

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) Consolidating integrated water resource management based on climate and environmental data; b) Increasing resilience of water sector to enhance food and energy security (water-energy-food-adaptation nexus); c) Strengthening institutional capacity and decision making process in the water, food and energy sectors based in provision and access to a National System of Climate Data; d) Raising awareness on climate change adaptation needs, measures and lessons learned through a National Adaptation Knowledge Platform.

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.

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



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
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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\$9,952,131

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 Corridor¹ in harmful ways. In addition, deforestation is a growing concern, as forests cover 40 percent of Panama's territory. Panama ranks 14th among countries most

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".

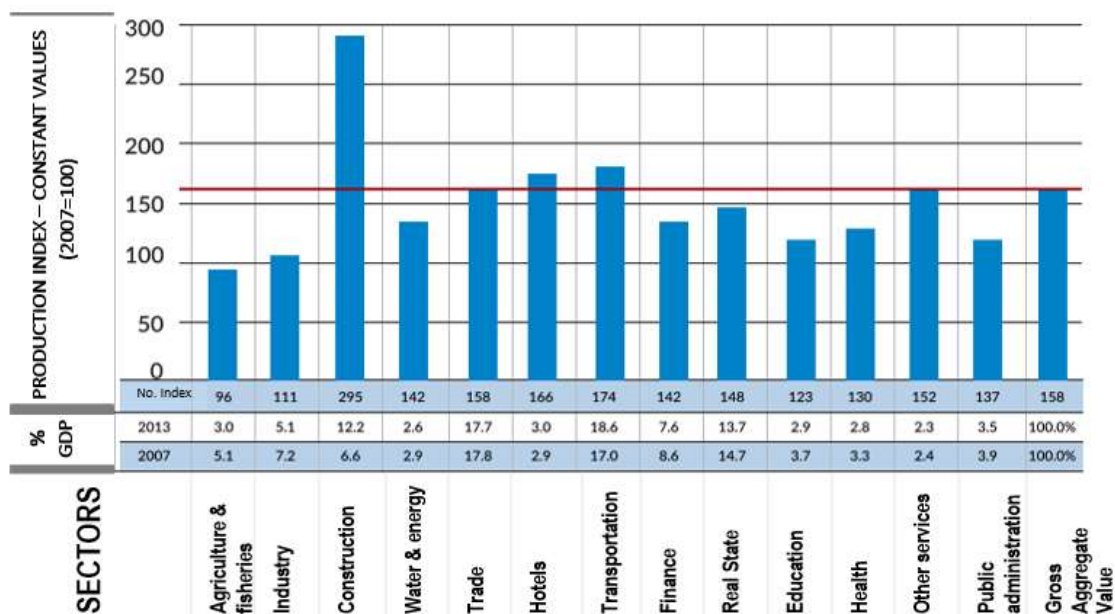
exposed to multiple hazards based on land area. Panama has 15 percent of its total area exposed and 12.5 percent of its total population vulnerable to two or more hazards. In addition, Panama ranks 35th among countries with the highest percentage of total population considered at a relatively high mortality 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 particular².

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 hm³), hydroelectric power generation (50,000 hm³), Panama Canal lockage's (2,580 hm³), agricultural and livestock production (105 hm³), industrial production (2.2 hm³) and touristic recreation (1.3 hm³). 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 out that these two watersheds have characteristics which make them suitable for

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.

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 generation⁵.

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 approximately \$400 million a year. Panama's power matrix depends on oil products by

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/>

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. Accordingly to the abovementioned World Bank The World Bank Analysis for the Country Diagnostic in 2015, "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 hm³ 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 hm³ 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 is 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); 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 looking 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

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.

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

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 km²) of the country, and the Caribbean edge is about 30 percent (21,000 km²). 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 km²; Bayano, with 185.43 km²; and Alajuela with 57 km².

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 km²), Isla del Rey (234 km²) and Cébaco (80 km²). 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 km², 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 populations¹⁰

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 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

⁸Panama locking in success. A systematic country diagnostic. World Bank. January 2015

⁹ Idem.

¹⁰ GEO Report Panama 2014.

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 overdemand 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 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).

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

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 present 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
<ul style="list-style-type: none"> • Given the expected variability in precipitation patterns, 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).

“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

¹² Idem.

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. 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	

¹³

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

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 Veraguense Savannah, the Township of Cerro Punta and the Ngöbe Bublé 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 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

¹⁴ Panama Dashboard. World Bank. Climate Portal

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

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 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 million¹⁸.

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>

¹⁸ Panama locking in success. A systematic country diagnostic. World Bank. January 2015

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.

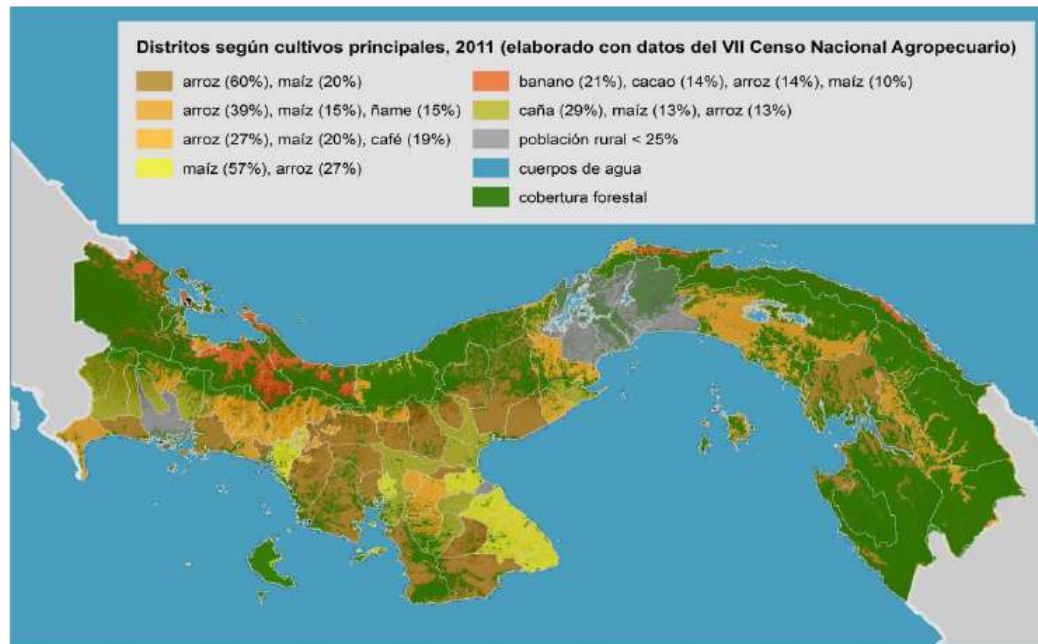
In 2014 CIAT and CATIE¹⁹ jointly conducted a climate change vulnerability analysis for the agriculture sector in Panama: *The Agriculture in Panama and the climate change. Where are the adaptation priorities?* The base for this analysis was the classification of the country districts according to their 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 Nöbe Buble 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 Kuna 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 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

