



ADAPTATION FUND

DATE OF RECEIPT:
ADAPTATION FUND PROJECT ID:
(For Adaptation Fund Board Secretariat Use
Only)

PROGRAMME PROPOSAL

PART I: PROGRAMME INFORMATION

PROGRAMME CATEGORY: **REGULAR**

COUNTRY/IES: **NICARAGUA**

TITLE OF PROGRAMME: ***Reduction of Risks and Vulnerability Based on Flooding and Droughts in the Estero Real River Watershed*** (PIMS ID 4448, Atlas IDs – Proposal 59776, Project 74925)

TYPE OF IMPLEMENTING ENTITY: **MULTILATERAL IMPLEMENTING ENTITY**

IMPLEMENTING ENTITY: **UNITED NATIONS DEVELOPMENT PROGRAM**

EXECUTING ENTITY/IES: **MINISTRY OF THE ENVIRONMENT AND NATURAL RESOURCES (MARENA)**

AMOUNT OF FINANCING REQUESTED: **5,500,950** (In U.S Dollars Equivalent)

PROGRAMME BACKGROUND AND CONTEXT:

A. Climate Background

Nicaragua faces severe impacts related to extreme natural phenomena. Combined with already significant climate variability, socio-economic impacts are magnified by high levels of poverty. Climate variability, especially during El Niño-Southern Oscillation (ENSO) episodes, results in droughts that cause significant losses, particularly affecting the agricultural sector which provides employment for over 60% of the population and on which food security¹ depends. During the wet season, devastating floods destroy harvests, infrastructure and housing.² In a predominantly sub-humid tropical climate characterized by strong inter-annual variability,

¹ Episodes of severe drought which have had important impacts at the national level occurred at least in 1972, 1977, 1991, 1997 and 2003.

² Significant floods occurred in 1988 (Hurricane Joana; Bluefields), 1991 (El Rama), 1993 (tropical storms Pert and Bret), 1995 (torrential rains), and 2008 (Tropical Storm Alma). Catastrophic landslides and torrential flows (lahares) have also been recorded, such as in Posoltega (Casita Volcano) during Hurricane Mitch (1998), which struck Central America, leaving a wake of destruction.

climate change trends pose a growing threat to continued development and to the wellbeing of poor rural communities in many areas. Current variability will be aggravated by climatic trends.

Both the First National Communication and the Second (FNC and SNC, respectively) relied heavily on extrapolations from global models and regional studies to define likely climate trends in the country. The FNC concluded that the average annual temperature could increase between 1.6° and 2.1° by 2050, with more severe changes of between 2.3° - 3.7° by 2100. This was later reconfirmed in the SNC, which notes that between 2020 and 2029 average temperatures could increase by 0.5° to 1.0° under scenarios A2 and B1. A recent study³ of climatic extremes in Latin America concluded that temperature ranges and the variability among them are changing in the region. With regards to precipitation, there is significant uncertainty. According to the SNC, there are notable discrepancies between models over both temporal and spatial scales. Some models register a slight decrease in rainfall under scenarios A2 and B2 in the near term, with deeper reductions in total annual rainfall of -8.20% (B2) and -11.49% (A2), toward the latter half of the century. Other models predict different scenarios. There are also constraints in that the calibration of climate change projection models used at present may not accurately reflect current and emerging conditions in the so-called dry zones of Nicaragua, regions that are already experiencing high levels of water stress. The SNC notes that during El Niño events that have triggered severe droughts, annual precipitation in the departments of Chinandega and León has decreased on average between 19% (270mm) and 35% (516mm). During La Niña events, river levels can rise significantly; especially in October when mean flows can surpass historical averages by over 500%.

The Pacific region, where over 65% of the population lives, is the most vulnerable, with strong demographic trends, high levels of extreme rural poverty and low precipitation rates. The areas that will be most affected by climate change are those currently classified as dry zones, such as the northern region of Nicaragua and the municipalities in the departments of Chinandega and León, where the current programme will be sited. In these areas, higher temperatures and increasing variability in precipitation combined with more intense events will aggravate current conditions of water scarcity and extreme poverty. Under conditions of a changed climate, it is estimated that these areas will receive an average annual rainfall of 500mm, which will have significant repercussions for agricultural and livestock activities, and will also affect both water quantity and quality.

In Chinandega and León, the Estero Real River Watershed (3,690 km²), and in particular the sub watershed of the Villanueva River (1,550 km²)—also known as Rio Grande or Aquespalapa⁴—is emblematic of the combined impacts of poor development models and strong climate variability. Deforestation and inadequate land management practices, particularly in the upper and mid watershed, result in high rates of erosion and sedimentation which have already undermined agricultural productivity and threaten food security. During the wet season,

³ Aguilar, E., et al., 2005: Changes in precipitation and temperatures in Central America and Northern South America, 1961-2003

⁴ In Nahuatl the term means “river of many fish” - an indication of the abundance that characterized this watershed in earlier times.

landslides in the mid watershed and heavy flooding in the mid and lower watershed are common, aggravated by extreme events such as hurricanes or storms, leading to heavy losses to crops, human lives, domestic animals, damage to infrastructure and progressive deterioration of local economies. In the dry season, many superficial sources dry up and insufficient rainfall limits access to water and reduces productivity, even when there is not an outright drought. Since the region is characterized by high levels of rural poverty, coping capacities and resilience are minimal.

This difficult situation is aggravated by the reduction of surface water sources and unsustainable extraction of groundwater, which is the primary source for meeting demands, of which 74.4% are for irrigation. According to the SNC, during droughts aquifer levels can decrease by 50%, exceeding recharge and increasing vulnerabilities. This is a severe future risk, since drought events are expected to be more prolonged.

Diverse and growing demands for water augur future conflicts, due to increasing urban demands and intensive agricultural production, as well as efforts by small farmers to improve productivity. The situation is rendered more complex by the limited knowledge and application of land and water use practices that would promote more efficient use of water, the absence of reservoirs to manage water supply in times of drought, as well as targeted efforts to manage groundwater recharge areas.

B. The evolution of the search for rural development

After the Sandinista revolution in 1979, all Nicaraguan governments have identified the eradication of rural poverty as a priority and, with support from aid agencies, have adopted policies, established institutions and initiated programmes and projects that pursue rural economic development. Since the preparatory process of the 1992 Earth Summit and the 1994 United Nations Framework Convention on Climate Change, it has been explicitly recognized that many common farming practices pose a danger not only for the environment and natural resources, but also for the economic sustainability of the farmers themselves.

Attempts to introduce agro-ecological practices that conserve water, soil and forest have grown slowly, and in parallel with contradictory processes. It has not yet been possible to stem the steady expansion of the agricultural frontier driven by a growing population looking for land to survive by means of cutting, burning, planting basic grains, and extensive cattle ranching. The expansion has been partially supported by programmes and projects of government and international agencies focused on the urgent priority of providing livelihoods for landless farm workers, including ex-combatants from both sides of the war.

The 1970s saw the fall of a strong cotton export industry based on monoculture using agro-chemical inputs that polluted several important aquifers and poisoned a large number of agricultural workers. Nevertheless, successive governments continued to promote many practices associated with the "green revolution" and both the import of pesticides and agrochemicals and the promotion of recipes for their use have been components not only of national and international agribusiness, but also of various development programs promoted by government agencies.

The extreme event of Hurricane Mitch in 1998 destroyed much of the infrastructure in the north and west, caused flooding throughout the country, triggered landslides that killed

thousands of Nicaraguans, and displaced a significant percentage of the population. The response to the event, with massive assistance from the international community, included the creation of the National System for Disaster Prevention (SINAPRED) and increased attention to the relationship between agricultural practices and the vulnerability of rural communities and soils to climate variability. Two events in the early years of this century—multiple bankruptcies provoked by a fall in international coffee prices which led to the eviction of thousands of small farmers and rural workers and a prolonged drought in the western part of the country—raised the threat of localized famines and underlined the urgency of finding ways to reduce the vulnerability of rural communities.

C. Weaknesses and efforts in institutional capacity and coordination

Unfortunately, national institutions lacked the capacity and coordination needed to tackle the challenge. Government institutions, crippled during the macroeconomic crisis of the 1980s war, were further weakened by the International Monetary Fund's insistence on reducing public spending during the long negotiations to obtain a remission of the huge external debt, by the privatization of many public services and by the priority given to servicing a new internal debt generated when the state guaranteed deposits threatened by several national bank failures. One consequence was that the agencies responsible for rural development, the Ministry of Agriculture, Livestock and Forestry (MAGFOR), the Rural Development Institute (IDR), the Institute of Agricultural Technology (INTA) and the National Forestry Institute (INAFOR)—as well as the Ministry of Environment and Natural Resources (MARENA) and the Nicaraguan Institute of Territorial Studies (INETER)—became highly dependent on international aid funds.

One product of the prolonged need to depend on donor agencies has been national programming organized in projects and programmes of limited geographical scope and short duration. Attempts to overcome these limitations, made before and after the Paris Declaration in 2005, led to the creation of a sector program (ProRural) with the participation of MAGFOR, IDR, INTA and INAFOR, and most of the international agencies that contribute to rural development. The efforts of ownership, harmonization and alignment represented in ProRural have been significant, but until now, the topic of adaptation to climate change has been absent from ProRural programs.

D. Lessons learned in environmental, water and watershed management

It has been much easier to declare the principles of harmonization and alignment than to put them into practice. In the absence of formal sector programs for water and the environment, certain levels of coordination were achieved through the Network for Water and Sanitation in Nicaragua (RAS-NIC) and National Network of Watershed Organizations (RENOC). Some relatively long-term programs related to watershed management⁵ have identified a set of important lessons that, as a whole, open a new perspective on methodology for promoting development in rural areas.

⁵ These include, for example: the Socio-Environmental and Forestry Development Programme (POSAF), implemented by MARENA with IDB funds between 1994 and 2007; the Programme for Sustainable Agriculture on the Slopes of Central America (PASOLAC), executed by Swiss Development Cooperation (COSUDE) between 1992 and 2009; the Programme for Innovation, Learning and Communication for Adaptive Co-management of Watersheds (FOCUENCAS), executed by the Tropical Agronomy Center for Research and Teaching (CATIE) between 2002 and 2010.

