales carecen de acceso a información.

Nuestra organización como actor local en la Cuenca del Río Santa María, reitera su apoyo a los esfuerzos de manejo de recursos naturales y adaptación al cambio climático, en particular las acciones que se incluyan en el concepto de un programa de adaptación al cambio climático mediante el manejo integrado del agua, y expresamos nuestro interés de participar en la fase ampliada de formulación de la propuesta completa del proyecto y la posterior implementación de las actividades en el campo, liderado por la Fundación Natura como entidad nacional implementadora ante el Fondo de Adaptación.

Atentamente,

HORTENCIO PALMA BLANCO
PRESIDENTE Y REPRESENTANTE LEGAL

AMIPARQUE

Amiparque, Santa Fe de Veraguas, República de Panamá. Oficina: Local comercial # 5, Terminal de Transporte de Santa Fe. Mobile: 00507-67211152, email: info@amiparque.org, web: www.amiparque.org