¹⁹ The Tropical Agricultural Research and Higher Education Center (CATIE).



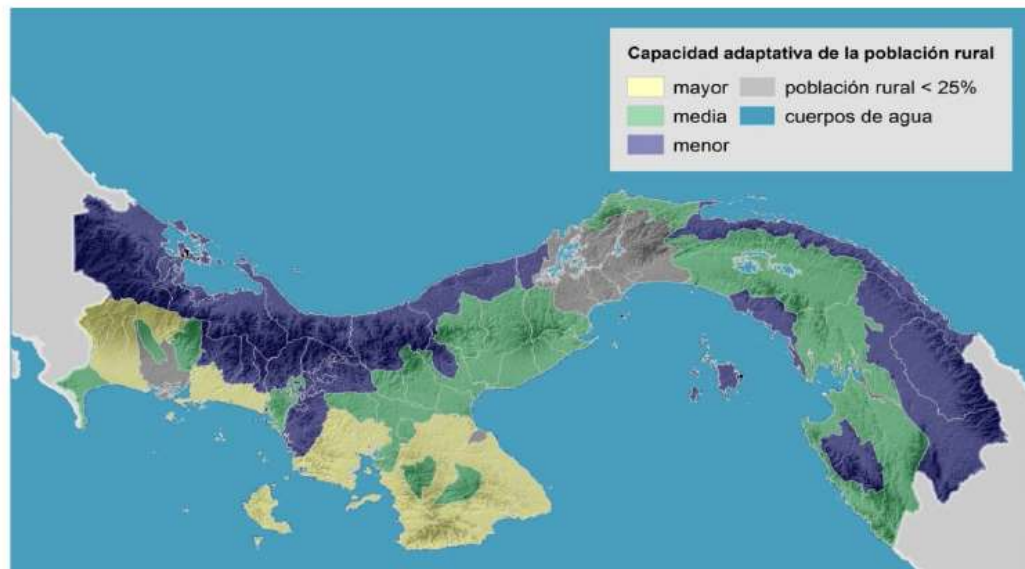
Source: The Agriculture in Panama and the climate change. Where are the adaptation priorities? Summary.²⁰

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 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.

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)

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, from 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
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Essential part of the diet. • Very susceptible to plagues and diseases 	<ul style="list-style-type: none"> • Important crop for agroforestry system in river watersheds •

Live stocking	Agroindustry	Poultry
<ul style="list-style-type: none"> • 30% of soil under agriculture and live stocking use. • Main producer of greenhouse gases • Vulnerable to weather changes and water stress 	<ul style="list-style-type: none"> • Provides added value to agriculture and live stocking production. • Depends on water and energy resources 	<ul style="list-style-type: none"> • 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.

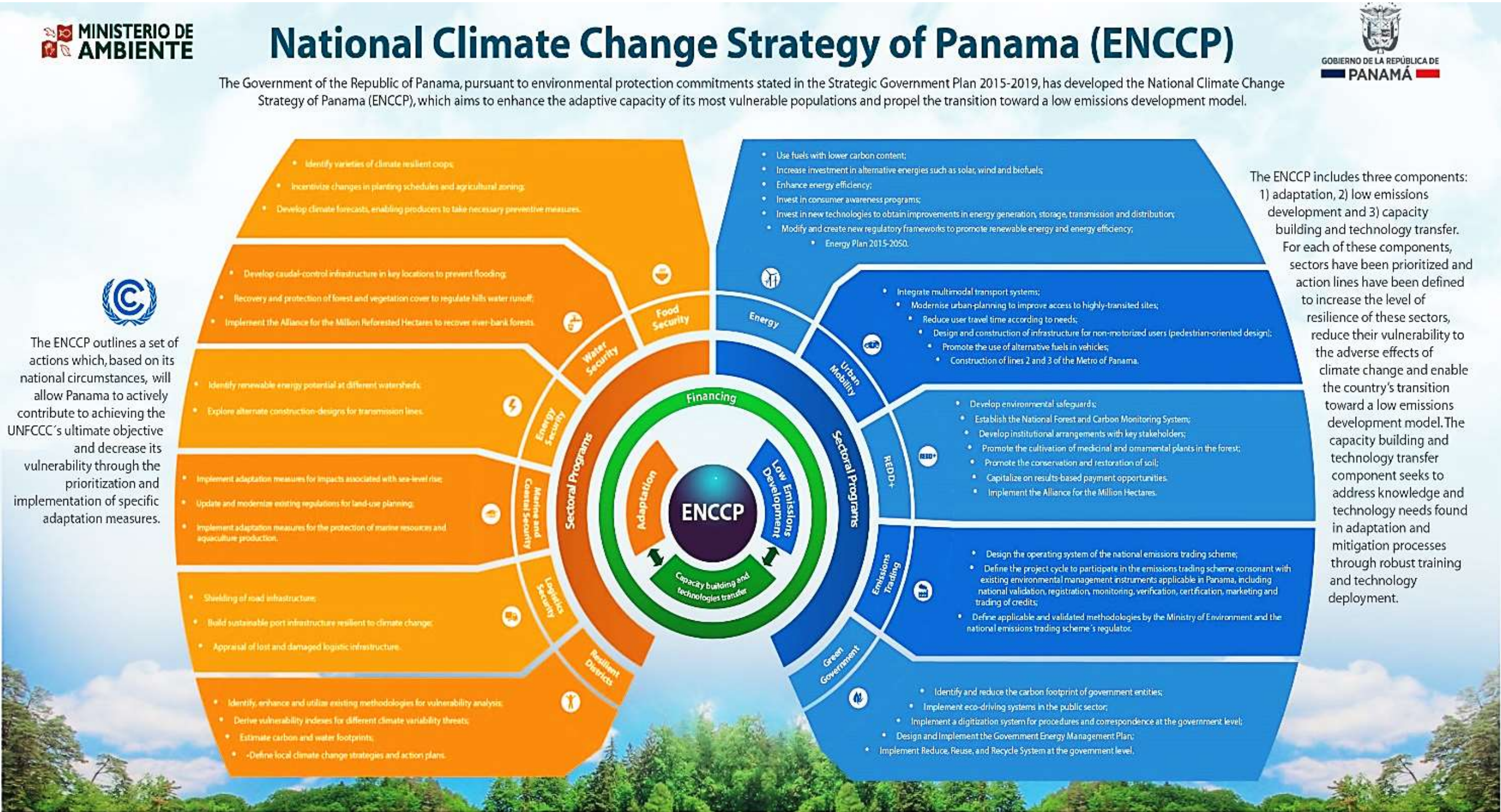
In addition, these two sectors have been prioritized as well from the Mitigation perspective. "To achieve the country's goal of reducing carbon emissions, two sectors of national development must be prioritized: energy and agriculture. In the energy sector, the pursuit of sustainability must be compatible 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