At a technical level, first of all, the effectiveness has been verified of a set of forestry, agro-forestry and silvo-pastoral practices in building vegetative cover that slows erosion and contributes to the protection of water recharge areas. Several procedures to facilitate the learning of these agro-ecological production practices have been validated, especially when there is availability of credit to finance implementation. Similarly, work has been performed on the validation of short-cycle crop varieties resistant to drought.

At the organizational level, in various micro and sub-watersheds, platforms for coordination among local farmers, municipal representatives and government and non-government institutions that support production have enabled farmers to stop being perceived solely as beneficiaries and to become partners. These organizational and perceptual accomplishments, though difficult, were achieved because water is a highly motivating theme for organization and empowerment in rural communities, especially when everyone in the community shares the same micro-watershed.

Methodologically, an understanding and facilitating attitude by project staff has been a key factor. It takes time and sensitivity to appreciate the complex psychological, family, neighborhood, cultural and spiritual interplay that influences, as much as economic and technical aspects, the willingness of a farm family to try out new practices. The first reaction of the traditional patriarchal power structures found in rural communities is to resist change. Often there is more energy and desire for innovation among women and youth. One key to awakening local community initiative lies in promoting greater age and gender equity.

E. New national policies

During 2010, the government has adopted a national climate change strategy, created the National Water Authority, adopted a special law giving legal status to the more than 5000 existing rural drinking water and sanitation committees (CAPS), and drafted new agricultural policies based on agro-ecological principles. These four steps, discussed in section II D (see pp. 26-28 below), strengthen the policy framework for climate change adaptation and call for inter-institutional collaboration in its implementation.

F. Communities in the upper part of the Estero Real River Basin

The specific background of this programme is found in the recent history of the communities in the upper part of the Estero Real River Watershed, where factors that establish an appropriate base for social change processes are found within the traditional rural culture that tends to resist change.

With prolonged support from GTZ and the NGO Ibis Denmark, social stakeholders in the municipalities of El Sauce and Achuapa played leading roles in preparation of the Strategic Plan for Northern León and the subsequent process of negotiations with high level representatives of the executive power which led to the *Achuapa Agreements*, signed in October 2002.⁶ The agreements, aimed at fighting poverty in the dry region of northern León and Chinandega, led to plans for an agro-forestry development program, production support for food security,

⁶ *Agreements to Implement the Strategic Development Plan in the Dry Area of Northern Leon and Chinandega*, signed in Achuapa by the mayors of Northern Leon and Chinandega, the Secretary of the Presidency of the Republic, and other national government officials.

small-scale irrigation programs and the creation of a development bank to finance production. All these items entered into the proposal made by the Government of Nicaragua to the Millennium Challenge Corporation. Another result of the *Achuapa Agreements* was the programme *Sustainable Land Management (SLM or MST, in Spanish)*, funded by the Global Environment Facility and implemented by the Ministry of Environment and Natural Resources (MARENA). The MST project addresses agricultural production with an explicit environmental focus, promoting agro-ecological practices in 10 municipalities—including those that occupy the upper Estero Real River Watershed—and enabling Municipal Environmental Management Units (UGAMs) to participate in the operational planning of government support for agriculture.

At the local organizational level, farmer associations and cooperatives are present in most communities in Achuapa, El Sauce and Villanueva. Although they are dedicated primarily to supporting their members in immediate economic matters such as purchase of agricultural inputs and selling crops, they also seek to promote practices known to be important for the conservation of soil and water. Normally, each community also has a Water Supply and Sanitation Committee (CAPS).

In summary, while still sharing traditional attitudes that harbor resistance to change, communities in the upper Villanueva River basin have a history of organizational initiative reinforced by technical support from donor agencies. The degree of community organization is relatively strong, with elected local leaders in most communities, active political parties, CAPS, and religious organizations. Existing projects and programmes have provided some training in agro-ecological practices and an initial awareness of climate change issues.

G. Erosion and flooding: the upper and lower watershed

The progressive deforestation of the micro-watersheds in the upper watershed of the Estero Real River for cultivation of basic grains fed by agrochemicals has affected the ability of soils to retain water, worsening water stress in dry seasons. It has also loosened the soils themselves, generating processes of erosion in the wet season that deposit sediments in the riverbeds in the lower watershed. Although present earlier, the erosion became massive in 1998 when the rains brought by Hurricane Mitch filled all the riverbeds with large quantities of rocks, trees and soil. This raised the already flat⁷ beds of the Villanueva and Gallo rivers and since then, large areas of some of the country's best agricultural land flood annually, displacing farm families, challenging the capacity of the Civil Defense in the municipalities of Villanueva and Somotillo, and threatening the genetic pool of the ancestors of maize in the Natural Genetic Reserve of Apacunca.

PROGRAMME OBJECTIVES:

The objective of the programme is to reduce risks from droughts and flooding generated by climate change and variability in the watershed of the Estero Real River. To reach the objective, the programme will rely upon a coordinated set of interventions designed to implement new

⁷ Villanueva River, for example, drops less than one meter per kilometer for a stretch of 20 kilometers in the lower watershed.

public policies for addressing climate change by introducing agro-ecological practices and participatory watershed management in highly vulnerable rural communities. Through targeted investments in water retention, long-term farm planning, and institutional capacity building in local communities, municipalities and government agencies, the Programme will validate an adaptation scheme as a vehicle for implementation of the national climate change strategy. The programme will have four outcomes:

1. Reduced risk of climate induced water shortages for small scale domestic and productive uses in eight micro-watersheds in the upper watershed of the Estero real River.
2. Strengthened climate resilient agro-ecological practices for the effective use of available water in the eight targeted micro-watersheds.
3. Enhanced institutional capacities for the incorporation of climate change risk management in work plans, policies, and normative instruments in the Villanueva River sub-watershed, and the watershed of the Estero Real River.
4. Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities. This will be based on ongoing monitoring and analysis of climatic conditions and changes in land use, water flows and soil quality.

 **PROGRAMME COMPONENTS AND FINANCING:**

PROGRAMME COMPONENTS	EXPECTED CONCRETE OUTPUTS	EXPECTED OUTCOMES	AMOUNT (US\$)
1. Investments in infrastructure for storing and using rain and surface water in eight micro-watersheds in the upper watershed of the Estero Real River.	Two communal irrigation systems supply family farms in two micro-watersheds. (\$727,215) At least 880 rainwater collection and storage facilities supply family farms in eight micro-watersheds. (\$1,650,000) At least 1000 farm families organized and trained in management, efficient use and maintenance of their communal and individual irrigation systems and water storage facilities. (\$100,000)	Reduced risk of climate induced water shortages for small scale domestic and productive uses.	2,477,215

<p>2. Introduction of climate resilient agro-ecological practices to make effective use of available water.</p>	<p>At least 1000 farm families with agro-ecological farm transformation plans and using their own resources and available credit for their ongoing implementation. (\$132,985)</p> <p>At least 140 hectares converted to water-conscious and climate resilient agro-ecological production in each micro-watershed. (\$1,069,800)</p> <p>At least 50 protected hectares in water system recharge areas and riparian zones in each micro-watershed. (\$100,000)</p>	<p>Strengthened climate resilient agro-ecological practices for effective use of available water in the eight targeted micro-watersheds.</p>	<p>1,302,785</p>
<p>3. Institutional development and capacity building in micro-watersheds, municipalities, and participating national institutions.</p>	<p>Local organizations in eight micro-watersheds prepare and implement climate resilient management plans to increase water retention, soil conservation and food security. (\$350,000)</p> <p>Inter-institutional coordinating bodies in El Sauce, Achuapa, and Villanueva coordinate governmental and non-governmental agency work plans in the micro-watersheds in the Villanueva River basin. (\$40,000)</p> <p>Validated proposals for normative instruments to build climate change resilience and for the operation of a Villanueva River sub-watershed committee.</p> <p>Nine municipalities in the Estero Real River basin incorporate climate change adaptation measures in their land use, investment and water use plans and related normative instruments. (\$10,000)</p>	<p>Enhanced institutional capacities for the incorporation of climate change adaptation measures in work plans, policies, and normative instruments in the Villanueva River sub-watershed, and the watershed of the Estero Real River</p>	<p>400,000</p>

4. Ongoing monitoring and analysis of climatic conditions and changes in land use, water flows and soil quality.	A hydrological study of the lower part of the Villanueva River basin, identifying the hydraulic works needed to reduce the flooding caused by sediments from the upper watershed. (\$120,000) Ongoing participatory monitoring of water flows and quality, soil conditions, and land use changes. (\$130,000) Electronic information posts in each targeted micro-watershed present relevant national and global climate information, digitalize local monitoring data, and prepare maps of land use, water flow and soil quality changes for farm families, local organizations and users of the National Environmental Information System (SINIA). (\$190,000)	Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities.	440,000
Programme Execution cost			450,000
Total Programme Cost			5,070,000
Programme Cycle Management Fee charged by the Implementing Entity ⁸			430,950
Amount of Financing Requested			5,500,950

⁸ On the request of the Government of Nicaragua, the project will be implemented by UNDP using the MIE modality. UNDP is able to provide the following implementation services through its country office, regional and headquarters networks: project identification, formulation, and appraisal; determination of execution modality and local capacity assessment of the national executing entity; briefing and de-briefing of project staff; oversight and monitoring of AF funds, including participation in project reviews; receipt, allocation and reporting to the AF Board of financial resources; thematic and technical capacity building and backstopping; support with knowledge transfer; policy advisory services; technical and quality assurance; and troubleshooting assistance to the national project staff. Further details on the types of specialized technical support services which may be provided are articulated in the table provided to the AFB Secretariat on 14 May 2010 (see Annex 11).

PROJECTED CALENDAR:

MILESTONES	EXPECTED DATES
Start of Programme Implementation	February 2011
Mid-term Review (if planned)	February 2013
Programme Closing	February 2015
Terminal Evaluation	March 2015

PART II: PROGRAMME JUSTIFICATION

The proposed Programme seeks to reduce vulnerability and risks that arise due to climate change and variability for the socioeconomic development of eight micro-watersheds in the upper basin of the Villanueva River in Estero Real River watershed. The micro-watersheds were selected because of their critical location on the highest slopes of the sub-watershed in the municipalities of El Sauce, Achuapa, and Villanueva in the Departments of Chinandega and Leon, in the Western Region of Nicaragua.