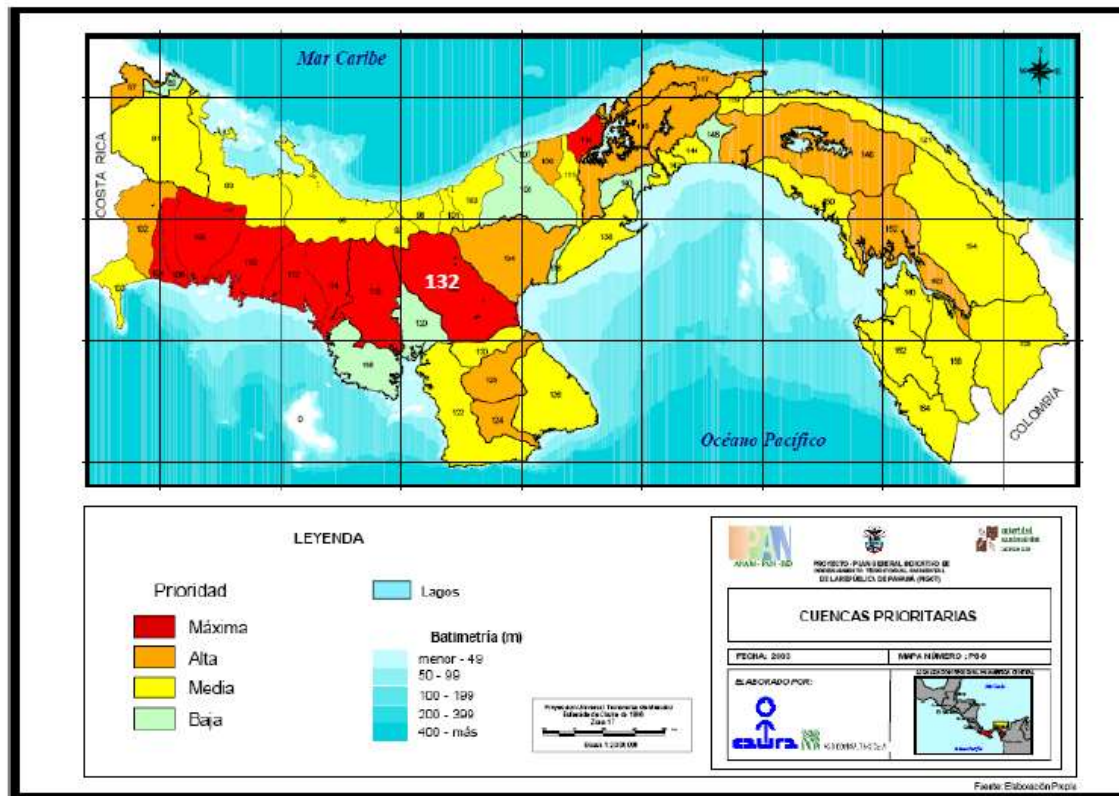
Regarding the application of the aforementioned criteria, the Program will focus on the following geographical areas:

- Chiriquí Viejo River watershed
- Santa Maria River watershed

Below there is a brief outline of both watersheds.

Santa Maria River watershed. This watershed 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, Coclé and Herrera. The watershed's total drainage area is 3,400.63 Km². 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 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 part 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 Coclé 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 Parita²²

Chiriquí Viejo River Watershed. The watershed 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 Km². 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:

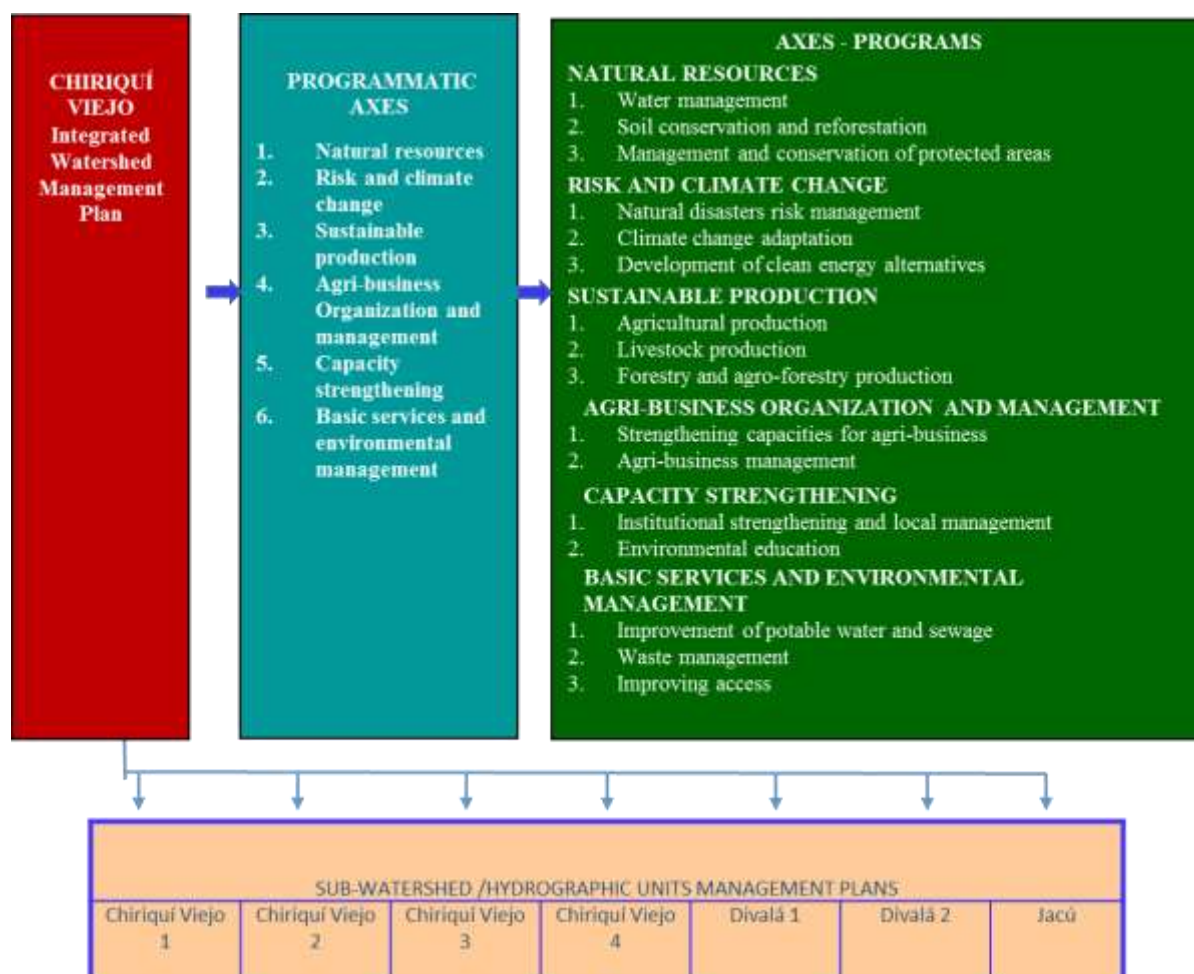
- In its upper part we find the Baru Volcano National Park and the La Amistad International Park, both have favorable conditions of protection and conservation, for the watershed's internal interrelationships and towards the bottom. This part of the watershed has the highest hydropower potential, eco 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. Furthermore, if the higher part is not covered by good vegetation, the water infiltration for the groundwater recharge could decrease.

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

- 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, SINAPROC²³, MIDA, IDIAP²⁴, 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:

Table 6. Crops

Region	Produce	Loss (B/.)
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²⁵ Information provided during the work meeting at the Ministry of Environment on December 30, 2015.

Los Santos	Rice, corn, squash	30,589.16
	Cattle raising	360,910.05
Herrera	Rice, corn, plantain, coffee, squash, cassava, yams, otoi, 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) Consolidating integrated water resource management based on climate and environmental data.
- b) Increasing resilience of water sector to enhance food and energy security (water-energy-food-climate change adaptation nexus).
- c) Strengthening institutional capacity and decision making process in the water, food and energy sectors based in provision and access to a National System of Climate Data.
- d) Raising awareness on climate change adaptation needs, measures and lessons learned through a National Adaptation Knowledge Platform.

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. Consolidate Integrated Water Resource Management by incorporating resilience and climate change adaptation, to harmonize the use and allocation of water for consumption, food production, and energy development.	<p>1.1. Analysis for climate change vulnerability in prioritized areas at the Chiriquí Viejo and Santa María rivers watersheds.</p> <p>1.2. Hydrological balance and environmental flows in prioritized areas within Chiriquí Viejo and Santa María rivers watersheds.</p> <p>1.3. Increase 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.</p> <p>1.4. Projects for the conservation of water sources at prioritized areas within Chiriquí Viejo and Santa María rivers watersheds.</p>	Strengthened governance of the water and “restored” hydrological cycle in priority areas of the Chiriquí Viejo and Santa Maria Rivers watersheds based on climate considerations	1,924,131
2. Climate resilient management of water resources (water-food-energy-climate change adaptation nexus).	<p>2.1 Early warning systems (EWS) for disaster risk reduction to identify in advance the necessary measures in case of hydro-climatic events that could affect food production and power generation.</p> <p>2.2 Good practices for energy and climate-smart agricultural production.</p> <p>2.3 Climate financing instruments for sectoral support.</p>	<p>The decision-making and allocation of water resources is made including climate information.</p> <p>Improved natural resources management in the prioritized watersheds.</p>	3,162,000
3. Design and implement a national system for monitoring climate change adaptation.	3.1 Design and operation of the National System for Climate Data, by upgrading ETESA’s existing network for recording hydro-agro meteorologic	A supply and demand of climate services has been created, to support the public and private decision-	2,500,000