The focus of the intervention at the level of micro-watershed is the proposed strategy because this is the level where the strongest and clearest interactions take place between the use of natural resources and their management. No other level of action that could be considered (municipality, community, farm, sub-watershed, etc.), focuses this relation in such a tangible manner. At the micro-watershed level inter-relationships between the actions of neighboring landholders are identifiable; the effects of joint efforts to identify problems and work on solutions are obvious and measurable; the importance of organization of all stakeholders is apparent.

Investments in small water-retention works appropriate for the conditions of each farm and each specific micro-watershed will make possible the preparation and implementation of agro-ecological farm plans that optimize the use of captured water for agro-forestry and silvo-pastoral practices that increase vegetative cover and significantly reduce soil erosion. The collective effect of these individual farm practices, combined with demarcation and protection of water recharge areas and a study of the hydrological dynamics of the Estero Real River Watershed (Watershed 60), will make it possible to scale up the lessons learned and prepare long term management plans for the Villanueva River sub-watershed, based on the landscape level relation between soil loss in the upper part of the basin and annual flooding caused by accumulated sedimentation in the lower plains.

Key to the Programme will be the development of an organizational framework that:

- Articulates the functions and responsibilities of each government institution in each micro-watershed, in accordance with its respective areas of competence.
- Integrates municipal technical teams in El Sauce, Achuapa, and Villanueva that optimize coordination and the benefits from the activities performed by each state institution, the municipal government and cooperatives, farmers' organizations and NGOs that are active in the area.

- Recognizes and respects the existing organizational bodies in each micro-watershed, such as the CAPS, farmers' and irrigators' associations, community committees, citizen power cabinets, groups of women, youth groups, and religious organizations, and facilitates their incorporation as program partners in micro-watershed committees.
- Integrates an educational and exchange process with similar groups in other micro-watersheds in the area, the country, and Central America to help stakeholders understand the changing geo-bio-physical nature of the micro-watershed where they live and help plan and monitor the effects of their productive practices.
- Articulates the micro-watershed committees and the municipal technical teams in order to integrate a watershed committee and management plan for the Villanueva River Sub-watershed and contribute to the creation of a watershed organization for the Estero Real River Watershed.
- Enables ongoing monitoring of the effects of water-retention investments, the climate resilient agro-ecological practices adopted to optimize water use and soil recovery, and the organizational process at the community, micro-watershed, municipal, and sub-watershed levels.
- Stimulates the application of the lessons learned in the eight micro-watersheds in the rest of the Villanueva River sub-watershed, the Estero Real River watershed, and other watersheds with similar climate conditions.

Component 1 – Investments in infrastructure for storing and using rain and surface water in eight micro-watersheds in the upper watershed of the Estero Real River.

The uppermost part of the Estero Real River Watershed is composed of micro-watersheds whose waters flow into the Villanueva River. During the dry season, the communities that live in these micro-watersheds suffer severe water stress. Droughts are a recurring threat, particularly due to the events caused by the El Niño phenomenon. In the wet season, and particularly during the La Niña events, the decreasing capacity of the soils to absorb and retain water facilitates erosion and causes flooding. In a vicious cycle, dry soils lose the vegetative cover that breaks the fall of water and thus permits infiltration: when the rain does arrive, it falls directly on unprotected soil, running off too quickly to penetrate the soil well, thus causing erosion. These soils, washed downstream by tributaries of the Villanueva River, are then carried to the lower watershed by the Villanueva itself where they raise the floor of the riverbed and augment annual flooding.

To break this vicious cycle and prepare to face the increasingly varied rainfalls expected over the upcoming decades, the communities in each micro-watershed need to retain as much rainfall as possible. Unless there are changes in agricultural practices, organic matter will continue to be lost as the topsoil of the micro-watersheds travels ever more rapidly toward the lower watershed. At the same time, if water is not retained in the upper watershed it will not be possible to introduce the agro-ecological practices needed to replace the lost organic matter in the soil.

Traditionally, in these micro-watersheds, two harvests of basic grains have been expected each year. The *primera* (“first”) is planted in time for the crop to be fed by the rains of April through July. After a brief dry season known as the *canícula* (“dog days”), a second crop, called the *postrera* (“final”), is planted. The *postrera* is the most important crop because of the heavier

rainfalls which occur between August and November. On several occasions during the past few years, however, local farm families have experienced the total loss of both crops. The losses occur not only when El Niño brings extended dry periods, but also when the rains unexpectedly fail during critical moments in the crop cycle.

Farm families in the area are motivated for change because of the repeated experience of losing crops. Their subsistence depends on their capacity to guarantee at least one harvest per year. They are willing to contribute with the resources they have, including their time and labor, to build small hydraulic works that will allow them to retain the necessary water to guarantee food for their families. This in itself will obviously not be enough to reverse the ongoing processes of soil degradation and erosion. It is, however, an essential precondition for the introduction of agro-ecological practices in Component 2.

The resources of the programme are insufficient to finance small hydraulic works for all the farm families in the upper watershed of the Estero Real River. In order to maximize the environmental impact of improved water retention, the programme will concentrate its resources in eight micro-watersheds located at the highest parts of the Villanueva River sub-watershed in the municipalities of El Sauce, Achuapa and Villanueva⁹. All eight suffer from acute water stress; five are in areas with traditionally lengthy “dog days”, now often extended into drought (see map 8); four are in areas with among the lowest average annual rainfall in the sub-watershed (map 49). All eight are located in areas characterized by agricultural overuse of soils more apt for forestry (maps 10-12).

Two of the micro-watersheds were chosen because they contain year-round sources of surface water appropriate for communal irrigation systems (**output 1.1**). The other six were selected for rainwater collection and storage facilities (**output 1.2**) by the Municipal Environmental Management Units of the three municipalities because of the geographic, climatic and land use factors mentioned above. The agricultural cabinets and other participants in the inter-institutional planning processes of the three municipalities concur with the selection since the communities in all eight micro-watersheds are considered to be amenable to organization and training in order to make good use of these investments in local infrastructure to harvest rainfall and use surface water (**output 1.3**).

The eight micro-watersheds are¹⁰:

Municipality	Micro-watershed	Communities	Farm Families
El Sauce	<i>Las Mercedes</i>	Mercedes Centro Cooperativa El Borbollón	80
	<i>Salale</i>	Salale La Montaña La Montañita	130

⁹ See Annex 1, map 1, for the location of each sub-watershed of the Estero Real River. See maps 2 to 7 for the location of the three municipalities and the eight rivers or streams of the targeted micro-watersheds in the Villanueva River basin.

¹⁰ Final determination of the communities and farms in each micro-watershed is subject to confirmation at project start-up.

		Ojochal	
	<i>Petaquilla/Campamento</i>	Campamento Petaquilla	140
El Sauce & Achuapa	<i>Varela</i>	San Antonio 2 Varela	80
Achuapa	<i>Coyolar</i>	El Pajarito El Guanacaste Las Brisas Las Lajas	150
	<i>El Cacao</i>	El Lagartillo El Waylo El Rodeito San Nicolás	145
Villanueva	<i>El Genízaro</i>	El Genízaro	135
	<i>El Pilon</i>	Las Brisas El Moto La Concha Pitahaya	145
Totals	8	24	1005

a. Irrigation systems in Las Mercedes and Salale Micro-watersheds (output 1.1)

Preparatory and final design studies have been completed for construction of irrigation systems fed from micro-dams on year-round streams found in the micro-watersheds of the Las Mercedes and Salale rivers. Both are located in the Municipality of El Sauce, close to the uppermost part of the Villanueva River sub-watershed. To ensure the durability of the structures, the maximum instantaneous peak flows and their corresponding hydrographs were estimated through the modeling of showers or storms of different probabilities of occurrence, which will generate floods of equal probability. The rains and flooding were determined for the probabilities of 5, 10, 15, 25, 50 and 100 years return periods.

A consultation process with local communities took place in 2008 while the design studies¹¹ were underway with funding from the Millennium Challenge Account-Nicaragua. As a result of these consultations, two irrigation associations were defined and agreements were reached about their creation and operation once the systems are built. The agreements include outlines of procedures for the prospective assignment of water rights.

a.1 Las Mercedes

The works designed for Las Mercedes Micro-watershed include two water inlets. One is located in Mercedes Centro area, where there is currently a gravity irrigation system used by 17 farmers. The other is located farther below, where 11 members of the Ismael Castillo Cooperative make use of a water intake that requires rehabilitation. Through these two intakes, with their respective complementary facilities, it will be possible to:

¹¹ See Annex 3 for the Las Mercedes study. The Salale study is similar.

- Irrigate a total area of 137.55 hectares per year instead of the 56 that currently have some irrigation;
- Implement a drip irrigation system in Mercedes Centro¹²;
- Improve the surface irrigation system in Cooperativa;
- Guarantee water supply during dry spells;
- Operate collective clothes washing facilities.

The elements of the Mercedes Centro system include:

- A zip type intake installation, 2.7 effective meters in width, on Las Mercedes River near the community of El Borbollón, to collect 30 liters of water per second. The installations include a sand trap, a surplus spillway, and a canal segment where a gauge will be placed.
- A water shunt along the right river bank through a cyclopean concrete channel.
- Construction of 2.6 miles of buried pipes for water pressure supply.
- 18 hydrants with flow valves for the delivery and regulation of the water directly to farm plots.
- Construction of a network of 1.07 km of secondary pipes.
- A pressure-break chamber.

The elements of the irrigation system in the Cooperativa sector include:

- Rehabilitation of the existing intake structure with better hydrodynamic conditions, and construction of a new output channel.
- Protection works in the water collection area.
- Covering of 1.12 kilometers of the channel, with a design flow of 50 liters per second, to reduce water losses by percolation.
- Construction of two vehicle bridges.
- An 8 meter aqueduct.
- Construction of 4 irrigation distributors.

For the cattle farmers and domestic use, the Cooperativa system will add:

- A reinforced concrete tank with a capacity of 25 cubic meters.
- Water troughs for cattle.
- Construction of collective clothes washing facilities.

¹² The original design (see Annex 3) included a sprinkler system. This will be changed to a drip system in keeping with the agro-ecological principles guiding the project, thereby increasing the number of hectares that can be irrigated throughout all months of the year, including the driest.

With these installations, the beneficiaries of the Las Mercedes micro-watershed irrigation systems will be:

SECTOR	Beneficiaries		Total
	Current	New	
Mercedes Centro	17	25	42
Cooperativa Ismael Castillo	11	3	14
Cattle farmers	0	9	9
TOTAL	28	37	65

The 2008 preparatory and final design study (Annex 3) estimated the construction costs of the installations to be US\$ 256,962, of which US\$ 25,865 would be the contribution of labor provided by the beneficiaries and US\$ 231,098 the donor's contribution. It was also estimated that, in addition, consulting services would be required to supervise the construction works and to support system users in providing their counterpart labor contribution. The cost of the consulting services was estimated at US\$ 167,600, indicating that the total contribution of the donor would be US\$ 398,698.

As part of the preparation of this programme Document, a review of the design and estimated costs¹³ was undertaken to determine if it would be necessary to make adjustments to the cost estimates before tendering the works once the programme begins, taking into account the time elapsed since 2008 and changes in the institutional context. The review determined that the devaluation of the Nicaraguan currency and inflation of certain costs justify a new estimate of the donor contribution for construction at US\$257,464. It was observed, however, that significant savings could occur in the consulting services for works supervision and user support because it will be possible to combine them in one contract with the consulting services for the same purpose in the Salale micro-watershed.

There are 80 families located in the Las Mercedes micro-watershed, all of them users of the drinking water and sanitation system. To enable all of them to improve their access to water for productive and/or domestic purposes, as part of output 2 some US\$ 30,000 will be allotted for additional small hydraulic installations for collection of rain water on those farms whose location does not allow a connection to the irrigation systems.

b.2 Salale

The irrigation system designed for the Salale micro-watershed will convert some eight existing individual micro-systems capable of irrigating 11.55 hectares into a community system for 20 families, capable of irrigating 24.5 hectares and tripling the annual net income from agricultural production in an area considered important for feeding the urban population in the Municipality of El Sauce.

The elements of the Salale system include:

- Construction of a 1.1 kilometer temporary access road.

¹³ See Annex 4

- A water storage installation on the Salale River in a natural cascade located in the community of Ojochal.
- A 2.0 to 2.5 meter wide platform on a rocky slope in order to install a 640 m concrete channel in the direction of the left bank of the river.
- Excavation of a ditch 6.0 meters deep for a water crossing.
- A 48 meter arched channel for the water transfer.
- Construction of a passage across a gully and an aqueduct of 8 feet in the water channel.
- A holding chamber, at the outlet of the arched channel, from which the main pipeline network will be loaded.
- A network of pipes buried at no less than 50 cm to work with pressure, with one branch located on the upper part of the agricultural terrace on the left side of the river and a second for irrigation on the right side of the river.
- A series of 11 hydrants to deliver and regulate water directly to the plots of land.
- A 22 meter hanging bridge on the right side of the irrigated area.

The preparatory and final design study¹⁴ estimated construction costs for this system at US\$ 280,297, of which US\$ 20,122 would be the labor contribution of the beneficiaries and US\$ 260,175 the contribution from the donor. In addition, it was estimated that the consulting services costs for works supervision and user support would be US\$169,200, so the total donor contribution would amount to US\$ 429,375.

The current review of the design and estimated costs¹⁵ raised the estimated donor contribution for the works to US\$ 288,851. Nonetheless, the consulting services to supervise the works could be combined in the same contract with the supervision of the works in the Las Mercedes micro-watershed for a total cost of US\$ 180,900. Consequently, the combined estimate of the amount necessary for the micro-dams and irrigation systems in the two micro-watersheds of Salale and Las Mercedes is US\$ 727,215.

As part of output 2, about US\$ 70,000 will be allotted for small additional works to allow families in the Salale micro-watershed that do not have access to the irrigation system from the river to collect rain water for agricultural production and/or domestic purposes.

b. Rainwater retention in the other six micro-watersheds (output 1.2)

It is anticipated that in six of the micro-watersheds, structures of an appropriate size will be built for individual farms, or for small groups of 2 to 4 neighboring farms. Building on the experience of the Sustainable Land Management Project (MST) with selected farmers in El Sauce, Achuapa, Villanueva and 7 additional municipalities in the area, and the analysis of other experiences in Nicaragua, a “menu” is available with five types of minor hydraulic infrastructure that can be installed on individual farms. Selection of the structure appropriate

¹⁴ GFA Consulting Group, Final Report, Irrigation Systems Salale. Millennium Challenge Account-Nicaragua. September 2008.

¹⁵ See Annex 4.

to each farm will be made on the basis of agro-ecological farm transformation plans prepared to determine the most appropriate agricultural production practices for the soils, slopes, and current soil cover of the land, as well as the capacities and interests of the farm family. The dimensions of each structure may vary to adjust to the physical conditions of the specific plot. The basic menu¹⁶ is:

Water storage structure	Typical dimensions	Volume	Estimated cost/m3
Brick lined cistern well	2m * 3m	9.42 m3	\$ 69.00
Roof collection system	varies according to size of house		\$ 37.00
Polyethylene lined pond	6m * 5.7m * 1.2m	41.00 m3	\$ 7.00
Polyethylene lined trench	31m * 1.8m * 1.3m	54.00 m3	\$ 5.82
Reservoir with dikes	6m * 10m * 1m	60.00 m3	\$ 5.85

In principle, US\$ 250,000 will be allotted to each of these micro-watersheds to contribute to the construction of rain water retention structures. The most effective manner of using these resources in each micro-watershed will be determined during the first year of the programme. A requirement for investment will be the preparation of an agro-ecological farm transformation plan by the farm family, specifying forestry, agro-forestry and silvopastoral practices that will be adopted (or reinforced) to optimize the benefits of the stored rain water.

In principle, the economic efficiency of a structure is higher when its total volume increases. Structures—such as cistern wells and roof collection systems—that by their nature have limited dimensions are significantly more costly per cubic meter than structures whose dimensions can be extended. Consequently, the benefits tend to be higher where several farm families with neighboring plots agree to share a larger size pond, lined trench or micro-reservoir. It must be noted, however, that the physical efficiency of sharing a larger structure is accompanied by organizational difficulties that are inherent to communal works. During the first year, efforts will be made to optimize the efficiency of the investment, looking for the point of equilibrium between the larger physical benefits of structures with higher volumes and the organizational difficulties that these can entail.

In the selection of works to be built in each micro-watershed, not only the water collection and storage structures will be considered, but also investments in soil and water conservation works to increase the recharge rates of aquifers through, for example, infiltration ditches and fences to protect forest regeneration areas. These investments will be complemented by agricultural works such as drip irrigation systems, contour line ditches and other agro-ecological practices promoted in Component 2.

c. Organization and training for water works management (output 1.3)

For construction of the works in the eight micro-watersheds, the municipalities of El Sauce, Achuapa and Villanueva will sign agreements with MARENA establishing financial mechanisms

¹⁶ See Annex 2 for specifications and costs of different types of rain and surface water retention structures.

for the transfer of funds to be used in the construction of the hydraulic works.¹⁷ Contracts for construction of the irrigation systems as well as the rainwater collection systems will require the contractors to work closely with the beneficiary families, incorporating their labor during construction and providing them with training in the management, efficient use and maintenance of the hydraulic systems. The civil engineer on the programme team will collaborate with municipal procurement staff to ensure that this training is provided properly. In addition, for the irrigation systems and wherever rainwater collection systems require organization involving neighboring farm families, the programme Coordinator will also oversee the training provided by the works contractors to ensure that it covers all organizational issues appropriately and that there is appropriate follow-up through Components 2 and 3, once the construction contracts have ended.

Component 2 – Introduction of climate resilient agro-ecological practices to make effective use of available water.

Climate change represents a serious threat to agricultural activities due to the close relation that exists between water and soil resources. Prolonged droughts weaken the biological basis of soil structure, and prolonged torrential storms erode weakened soils. To break the cycle of growing vulnerability in the communities in the Villanueva River basin, the hydraulic works financed in Component 1 will be important but not sufficient. To be effective, they must be selected, designed and used as tools in a series of fundamental changes in the activities of agricultural production. These changes must ensure more efficient use of water in all production processes, increase infiltration, strengthen soil structure, and stabilize slopes.

a. Agro-ecological farm transformation plans (output 2.1)

The decisions and work required to introduce the changes needed in production practice can only take place at the individual farm level. Consequently, the most important planning process in this component will be the preparation of detailed farm plans for the progressive introduction of agro-ecological practices.

The priority activity during the first year of the programme will be the preparation and/or updating of a farm transformation plan by each farm family in each micro-watershed. The basic elements for each farm transformation plan will be:

- Identification of the vocation of the soils on the farm.
- Diagnosis of current practices, including the use given to all land and available water.
- On the farms benefiting from the irrigation systems designed for Las Mercedes and Salale micro-watersheds, identification of the potential production options afforded by the irrigation system.
- On the other farms, identification of feasible water collection alternatives, a reasoned selection of the preferred option(s), and identification of new productive options that will arise.
- Design of the future use of all land and available water, applying agro-ecological practices.

¹⁷ See Section III-A below, especially p. 38.

- A long term transformation strategy.
- A 1 to 3 year transition plan
- A proposal for immediate implementation, specifying the following elements:
 - selected rainwater retention facilities and, where applicable, drip irrigation system installations;
 - household installations and procedures for optimizing water and fuel use;
 - household investments for family nutritional security including home gardens and, where appropriate, small animal management;
 - application of a selected agro-ecological production process on 1 hectare of farm land.