Project / Program Components	Expected Concrete Outputs	Expected Outcomes	Amount (US\$)
	<p>information from hydrographic watersheds.</p> <p>3.2 Interface and equip the system with joint node, with the Ministry of Agriculture Development, to generate and manage climatic information.</p> <p>3.3 Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures</p>	making mainly in the water sector, impacting the agricultural, energy and other sectors.	
4. National Knowledge Platform for Climate Change Adaptation	<p>4.1 Strengthen capacities for the climate data analysis and processing, for different sectors involved.</p> <p>4.2 Train stakeholders for the effective implementation of EWS.</p> <p>4.3 Strengthen capacities on water resources management by incorporating climate change adaptation approach.</p> <p>4.4 Systematization and dissemination of climate changes adaptation experiences nationwide.</p> <p>4.5 Climate Change Adaptation Portal in Panama.</p>	A critical group of professionals and technicians are using climate information on a daily basis to manage hydrological resources, with emphasis on the agriculture and energy sectors.	575,000
5. Project/Programme Execution cost (9.5 per cent)			945,250
6. Total Project/Programme Cost			8,161,131
7. Project/Programme Cycle Management Fee charged by the Implementing Entity 8.5%)			845,750
Amount of Financing Requested			9,952,131

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.

Consolidate Integrated Water Resource Management by incorporating resilience and climate change adaptation, to harmonize the use and allocation of water for consumption, food production, and energy development

Expected concrete outputs:

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

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) 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.

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

1.2 Hydrological balance and environmental flows in unaltered watersheds with hydroelectrical potential at prioritized areas within Chiriquí Viejo and Santa Maria rivers watersheds.

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 CHVRW. 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) Technical document with criteria to advice on the process to grant water concessions for agricultural and energy uses, based on the information and findings of the flow's analysis.
- d) Assessment of the technical document with the authorities who are responsible for granting permits and concessions.
- e) Revision of existing concessions in both watersheds, based on the technical document and recommendations to apply required adaptations to re-establish the hydrological cycle.

In addition to be useful for the aforementioned conservation plans' purposes, these hydrological balances and environmental flows shall be used as input in drafting the district plans on hydrological security.

1.3 Increase 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.

The hydrological 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).

Through this activity there shall be a link between this Adaptation Program and the process of the National Plan for Water Security for 2030 which the National Government is developing. The link shall take place through showing how the water harvesting projects directly contribute to the water security purpose at family and property level.

- a) Installation of 50 water harvesting systems, at a rate of 25 in each watershed at the farm level (SMRW and CHVRW). The location of the water harvesting systems shall be done based on the vulnerability analysis' results.
- b) Training on the installation, use and maintenance of the water harvesting systems.
- c) To support the long term feasibility of the systems, in parallel to the installation, 2 hydrological security district plans, including weather information, shall be drafted at a rate of 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 and the vulnerability analysis' results.

1.4 Projects for the conservation of water sources at prioritized areas within Chiriquí Viejo and Santa María rivers watersheds.

The proposed adaptation activities meet the ecosystem based adaptation approach.

- a) For the CHVRW the strategic action of establishing 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, shall be implemented. This strategic activity is pre-identified in the Caisan River's Sub-watershed conservation Plan. 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 (gallery forest) and the corresponding agroforestry system.
- b) For the SMRW it shall be implemented the strategic action of training and start-up of an orchids and "naranjilla" growing and marketing project. This activity is pre-identified in the micro watershed's Conservation Plan as a development option of income sustainable sources based on the natural resources' conservation. The expected result is to contribute to the reduction in the expansion of intensive agriculture and the reduction in the changeover to extensive livestock. The activity involves creating capacities for operating orchid and naranjilla crops, as well as establishing the correspondent commercialization scheme:
 - Training on orchids and "naranjilla" crops growing and management.
 - Drafting of the corresponding business plan.
 - Development/improvement of seedling nurseries
 - Support and technical assistance for marketing and commercialization..

Component 2.

Climate resilient sectoral management of water resources (water-food-energy-climate change adaptation nexus)

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.

Expected concrete outputs:

2.1 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

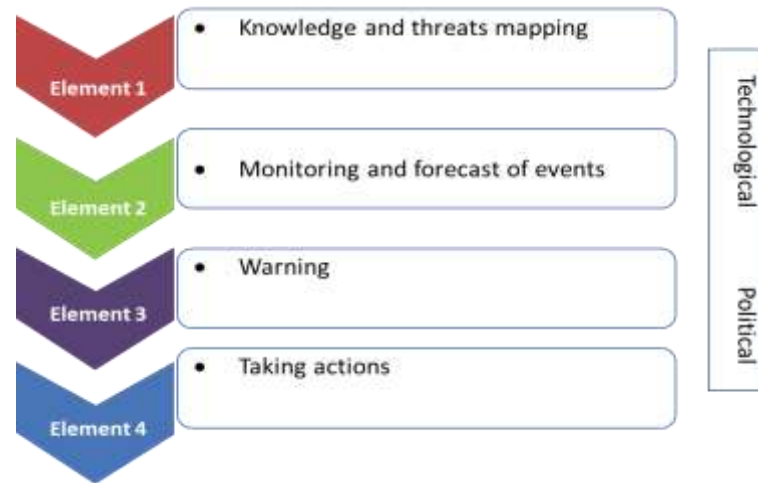
and 3 in Chiriquí, including the Chiriquí Viejo River's watershed (CHVRW) since 2008 (flooding EWSs).

- 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).

Accordingly 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 information generated shall be collected in the Component 3 (National System for Monitoring Climate Change Adaptation) and component 4 of National Knowledge Platform for Climate Change Adaptation. 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.

2.2 Good practices for energy and climate-smart agricultural production. To Increase communities' resiliency and adaptive capacity through the climate management of the water.

a) The project 18 from the Management Plan will be implemented In the CHVRW which corresponds to the "improvement of the agricultural production through irrigation systems". The purpose of this project is to increase the agricultural production through the use of efficient and low cost irrigation technologies. This activity will take place in the community of Cerro Punta (upper watershed) and in Divala (lower watershed). This activity in the community of Divala will focus on the rice production. The following tasks shall take place:

- Irrigation needs' assessment
- 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.

b) At Divalá, the irrigation system will be complemented with an analysis of the water footprint for rice crops, which will 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

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.

that has shown positive results in respect of water reduction with co-benefits in terms of health.