The programme will place a great deal of emphasis on these farm transformation plans, and especially on facilitating their full appropriation and active use by each farm family. To this end, personalized and patient attention will be dedicated to each family; the programme will finance materials for initial plan implementation; the pertinence of the plan and/or any necessary adjustments will be confirmed before each technical assistance activity. During years 2 to 4 of the programme, transformation plan updating sessions will take place at least once a year and farm families will be assisted in applying for financing to ongoing implementation. In the event that some farm families do not prepare transformation plans in the first year, they will be offered support for their preparation in each subsequent year of the programme.

b. Menu of Production Practices (output 2.2)

In order to increase the capacity of each farm to adapt to climate change and variability, the programme will offer technical support as well as vegetative and construction materials needed to carry out the changes involved in the adoption of a “menu” of agro-ecological practices. Each farm family will be assisted in identifying appropriate practices to be included in their farm transformation plan, selecting them not only from printed descriptions, but also – in many cases – from ongoing examples: a “buffet” that illustrates the “menu”. This will be possible because in each of the three municipalities there are a number of farms that have already received support from the programme “Sustainable Land Management” (and/or from other technical assistance programmes); each farm family in the targeted micro-watersheds will be offered the opportunity to visit nearby sites where several recommended practices are under way.

Annex 5 provides a summary of the information about the practices included in the menu. The programme will supply validated information about the procedures, investment costs, and conditions required for:

- practices that protect underground water resources. These include:
 - reduction in the use of agrochemicals for different production practices.
 - production and use of organic fertilizers and botanical insecticides.
 - integral crop management with biological, physical and manual control of crop health.
- practices to reduce the risk of harvest losses during drought periods. These include:

- adoption of climatically adaptable crops,
- adoption of higher value crops,
- changes in the production calendar and review of planting dates,
- use of short cycle varieties,
- use of drought resistant varieties.
- practices to increase the benefits of available water. These include:
 - climatically adaptable irrigation methods,
 - efficient practices in the use of irrigation water.
- practices that minimize the impact of animals on the topsoil. These include
 - use of leguminous fodder trees,
 - animal feed alternatives,
 - improved livestock feed storage facilities.
- communal and individual practices to protect water table recharge areas, stop erosive processes, increase underground water infiltration, and reduce the risk of landslides (**output 2.3**). These include:
 - delimitation and preservation of natural regeneration areas,
 - maximization of plant cover on cultivated plots,
 - participation in the efforts of the local authorities to prevent and reduce fires.

c. Transformation plan implementation (outputs 2.1 and 2.2)

The first farm transformation plans should be ready 3 to 4 months after programme start up. Programme support will be provided for the elements in the proposed plan for immediate implementation, provided that:

- a member of the farm family has a property title or good faith possession¹⁸ of the farm;
- the farm is not located within a protected area;
- the farm is located within one of the targeted micro-watersheds;
- the farm family does not receive public financing from another entity for the same activity;
- the elements in the immediate implementation plan are judged by the programme outreach worker assigned to the micro-watershed as legitimate steps towards the full agro-ecological transformation of the farm.

Some of the elements in the proposal (such as the construction of a low consumption stove, for example) will be possible to implement at any time. Others (such as construction of rainwater retention structures) will not be advisable during rainy periods. Yet others (such as adapting a hectare for planting under a new agro-forestry system) will need to be timed to begin with the preparation for the final crop (the *postrera*) of the first year or the first crop of the second year. The programme team will endeavor to ensure that the required materials and technical assistance are available in each micro-watershed at the appropriate times.

¹⁸ As defined in the Nicaraguan Civil Code.

Care will be taken to ensure that implementation occurs at a speed conducive to quality and full appropriation by the farm family, even if this means that some elements included in the proposal need to wait until the following year. Respect for the absorptive capacity of the family will also guide the completion of the farm transformation plans. The first annual programme work-plan will specify the technical assistance inputs to be made available in each micro-watershed, but it will not establish quantitative targets for the number of immediate implementation proposals that should be carried out during the year. Implementation targets will be established for the second and—if necessary—the third year of the programme, following analysis of the implementation rhythm achieved in each micro-watershed during the first year.

While seeking to ensure that the benefits of the programme are available to the farm families as soon as possible, the programme team will also give a high priority to ensuring that each investment made on a farm is not seen as an end in itself but rather as a step toward the full agro-ecologic transformation of the farm, and, therefore, part of a long term process which will depend on the attitude, understanding and commitment of the farm family.

When properly appropriated and carried out, agro-ecological practices will generate secure harvests, higher crop yields, and increased income—along with stable soils and greater water retention. This will stimulate farm families to continue with the implementation of their 1-3 year transition plans and their long-term transformation plans. If, on the other hand, innovations are imposed or pushed through to meet programme targets they will be less likely to provide solid benefits to the farm families and they may be abandoned once the programme is over.

d. An innovative mentality (outputs 2.1, 2.2 and 2.3)

Through the process of preparing farm transformation plans, consideration of the menu of production practices, visits to the buffet of ongoing practices, implementation of the transition plan, and regular updating of farm plans, the programme will seek to induce an innovative mentality in farm families. Agro-ecological technical assistance will be accompanied by a broader educational process, with three areas of focus. Overall, it is anticipated that awareness in these areas will stimulate the adoption of proactive behaviors to adapt to already experienced climate variability, and also to proactive attitudes for ongoing learning about future climate change effects.

One area of focus will be **the climate change process itself**. Farmers in the area say they have heard many references to the greenhouse effect and the impacts being generated on the Earth, but they lack clear information that enables them to understand the whole process and its relationship to their own lives. Through the activities of component 4, the communities of the targeted micro-watersheds will have access to relevant information managed by the Nicaraguan Institute for Territorial Studies (INETER) and the Climate Change Directorate of MARENA, including the first and second national on climate change¹⁹.

A second area of focus will be **agro-ecological**. Taking into account both the new national agro-ecological policy focus as well as university courses already underway in this field, farm families

¹⁹ See pp. 21-22 below

will be placed in contact with agro-ecology technical specialists and students during the development and implementation of their farm transformation plans. It is anticipated that this will have the effect of introducing a practical action-research perspective that promotes testing a combination of traditional practices with advanced technology. If they assume this perspective, farm families will assess their innovations on the basis of their success in producing healthy and good quality food, through respectful techniques in harmony with the environment. In particular, the programme will communicate ways to **replace the use of agrochemicals** with organic biological processes aimed at reducing pollution in water bodies, soil and air, and also minimizing production costs while increasing the nutritional and economic value of produce.

Applying in depth national policies that value the role of women in rural areas, emphasis will be placed on the importance of integral practices in production systems that encourage **family involvement**. In each micro-watershed, a series of workshops²⁰ will be held to stimulate analysis of the roles played by men, women, youth and children in the production process and the family economy, valuing household work, marketing of products and home garden production. This will aim at promoting just relations and solidarity among men and women, adults and youth, creating the conditions and values that enable more equitable capacity development and role distribution among family members. It is anticipated that this will also have the effect of releasing the energies latent in farm families, and that women and youth will drive changes in favor of ecology, nutrition, food security, food sovereignty, and biodiversity.

e. Agents of change (outputs 2.1, 2.2, and 2.3)

The success of the programme will depend on the capacity of the technical team to induce and accompany a critical mass of changes in production systems, sufficient to generate appreciable effects in water availability and soil conservation. To this end, the resources provided in Component 2 will be aimed not only at the adoption of agro-ecological practices but also at establishing a close relation between farm families and the sources of the support they will require for successful long-term application of such practices.

One part of the Component 2 input will be economic. In principle, the programme will allot US\$ 146,225 to each micro-watershed to support the adoption of new conservation and agro-ecological practices²¹.

These resources will accompany an intensive and carefully designed human input in each micro-watershed. As expressed in the discussion of implementation arrangements²², a careful selection of the professional staff for the programme team will be made, aimed at guaranteeing the staff's technical and social capacity as promoters of change. The programme team will coordinate closely with staff from pertinent national government institutions (MAGFOR, INTA, IDR, and MARENA), municipal governments, cooperatives, farmer organizations, churches of different denominations and the NGOs that are active in the micro-watersheds.

²⁰ See Annex 10 for a discussion of gender and family role workshop methodology.

²¹ See Annex 5 for a summary of costs related to adoption of various agro-ecological practices.

²² See pp. 37-42 below

Particular attention will be given to ensuring the timely participation of leaders in the national agro-ecological movement, since their experience as farmers whose success with agro-ecological practices makes them particularly effective communicators of the importance and possibility of farm transformation. To this end, the programme will allot \$55,800 to cover their expenses in workshops with farm families.

In addition, developing a recent experience of the Nicaraguan Institute of Agricultural Technology (INTA), the programme will facilitate agreements between INTA, the Faculty of Science and Technology of the National University of Nicaragua (UNAN-León), the Faculty of Anthropology of UNAN-Managua and the municipal governments of El Sauce, Villanueva and Achuapa, so that senior students, both of agro-ecology and anthropology, undertake work-study activities in the micro-watersheds.

Each micro-watershed will be assigned 4 students of agro-ecology for 3 months each year. Teaming up with INTA staff and the programme team extension workers, these students will enter into direct relationships with farm families to provide support for them in developing, implementing, monitoring and annually updating agro-ecological farm transformation plans. To support their participation, US\$ 150 monthly will be allocated for the expenses of each student during the three months that he or she will live in his or her assigned community each year. Community families will be asked to commit to provide the students with room and board for a reasonable charge during their stay. In this way, while ensuring close contact with farm families, cash resources will be injected into the community economy.

An anthropology student will accompany each team of agro-ecology students. With technical support of INTA professionals and coordination and advice from the extension staff on the programme team, these student teams will function as agents of change in the communities where they will share in the lives of the farm families for 3 months of the year. Their presence is expected to facilitate the involvement of families and communities in different measures of adaptation to climate change and so that they can attain ownership and empowerment.

f. Added value for climate change adaptation

The proposed Programme outputs under Component 2 have a definitive additional value for two reasons: i) focus is on the development of practices and skills that go beyond “traditional” sustainable land use management (SLM) approaches; and ii) these constitute part of a comprehensive effort to ensure that the investments made under Component 1 are maximized. SLM approaches deliver a range of benefits which include enhanced resilience and stability of ecosystem services and functions and it can thus be argued that these practices contribute to reducing vulnerability to climate variability and change. However, specific activities will be promoted that go beyond traditional SLM approaches and which seek to address the existing and projected climate stresses and that specifically seek to strengthen the coping capacity and options of local communities and livelihoods. These include adoption of crop varieties that are more climate resilient, changes in crop cycles to account for climatic variability during the wet season, and promotion of livestock feed facilities for times of drought. These are not “traditional” SLM nor development objectives.

Notably a key programme goal that underpins Component 2 is to contribute both to improving water availability and to the promotion of water use efficiency in order to complement the

investments being made under Component 1. With regards to the former, aquifers constitute critical resources for drought-stricken areas. However, there are concerns that aquifers in the programme area are being overexploited and Government authorities are keen to support activities that will enhance groundwater infiltration rates. Such activities which include improved catchment area protection efforts will also contribute to slowing down erosion rates and therefore limiting the risk of landslides, a recurrent threat during the wet season. The understanding that aquifers are essentially natural water storage facilities also drives the concerns to ensure that these critical resources are not polluted from excessive agro-chemical use. Thus some of the activities under Component 2 seek to protect groundwater resources – as part of a long-term adaptation strategy - both in terms of water quantity and water quality. With regard to water use, under Component 2 approaches that encourage more effective water use will be promoted. These include climate resilient irrigation approaches – which are critical so as to make the best use of increased water availability through investments under Component 1.

The programme will work closely with the municipal planning, environmental and water and sanitation units, as well as with the departmental MARENA office, in order to define the baseline and further characterize risks related to the effects of climate change. An important tool that will aid this process is the national system of environmental indicators (SINIA), which will also be strengthened to incorporate climate change considerations under Component 4 (see below).

Component 3 – Institutional development and capacity building in micro-watersheds, municipalities, and participating national institutions.

To adapt to climate change, human beings have to develop new capacities and forms of social organization. To be able to respond to the effects of climate change that have and will have the greatest major impacts on our lives, the core issue is water management.

Water management, as recognized by Law 620, the General Law of National Waters, requires organization that is structured in terms of watersheds, at the watershed level and at the levels of the sub-watersheds and micro-watersheds that make up the 21 watersheds of Nicaragua.

The national experience in watershed management is limited, but it has generated lessons at the level of micro-watershed and sub-watershed management that are very important for this programme. Based on the scientific information available (geographical, hydrological, weather, agricultural and forestry), it is possible to elaborate an ideal design for water management and soil conservation in a micro-watershed and for the set of micro-watersheds that make up the sub-watershed. An ideal master plan, however, will have no effect if it is not appropriated by the population that lives in each micro-watershed. The decisions of the local population are what determine how water and soils are used. And for local stakeholders to make use of a plan to guide their decisions, they should participate in its preparation.

To participate effectively in the preparation of micro-watershed and sub-watershed plans, the local communities need access to the pertinent scientific information. They also need a forum where they can examine the information, compare it with their own experience, debate its implications, examine the options for action, consider the consequences of each option, verify the intentions and will of their neighbors, and make decisions.

This forum cannot be a single workshop, or a series of planning workshops, that conclude with the “approval” of a plan for the micro or sub-watershed. Participation in a verbal or written agreement does not change behavior on the ground. A permanent forum is needed to allow for reflection about the results of the first new actions undertaken by the community or by some of its members, consideration of other initiatives stimulated by the results of the first, and an assessment of the new situation created. Management of the transformation of agricultural practices in a micro or sub-watershed is—necessarily—adaptive: adaptive not only to climate changes but also to the changes generated in and by the activities of the participating local families themselves.

Adaptive management is also—necessarily—co-management. Not only local stakeholders participate in it, but also the promoters of the management process, the agents of change in rural development. They are not the generators of the scientific information about the watershed, but initially they are the ones who know how to obtain that information. These are the technical specialists in management of water and other natural resources, the extension workers and local and national government planners and professionals who work in cooperatives, professional organizations and NGOs active in the area.

Component 3 is the key component; it is the core of this programme. Its inputs consist of actions designed to create and/or strengthen bodies for adaptive co-management in the eight targeted micro-watersheds and the Villanueva River sub-watershed, and for participation in adaptive co-management of the Estero Real River Watershed. These bodies—equipped with the required capacities and appropriate instruments for their respective contexts—will be the crucible where local will and experience meet and interact with national institutions and policies, and pertinent scientific knowledge.

Experience in Nicaragua and in other parts of Central America has shown the importance of creating adaptive co-management bodies in order to advance toward integral management of a micro or sub-watershed. It has not generated a prefabricated recipe for their creation. There are several strategies under construction; each new initiative contributes new knowledge; this programme will also contribute to the development of the adaptation process.

a. Capacities, organization and co-management in the micro-watersheds (output 3.1)

This programme proposes to effect deep changes in the water use behavior of agricultural producers and water consumers in eight micro-watersheds, both in agricultural practice and in domestic use, with the purpose of guaranteeing food security.

Some years ago, farmers in the upper part of the Villanueva River basin used certain natural *señas* (“weather signs”) to guide their harvest plans. Today, these signs are not sufficient. Changes in rain patterns with ever more frequent, longer, and more intense periods of flooding and drought, place human life and food security in danger, making different economic and production activities more vulnerable. At the community level, the farmers with most expertise in reading the *señas* of change in the seasons have noted that these are no longer as reliable as in the past. Now, they accompany this verification with a new indication: *cultivate as soon as rain falls and not when the señas appear*. Climate changes have made it necessary to leave the language of *señas* behind.

Despite this loss of faith in traditional knowledge, a collective search for new patterns of knowledge has not been generated. There is uncertainty and insecurity, but these have not generated social processes for reflection and change in the face of greater variability in ENOS events. To generate such processes, the programme will facilitate the creation of a body for adaptive co-management in each micro-watershed.

The co-management body to be created may be called, as Law 620 indicates, a “micro-watershed committee”, but it may also be a product of the evolution and strengthening of an existing organization. The important factor, as a starting point, is that it recognizes, respects and facilitates the incorporation, as programme partners, of the existing organizations, such as the drinking water and sanitation committees (CAPS), organizations of farmers and irrigators, community committees, citizen power cabinets, women’s groups, youth groups, religious organizations and other organizations that are present.

It is equally important for the programme that the process of organizational evolution be accompanied by a culturally digestible learning process. Generally, farmers make their decisions while thinking from their property boundaries inward. Technical specialists are also accustomed to planning actions for the farm’s production system. The micro-watershed approach requires changes in the way farmers and technical specialists reflect, rationalize and make decisions.

People should adapt to sharing, making and accepting communal decisions about various aspects of the use and management of their natural resources—in the past this was an individual concern. This may be a long term process, in which it is necessary for extension workers, technical advisors and farmers to continually emphasize certain important factors as a way of inducing the beginning of a change process.

The most important factors are:

- **The farm is not isolated.** Farm families need to become aware of the fact that the farm is not isolated but is rather part of the micro-watershed. It influences this larger landscape and is influenced by it. If inhabitants are not clear about this relation, it will be difficult for them to coordinate actions to correct the existing problems in the micro-watershed.
- **Everyone is responsible.** It is common for farmers to blame neighbors or other people for the damages or bad agricultural practices that affect the environment. Hardly ever do they feel responsible and, in consequence, they do nothing different that would involve a process of ongoing and environmentally attuned change. Action at the micro-watershed level requires awareness of the fact that everyone is responsible and that important impacts will be attained only if the majority (ideally everyone) take action jointly.
- **Decision making:** One of the most complex processes to be implemented together with the farm families in the micro-watershed is to enable them to identify themselves as a community that can work as a team and begin to make joint decisions for the management of the natural resources located on their lands. The population is accustomed to making shared decisions for infrastructure (schools, clinics, transportation, communication, security, etc.), where the action does not involve changes in the use and management of their own personal properties: their fields, their production system, their farms, and of course, their costs and incomes. The micro-watershed plan will only be

feasible when the local population is willing to make and accept communal decisions. To begin with small actions of interest to the majority can be the shortest path to inducing awareness that can generate the necessary social change.

- **The need to organize:** Making decisions and implementing shared actions at the micro-watershed level requires organization. It is, however, necessary to organize for a purpose and not as an end in itself. In this sense, the organization must be viewed as a tool to reach objectives that are not accessible for individuals on their own.

The aforementioned gap in the traditional reliance on “weather signs” can be an open door for the start of this learning process. Through the actions of Component 4 communities will be provided with new sources of information relevant to their agricultural decisions²³. Institutions, local governments and the population can join in studying this information in preparation for facing the risks of climate variability.

The central issue in the generation of the required organizational change is likely to be the interaction between climate change and water availability. Most communities already have some experience with organization to address the issue of water. It can be particularly strategic to strengthen (or in a few cases, to organize) the local Water Supply and Sanitation Committees (CAPS) which in fact already function as social structures that collectively manage the use of water resources for human consumption. In some micro-watersheds, there are also irrigators' associations that manage water for agricultural purposes. It is possible that the micro-watershed committee will be born as an extension of the functions of a CAPS or out of coordination between a CAPS and an irrigators' association.

The process of establishing a micro-watershed committee should not be hastily forced. The development of farm transformation plans in Component 2 will initiate changes in the perception of farm families; the introduction of new sources of information and a detailed understanding of the dynamics of interactions in the sub-watershed in Component 4 will stimulate an expansion of perspective; the implementation of the investments in Component 1 will show that notable changes in access to water are feasible. The analysis of the effects of these interventions on attitudes, intentions and behaviors in each micro-watershed should contribute to the programme team's decisions about the pace of its organizational interventions.

It is possible that in some of the micro-watersheds, the creation of a watershed committee will be achieved in the first year of the programme. The goal will be to have a co-management body in operation in each targeted micro-watershed by the end of the second year.