- c) In the SMRW it will be implemented the sustainable livestock project as part of the agricultural and forestry Production Program, identified in the Management Plan, whose purpose is to improve the 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 for this activity will be determined considering the VIAs results, preliminary critical areas identified during the consultation process for the full proposal submission and the critical areas pre-identified by MIDA (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.

2.3 Climate financing instruments for sectorial support.

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) On the supply side, will work in 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. 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

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

Component 3.

Design and implement a national system for monitoring climate change adaptation.

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 km² per station, in comparison with the recommend standards of the OMM of 20 km².

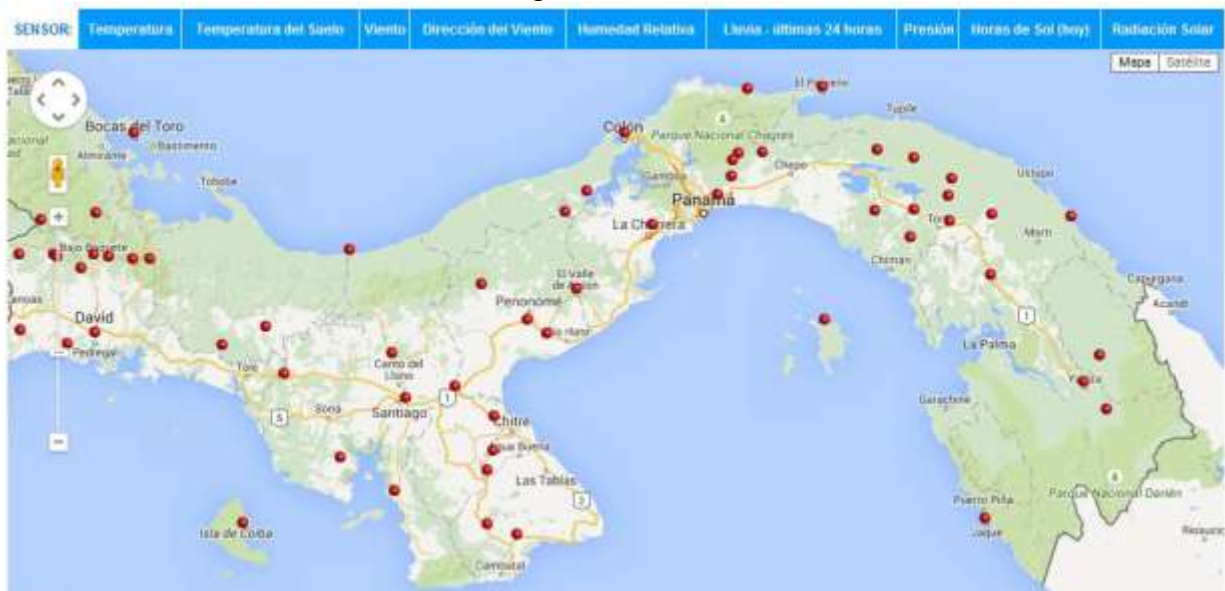


Hydrometeorological Stations (Total = 215)			
Meteorological		Hydrological	
Type A	5	Limnigraphical	34
Type B	20	Limnigraphical	0
Type A Automatic	21	Automatic	22
Type A Satellite Automatic	13	Satellite Automatic	8
Rain Cans	3		
Rain Gauges	67		
Automatic Rain Gauges	22		
Total	151	Total	64
Conventionals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

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/>

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 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.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. An exhaustive description of the new stations, number and technical specifications will be presented in the full proposal document.
- 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 Interface and equip the system with joint node, with the Ministry of Agriculture Development (MIDA), 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

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.

sector. Climate data for climate smart agriculture is the basis of this activity. This encompasses the design and installation of the ETESA-MIDA interface.

3.3 Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program.

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 system³¹:

- 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

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

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.

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
- 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.

Expected concrete outputs:

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

4.1 Strengthen capacities for the climate data analysis and processing, for different sectors involved.

For this purpose, the following activities will take place:

- 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) Training on identification and valuation of eco-systemic services of water supply, focusing on hydrological modeling tools to determine hydrological profits (at least 40 participants). 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. 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

4.2 Train stakeholders for the effective implementation of EWS.

Workshops and simulations to train technical staff and communities on the early warning system. This training activity will be linked to output 2.1

4.3 Strengthen capacities on water resources management by incorporating climate change adaptation approach.

The following formal training activities will be replicated in Panama:

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

- a) 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.
- b) International training on participative integrated watershed management. Ministry of Environment -CATHALAC³⁴ (40 participants nationwide, including key actors of the 2 priority watersheds CHVRW and SMRW). Together with the Ministry of Environment and CATHALAC
- c) International training on adaptation based on ecosystems in marine coastal zones (20 participants). Together with CREHO³⁵.

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.

4.4 Communications strategy and dissemination of climate changes adaptation experiences nationwide.

- a) Systematization process of current and planned adaptation action in Panama. 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. 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.
- b) Adaptation Programme Communications strategy. 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. The systematization of the Adaptation Programme results and impact is included in the scope of this communications strategy.

4.5 Climate Change Adaptation Portal 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. The activity includes: a) design, implementation and operation of the portal, comprising the technical and technological aspects, moderation and permanent update of Programme activities and results; b) Compilation and synthesis of printed and

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).

audio visual materials for different audiences on adaptation to climate change; c) Training on the use of the portal for different audiences (producers, institutions, academic, etc.). Systematization documents produced in the previous activity will be basic pieces of information to feed the portal. This portal is also a key element of the knowledge management process of the proposed Adaption Programme.

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.

Socio-economic benefits. 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 programme 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 data 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 subwatersheds; 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.

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 measures³⁶); 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.

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 threats may not occur in the future.

- Consider the financial analysis of productive projects, mainly on aspects of profitability, social benefits and environment.

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 nationwide³⁸. 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.

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.