The main tool for adaptive co-management of the micro-watershed will be a climate resilient micro-watershed management plan to increase water retention, soil conservation and food security. The plan should address water use and protection, soil conservation and enrichment, and land use regulation, reflecting current reality, a shared vision of what should be, and a transition plan covering a timeframe determined by the community. The monitoring plan of the micro-watershed plan will be fed by monitoring reports about farm plan implementation, irrigation and drinking water systems operation and development, and collective activities for

²³ See pp. 21-22 below

the protection of recharge areas and / or conservation. The first version of the co-management plan for each micro-watershed should be prepared no later than the first semester of the third year of the programme to ensure that by the end of the programme the micro-watershed committee has had at least one year of experience in its implementation, monitoring and updating.

In recognition its central importance, Component 3 will be coordinated directly by the Programme Coordinator. The terms of reference for this position²⁴ require that the person concerned be an anthropologist, sociologist, social psychologist, an adult educator or a professional in another related field, with expertise in facilitating organizational and learning processes in rural communities.

In addition to the technical team and professionals from the central government institutions (MARENA, INTA, MAG, and IDR) and municipal governments with responsibilities in the area, the coordinator will have the support of students from the anthropology faculty in the UNAN-Managua. These anthropology students, as well as the agro-ecology students who will support the programme in Component 2, will work within the institutional context of their university's agreement with INTA. INTA has found that anthropology students enhance the appropriation of agricultural technologies since they study the processes that create social behavior and that can lead to change and improvement in a community.

b. Capacities, Organization and Co-Management in the Villanueva River Sub-Watershed (outputs 3.2 and 3.3)

This programme should generate behavioral change, not just by the communities, but also by the staff on the facilitation team and the staff of the national and municipal institutions involved in the programme. To generate this process of change the programme will develop an organizational framework that articulates, for each targeted micro-watershed, the functions and responsibilities of each government institution in accordance with its respective authority. Each entity must learn to carry out its functions while maintaining a sense of opportunity with respect to the actions performed by other institutions or levels of government, so that there is consistency and an enhanced impact of each and every action taken.

Traditionally, government institutions have worked in isolation, each assuming a topic and approaching problems with a partial focus. The intention is to achieve an integral approach. For the relevant institutions to work in an articulated manner, each one within its scope of authority, as mandated by the National Environment and Climate Change Strategy, the programme will support the integration of inter-institutional harmonization platforms in the municipalities of El Sauce, Achuapa and Villanueva.

The purpose of inter-institutional harmonization in these municipalities will be to optimize the coordination and benefits of the activities in the targeted micro-watersheds performed by each of the national government institutions, the municipal government, cooperatives, farmer associations and NGOs that are active in the area. They will identify the problems as well as seek integral solutions.

²⁴ See Annex 9.

Once the micro-watershed committees are created, the articulation between these and the municipal harmonization platforms will be undertaken with the purpose of integrating a watershed committee of the Villanueva River Sub-Watershed, thus contributing to the creation of the watershed body for the Estero Real River Watershed and to the generation of the watershed management tools called for in the General Law of National Waters.

The goal will be to propose a sub-watershed management plan during the last year of the programme at the latest. Based on the experience in preparing micro-watershed plans, the sub-watershed plan should include proposals for normative instruments to build climate change resilience and for the operation of the Villanueva River sub-watershed committee. Its focus will be on water use and protection, soil conservation and enrichment, as well as territorial organization, reflecting the current reality, a shared vision of what “should be”, and a transition plan within a timeframe established by the communities, municipalities, cooperatives and professional organizations, NGOs, and the pertinent central government institutions. The proposal for the operational organization of the Villanueva River Sub-Watershed Committee, will aim at ensuring that this body is capable of reviewing, adopting and monitoring the implementation of the sub-watershed plan.

It should be noted that the establishment of a sub-watershed committee will be a key output, significantly augmenting the programme’s benefits by providing a strategy to extend in-depth agro-ecological transformation of farm practices to all the other micro-watersheds in the Villanueva River basin. Data from the 2005 census²⁵ indicates that this will expand the number of rural families benefiting from the programme from 1,005 to 7,120, with a total population of over 33,000.

One of the most important functions of the sub-watershed committee will be to generate a widespread practical educational process through exchange among similar groups. This will allow stakeholders to better understand the particular geo-bio-physical nature of the micro-watershed where they live and/or act and will help them to plan and monitor the effects of investments in water collection and use, new production practices and other actions included in their co-management plans.

Although exchanges among stakeholders in micro-watersheds in other parts of Nicaragua and Central America may take place, the immediate scope of exchange will be within the Villanueva River Sub-Watershed and, in second place, the other sub-watersheds in the Estero Real River Watershed (Watershed 60). Watershed 60 is the scenario of complex bio-hydrological interactions and very diverse economic activities. Creation of a watershed organization for Watershed 60 will be a complex process that will benefit from the exchange experience among micro-watersheds in the upper Villanueva River Sub-Watershed.

c. Climate change considerations in municipal plans throughout the Watershed (output 3.4)

The programme will also endeavor to ensure that all nine of the municipalities which have a significant portion of their territory within the Estero Real River Watershed participate in the implementation of the National Environment and Climate Change Strategy. To this end, the

²⁵ These numbers include 85% of the population and rural households counted in El Sauce in 2005, 80% of those in Achuapa, 40% of those in Villanueva, and 30% of those in Somotillo.

programme team, in coordination with staff in the Climate Change Directorate in MARENA will identify appropriate climate change adaptation measures for incorporation into municipal land use and water use plans, as well as municipal investment plans. Workshops will be held for municipal officials and staff to assist in the incorporation of these measures in these municipal plans and related normative instruments.

Component 4 – Ongoing monitoring and analysis of climatic conditions and changes in land use, water flows and soil quality.

a. Hydrological study (output 4.1)

At the beginning of the programme MARENA will organize the relevant geo-bio-physical and weather data available for the Villanueva River Sub-watershed. This data will be complemented by a study of the hydrological dynamics of the Sub-watershed to identify the causes of the flooding that has occurred in the lower watershed since Hurricane Mitch in 1998.

b. Participatory monitoring (output 4.2)

With support from INETER, MAGFOR, MINSA and INTA training will be provided for the agro-ecology students assigned to each micro-watershed and interested members of the farm families so that they can collect geo-referenced local information about current land use, surface water flows, water quality and soil conditions. In addition to being used in preparing the farm transformation plans (see Component 2, pp.13-15 above), this information will be combined with the relevant data organized by MARENA and the results of the hydrological study of the sub-watershed to provide a detailed characterization of the baseline conditions and the relation between the upper and lower parts of the Villanueva River Sub-watershed.

Data collection training will be repeated each year and interested members of local farm families will be encouraged to learn how to monitor not only their crops and water facilities, but also changes in water flows, soil conditions, erosion rates, and other variables. The goal is that climate change considerations become a part of the communities' ongoing decision-making processes.

c. Electronic information posts and SINIA (output 4.3)

An electronic information post will be installed in each targeted micro-watershed, with a computer technician capable of producing digitalized maps. Each post will maintain interactive communication with the regional node of the National Environmental Information System of Nicaragua (SINIA) located in the Departmental Delegation of MARENA-Leon, and will receive the meteorological information that MARENA obtains from INETER and NOAA. The post will also operate as a programme office serving the micro-watershed co-management body.

Local information, including geo-referenced information used for the farm plans will be digitized and converted into maps of current and projected use of the land in the micro-watershed, and of water sources and systems. These maps, in addition to serving as work documents for farm families, the CAPS, irrigators' associations and other organizations in the micro-watershed, will constitute the main monitoring tool for components 1 and 2 of the programme. It is expected that the precise digitalized monitoring of land use and water presence will become a tool for adaptive management by the micro-watershed committee and

that it will be useful and operational for a much longer period than the four years of the programme.

The SINIA work team in the regional node and the staff of the information posts in the eight micro-watersheds will also collaborate with the other early warning systems in the northern area of Leon and Chinandega. With support from MARENA's Climate Change Directorate, the SINIA team will incorporate indicators of variability and climate change in its communications with other national government institutions and in the reports, studies, diagnoses and plans prepared in the other programme components. Since information from the municipal level is transferred to the regional node, the programme's local information system will constitute a new knowledge management tool which will strengthen SINIA's capacity to incorporate data relevant to climate change adaptation to the information it provides at the national level.

Through SINIA, the programme team and other collaborators in the micro-watershed committees, municipal inter-institutional harmonization bodies and the eventual Villanueva River Sub-Watershed Committee, as well as each participating farm family, will have the opportunity to communicate their experience and make socio-environmental contributions to the preparation of government strategies, policies, plans and programs at the municipal, departmental and national levels.

A. Describe how the programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities.

Agricultural practices in the Estero Real River Watershed, where more than 46% of the population is classified as living in extreme poverty, have subverted the adaptability of the production landscape. Although efforts have progressed in promoting more sustainable land management approaches through a series of programmes, the vision of agricultural producers is focused on immediate subsistence and short-term earnings without understanding current risks in weather variability and the threats posed by long-term climate change. Water stress is constant during the dry season and drought periods, related to the recurring El Niño-La Niña (ENOS) events which affect agricultural production and food security. Significant levels of famine characterized the droughts in 1972, 1977, 1991, 1997 and 2003. Surface water availability is uncertain due to high variability in the region and there are indications that underground water is being exploited in an unsustainable manner. Extraction of underground water resources does not take into account recharge rates; mycorrhizal fungus loss, deforestation, and loose or highly compacted soils limit underground water infiltration. During the wet season, torrential downpours cause recurrent flooding and increased runoffs that progressively wash away the remaining soils.

The social, economic and environmental benefits that the programme will provide for the communities in the Estero Real Watershed, particularly in the Villanueva River Sub-Watershed, are intertwined. These communities are already being decimated by high levels of emigration that leave an increasingly vulnerable population at home. In a region where a little over a decade ago two annual harvests were traditionally harvested, now—due to climate change trends—only one harvest is feasible. This single harvest increasingly tends to have lower yields due to erratic and insufficient rainfall and, in some areas and years, has failed completely. If

farm families can demonstrate that at least one harvest per year is certain, their access to credit will rise, overcoming a critical economic barrier.

The economic benefits derive, in the first place, from investments in infrastructure to collect water in order to respond to a series of demands (human and animal consumption, irrigation). Despite the existence of numerous springs, streams and semi-permanent or permanent rivers that could be exploited for drinking water or for small scale irrigation, very few investments have been made in the required infrastructure – most of them in drinking water systems.