- 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, 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 country³⁹. 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

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

level, considering the impact on economy and food security both offer, to supply a significant proportion of agricultural commodities and energy generation.

- 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.

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.

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.

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.

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: 4.4: Communications strategy and dissemination of climate changes adaptation experiences nationwide. To do this, the Programme will implement 2 specific actions:

- a) Systematization process of current and planned adaptation action in Panama. 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. 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 and knowledge centres.
- b) Adaptation Programme Communications strategy. 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. This activity includes the systematization of the Adaptation Programme results and lessons learned.

The climate change adaptation portal described in 4.5 is also a key element of the knowledge management process of the proposed Adaption Programme.

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.

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. A detailed sustainability analysis will be presented with the full proposal document.

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.

Table 9. 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
<i>Compliance with the Law</i>		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. In addition, for development of improved farming practices, all regulations regarding fertilization or waste management will be met.
<i>Access and Equity</i>		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.
<i>Marginalized and Vulnerable Groups</i>		During the process for formulation of full proposal, a complete analysis will be made in order to prevent any risk of generating and adverse impact on marginalized / vulnerable groups.
<i>Gender Equity and Women's Empowerment</i>		During the process for formulation of full proposal, a complete analysis will be made in order to ensure promotion of gender equity, and that women are enabled to participate fully and equally

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
		without suffering any adverse effects for doing so.
<i>Protection of Natural Habitats</i>		During the process for formulation of full proposal, a complete analysis will be 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.
<i>Climate Change</i>		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.
<i>Resource Efficiency</i>		So far, none of the proposed initiatives has been identified as huge energy demanding. During the process for formulation of full proposal, a complete analysis will be made in order to identify potential impacts –regarding resource efficiency- for each component.
<i>Public Health</i>		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.
<i>Lands and Soil Conservation</i>		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

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
		technical guidelines from Ministry of Agriculture Development will be observed during implementation of agricultural practices to avoid any possible risk on this subject.

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.

Detailed description of the implementation arrangements will be provided with the full proposal document.

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. Detailed risk management model to be presented with the full proposal document.

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

This section will be detailed when full proposal is presented.

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

This section will be detailed when full proposal is presented.

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

This section will be detailed when full proposal is presented.

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

This section will be detailed when full proposal is presented.

Project Objective(s)⁴¹	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Project Outcome(s)	Project Outcome Indicator(s)	Fund Output	Fund Output Indicator	Grant Amount (USD)

⁴¹ The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

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- 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.

Detailed budget will be presented with the full proposal document. For indicative purposes, below please find a preliminary budget developed to determine the proposed adaptation programme full cost.

Output	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
1. Consolidate Integrated Water Resource Management by incorporating resilience and climate change adaptation, to harmonize the use and allocation of water for consumption, food production, and energy development.						
Output 1.1	Analysis for climate change vulnerability 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			180,000
		b) Socialize the SMRW vulnerability analysis to facilitate the implementation of identified adaptation measures.	70,000			70,000
		c) 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			100,000
		d) Socialize the CHVRW vulnerability analysis to facilitate the implementation of adaptation measures outlined in the watershed Management Plan.	70,000			70,000
		Total	420,000	0	0	420,000
Output 1.2	Hydrological balance and environmental flows in unaltered watersheds with hydro electrical potential at prioritized areas within	a) Identify the hydrological balance and environmental flow for the SMRW, specifically at the Gallito river micro-watershed.	30,000	15,000		45,000
		b) Identify the hydrological balance and environmental flow of the CHVRW, specifically at the Caisán river micro-watershed.	30,000	15,000		45,000

Output	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
	Chiriquí Viejo and Santa María rivers watersheds.	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.		20,000		20,000
		d) Socialize the technical document with incumbent authorities in the process of granting water use permits and concessions.		10,000		10,000
		e) Review current concessions on both watersheds, based on the technical document, in order to determine recommendations for improving or restoring the water cycle.		10,000		10,000
		Total	60,000	70,000	0	130,000
Output 1.3	Increase 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) Install at least 50 water harvest systems, 25 in each of the watersheds (SMRW and CHVRW).	175,000	58,000		233,000
		b) Train beneficiaries on the installation, use, and maintenance of water harvest systems.	25,000			25,000
		c) Design 2 district plans for water security, incorporating climate information (1 at each watershed, SMRW and CHVRW).	30,000			30,000
		Total	230,000	58,000	0	288,000
Output 1.4	Projects for the conservation of water sources at prioritized areas within Chiriquí Viejo and Santa María rivers watersheds.	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.	149,195	328,936	58,000	536,131

Output	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		b) Implement the strategic action CRSM of creating capacities for operating orchid and “naranjilla” crops, as well as establishing the correspondent commercialization scheme. 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.	342,000	144,000	64,000	550,000
		Total	491,195	472,936	122,000	1,086,131
		TOTAL	1,201,195	600,936	122,000	1,924,131
2. Climate resilient sectorial management of water resources (water-food-energy-climate change adaptation nexus)						
Output 2.1	Disaster risk reduction. Early warning systems (EWS). Establishment of 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) CRCHV. 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.	50,000	60,000		110,000
		b) CRSM. Implement an early warning system for droughts at the SMRW.	50,000	130,000		180,000
		Total	100,000	190,000	0	290,000
Output 2.2	Good practices for energy and climate-smart agricultural production.	a) CRCHV. Establish irrigation systems, with efficient and low cost technologies, to enhance agricultural production and increase crops yields. This activity will be developed at Cerro Punta (upper watershed) and Divalá (lower watershed). 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.	186,000	206,000	10,000	402,000
		b) At Divalá, the irrigation system will be complemented with an analysis of the water footprint for rice crops, which will allow identification of technological schemes for climate-smart rice production.	30,000	180,000	20,000	230,000

Output	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
		c) At SMRW, implement a sustainable cattle ranching project, covering cover 800 has.	780,000	1,000,000	250,000	2,030,000
		Total	996,000	1,386,000	280,000	2,662,000
Output 2.3	Climate financing instruments for sectorial support.	a) Review current credit products offered to agriculture and energy sectors.		10,000		10,000
		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.		75,000		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. 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.		125,000		125,000
		Total	0	210,000	0	210,000
		TOTAL	1,096,000	1,786,000	280,000	3,162,000
3. Design and implement a national system for monitoring climate change adaptation						

Output	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
Output 3.1	Design and operation of the National System for Climate Data, 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.	2,000,000			2,000,000
		Total	2,000,000	0	0	2,000,000
Output 3.2	Interface and equip the system with joint node, with the Ministry of Agriculture Development, to generate and manage climatic information.	a) Interface and equip the system with joint node, with the Ministry of Agriculture Development, to generate and manage climatic information.		400,000		400,000
		Total	0	400,000	0	400,000
Output 3.3	Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program.	a) Design a monitoring and evaluation tool to assess effectiveness of climate change adaptation measures implemented by the program.	50,000	40,000	10,000	100,000
		Total	50,000	40,000	10,000	100,000
		TOTAL	2,050,000	440,000	10,000	2,500,000
4. National Knowledge Platform for Climate Change Adaptation						
Output 4.1	Strengthen 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).		60,000	10,000	70,000
		b) Offer a course for identification and valuation of ecosystem services of water supply, emphasizing hydrologic modelling tools to determine hydrological gains (at least 40 participants).		60,000		60,000
		Total	0	120,000	10,000	130,000
Output 4.2	Train stakeholders for the effective implementation of EWS.	a) Workshops and simulations to train technical staff and communities on the early warning system.	10,000	30,000	10,000	50,000
		Total	10,000	30,000	10,000	50,000
Output 4.3	Strengthen capacities on water resources management by	a) Offer an international course on Adaptation to Climate Change: Role of Ecosystem Services (40 participants nationwide, including stakeholders in the two prioritized watersheds).	50,000		15,000	65,000

Output	Description	Budget Notes/Activities	Year 1	Year 2	Year 3	Total
	incorporating climate change adaptation approach.	b) Offer an international course on participatory and integrated watershed management (40 participants nationwide, including stakeholders in the two prioritized watersheds).		80,000		80,000
		c) Offer an international course on ecosystem-based adaptation at marine-coastal zones. (20 participants)		30,000		30,000
		Total	50,000	110,000	15,000	175,000
Output 4.4	Systematization and dissemination of climate changes adaptation experiences 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.			25,000	25,000
		b) 10 workshops will be held at national level (1 per province) to present the document.			10,000	10,000
		Total	0	0	35,000	35,000
Output 4.5	Portal for Climate Change Adaptation in Panama.	a) Design and operation of the Portal for Climate Change Adaptation in Panama.		3,000	9,000	12,000
		b) Compilation and synthesis of materials for different audiences on adaptation to climate change.	5,000	5,000	10,000	20,000
		c) Training on the use of the portal for different audiences (producers, institutions, academic, etc.).		20,000	18,000	38,000
		d) Communication strategy and systematization of experiences from the program.	20,000	25,000	70,000	115,000
		Total	25,000	53,000	107,000	185,000
		TOTAL	85,000	313,000	177,000	575,000
		Total Direct Costs	4,432,195	3,139,936	589,000	8,161,131
		Total EE costs (9.5%)				945,250
		Total NIE (8.5%)				845,750
		TOTAL				9,952,131

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


This section will be detailed when full proposal is presented.

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

A. Record of endorsement on behalf of the government⁴² *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:*

<i>(Enter Name, Position, Ministry)</i> Emilio Sempris Deputy Minister Ministry of Environment	Date: (Month, day, year) 01, 07, 2016
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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, <u>commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund</u> 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: January 11 th , 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	

⁴² 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.

Panamá, 7 de enero de 2016
DV-002-2016

Señora
Marcia Levaggi
Gerente
Fondo de Adaptación
En su despacho

Estimada Señora Levaggi:

Como Punto Focal Nacional del Fondo de Adaptación, estamos apoyando formalmente en su totalidad, la propuesta de programa titulada **'Adaptación al cambio climático por medio de la gestión integrada del agua en Panamá'** presentada por la Fundación Natura, Entidad Nacional de Implementación de Panamá.

La propuesta de concepto está completamente alineada con los compromisos de acciones de protección ambiental y de cambio climático reflejado en nuestro Plan Estratégico de Gobierno 2015-2019 y la Ley que crea el Ministerio de Ambiente en la cual se reconoce los efectos adversos del cambio climático en la población, los recursos hídricos, y de todos los sectores productivos de nuestra economía.

Panamá es probablemente uno de los mejores ejemplos en la escala global de un país impulsado por el agua; junto con la operación del Canal, pilar principal de la economía nacional, la logística, los servicios financieros y de transporte asociados a ella están, relacionados directamente a la gestión del recurso hídrico, al igual que la hidro-energía y el turismo que son motores de crecimiento de la economía.

La seguridad hídrica es ahora reconocida como un desafío de seguridad global. También se ha reconocido que el agua, los alimentos, la energía y el clima están estrechamente vinculados. El impacto del cambio climático sobre la seguridad hídrica se reconoce como un tema importante a nivel nacional y local. En base a eso, los habitantes de Panamá necesitan acceso a información precisa y recomendaciones sobre la mejor manera de responder a este entorno cambiante, a través de esfuerzos de adaptación y mitigación.



Esta Propuesta de Programa de Adaptación, basado en la gestión del agua para avanzar hacia la adaptación al cambio climático, busca cumplir esta necesidad y servir como punto de referencia nacional para abordar, monitorear y evaluar sistemáticamente, la adaptación al cambio climático a la escala nacional y local.

En base a lo anterior, el Ministerio de Ambiente de Panamá, como Autoridad Designada de Panamá al Fondo de Adaptación, apoya la propuesta adjunta.

Atentamente,

Emilio Sempres
Viceministro de Ambiente

ES/FW/RL/lv



C.c. Licda.. Rosa Montañez,- Directora de la Fundación Natura