Construction of small structures for collection, use and infiltration of rain and ground waters and of two irrigation systems will guarantee at least one full harvest per year for farm families in eight micro-watersheds in the upper part of the watershed. These investments will expand the communities' capacity to respond to water stress and drought, not only improving collective wellbeing, but also raising their potential for subsistence in the face of the reduced rainfall, the intensity of rainy periods and events, and the increased temperatures foreseen in long-term climate change scenarios.

To maximize the economic and environmental benefits of the investments, the selection, construction and implementation of new water structures requires a planning process at the farm and micro-watershed levels. Through agro-ecological farm transformation plans, farm families will articulate their production activities with new water sources. During preparation of these plans, each family will receive a menu of forestry, agro-forestry and silvopastoral production practices. Agro-ecology student teams, guided by the programme's technical specialists and agriculture agency staff will accompany farm families on visits to farms in the area where many of the practices are underway, thanks to the MST project and others.

The preparatory studies undertaken by the Millennium Challenge Account for the irrigation systems in Las Mercedes and Salale concluded that the investments were feasible because of the following internal rates of return²⁶:

Investment	Financial IRR	Economic IRR
Irrigation System and Soil and Water Conservation, Las Mercedes	13%	19%
Irrigation System and Soil and Water Conservation, Salale	20%	25%

The investments in rainwater collection and storage are not expected to provide the same benefits as the year-round irrigation systems. Together with the investments in agro-ecological practices, however, they are expected to enable the other 920 farm families in the target micro-watersheds to obtain, at a minimum, an increase in yields equivalent to a quarter hectare of vegetables and at least one annual good harvest from one hectare of corn, thereby ensuring their basic food security at a subsistence level.

²⁶ GFA Consulting Group. Watershed Management Action Plan for Land Use and Integral Use of Prioritized Sub-Watersheds in the Departments of León and Chinandega. MCA-N # QCBS 2006-5. Final Report . Submitted to the Millennium Challenge Account-Nicaragua. November 5, 2007. Page 10.

Two case studies of producers supported by the current MST project on which the proposed agro-ecological menu is based show very positive economic benefits. In one case²⁷ agro-forestry practices increased corn yields from 322 kilos per hectare to 774 in the first year. By the third year, the producer studied was harvesting yields of 1,934 kilos per hectare. In the second case²⁸, a rancher who introduced silvo-pastoral practices on 20 hectares with an investment of US\$7,905 spread over three years, saw his annual operating costs increase from US\$3,494 to US\$4,792. However, his gross income increased from US\$4,600 to US\$5,800 in the second year and US\$13,580 in the third. Consequently, his net income of \$8,788 in the third year was greater than his entire investment of US\$7,905.

In both these cases, the farms were medium sized and the areas converted to agro-ecological practices were considerably greater than those that will benefit from the investments made by the proposed programme on each family farm. Nevertheless, preliminary results from a study²⁹ currently underway in the proposed programme area suggest that the examples of these case studies are indicative. With the assumption that the programme will be successful in inducing the practices, capacities and organizational structures required for ongoing adaptive farm and micro-watershed management, it can be expected that agro-ecological practices will be progressively extended to cover whole farms, thereby restoring soils, increasing yields, diversifying production, and enabling a significant portion of the families to achieve important new cash income.

The social benefits of the programme are difficult to estimate numerically. After years of impotence while viewing the progressive erosion of their soils and their manner of living, families will experience a process of learning about new options, of selecting some of them and planning their adoption, as well as planning land use to maximize water collection benefits. The anticipated effect of this social benefit was well expressed in the words of a farmer from Salale: *With the preparation of this programme, I see hope returning to this community; my grandchildren will have new harvests, new opportunities, right here. They will no longer be compelled to emigrate.*

The environmental benefit will begin with the water collection works that will increase infiltration and recharge the aquifers. Additional benefits will come from the introduction of agro-forestry and silvopastoral practices on farms, where vegetative cover and reduced use of agro-chemicals will conserve existing soils and begin recovery of their biological health and fertility. During the second half of the programme, environmental benefits will be consolidated when the cumulative effect of individual changes in land use on farms is complemented by the effects of communal protection of water recharge areas, and a collective vision of the future is expressed in micro-watershed plans guided and monitored by local committees.

²⁷ Case Study 260109. Hipólito Martínez. MST MARENA-UNDP. 2009.

²⁸ Case Study. Luis Urrutia. *Economic and Environmental Analysis of a Wooded Slope Silvopastoral System*. MST MARENA-UNDP. 2009.

²⁹ Economic and Environmental Valuation of Adaptive Production Systems. MST MARENA-UNDP. (Forthcoming)

In addition, it is expected that collaboration among participating committees and inter-institutional harmonization platforms in the three municipalities will allow the economic, social and environmental benefits in the highly vulnerable communities of the eight targeted micro-watersheds to have an impact throughout the Villanueva River Sub-Watershed and to exert influence on the governing structures of the Estero Real River Watershed.

The potential cumulative economic benefit is very significant, especially through prevention of the costs of landslides, and reduction of the costs of accumulated soil sediments in the lower part of the Villanueva River Sub-watershed. Annual flooding there causes millions of dollars of damage each year through crop and cattle loss, roadbed erosion, emergency shelters, and housing damage. The study of the hydrological dynamics in the sub-watershed is expected to identify the works needed to repair the effects caused by Hurricane Mitch and the erosion of the subsequent 12 years. Once these works have been completed, avoidance of recurrent flooding will be determined by the programme's success in demonstrating that the intensive adaptation scheme composed of water retention and agro-ecological transformation of farm practices in micro-watersheds makes soil conservation in the upper watershed both feasible and profitable.

B. Describe or provide an analysis of the cost-effectiveness of the proposed programme.

Two alternative strategies were considered for addressing the underlying problem. The first was to concentrate on national policy development for climate change adaptation. This option was discarded because Nicaragua already has a national climate change strategy that addresses adaptation, a new water law, and a governmental commitment to introduce agro-ecological principles into all agricultural policies. What the country needs is not more policy initiatives, but rather effective implementation of the policies that exist or are in preparation.

As discussed in sections B, C and D of Part I of this document (see pp. 2-4 above), important lessons learned in regard to rural development, environment management, water management, and watershed management have only sporadically been applied by the respective national institutions with authority in these areas. Much less frequently have these lessons been effectively harmonized and applied together in specific sub and micro-watersheds.

Consequently, the decision was made to use the country's first specific climate change adaptation programme to focus on integrated environmental and agricultural policy implementation. The water retention investments of Component 1 are made essential by ever more serious climate changes that bring the threat of droughts and famine. To be effective in soil retention and recovery at the farm level, these investments must be accompanied in component 2 by agro-ecological practices. Agro-ecological transformation, in turn, cannot be left only at the farm level: to achieve the expected environmental effects of ecosystem recovery, it has to be a generalized process at the micro-watershed level, planned by a community organized in component 3. In this way, the crucial additionality of vulnerability to climate change in water stressed rural areas acts as a catalyst that integrates verified agro-ecological and watershed management practices in one coordinated process.

The potential benefit of this approach is considerable. If effective, it will serve as a demonstration of how to apply the National Environmental and Climate Change Strategy, and it will also stimulate the introduction of climate change adaptation measures as key elements in

national efforts to achieve effective implementation of agricultural policies, on the one hand, and of water and watershed management policies on the other. Catalyzing the energies of these large sectors is likely to be much more effective in mainstreaming climate change adaptation than a focus on strengthening national policy for climate change adaptation.

Within the framework of a focus on policy implementation, an alternative strategy considered was a much wider geographic scope. A wide geographic scope is often used in rural development programmes with an explicit environmental emphasis³⁰. The argument in favor of a wide geographic scope is that a programme can support the development of model farms in many areas and thereby stimulate the replication of the practices they demonstrate by a large number of farm families.

There are two limitations to such an approach. The first is that individual farm families, even those who are enthusiastic about the success of their innovations, have difficulty sustaining the changes they make on their farms when surrounded by communities that continue using “traditional” chemical-intensive soil-depleting agriculture practices. Social reinforcement in local communities is an important factor for sustainability, and it is usually lacking in projects and programmes with a broad geographic scope.

A second consideration is especially important for a programme that has climate change adaptation as its primary goal. While agro-ecological practices may significantly improve soil conditions on an individual farm they are unlikely to have a measurable effect on water retention in an aquifer, on surface water flows and on landslide resistance in an area with steep slopes unless they are introduced on all or most of the farms in the neighborhood.

The proposed programme will be implemented within the context of the Water Law, which calls for a comprehensive watershed management approach. To date and to a great extent, considerations about climate change have been absent from production processes and also from regulatory and development approaches, a situation aggravated by the fact that decisions at all levels have been made with a short-term horizon, both in terms of space and timeframe. There is a limited understanding of the interdependencies in the watershed and also of the differentiated impacts and socioeconomic interests that could worsen due to weather stress, which will require responses focused on responding to collateral effects, opportunity costs and common problems that build on eco-systemic synergies.

The strategy of concentrated intervention in a small number of micro-watersheds was chosen because the micro-watershed is the space where the strongest interactions between use and management of natural resources take place. No other scope of action that could be considered (municipality, community, farm, etc.), maintains this relation in such a focused and tangible manner. The tightly knit web of social relations that is usually found within the micro-watershed provides a starting point for stakeholder organization and the cultural change process needed if farm families are to assume broadened geographic and temporal

³⁰ This is the case, for example, with both the Integrated Watershed Water and Sanitation Programme (PIMCHAS) and the Sustainable Soil Management Project (MST) which both made important contributions to the menu of agro-ecological and conservation practices included in the design of this project. It is also the case of the new Environmental Programme for Management of Disaster Risks and Climate Change recently approved by the Nordic Development Fund and the Inter-American Development Bank.

perspectives in their decision-making. Ongoing adaptation to climate change requires this change in perspective; for the required cultural change to take place, individual and collective actions and their combined impacts on water flows and soil conservation must be seen as an integrated whole.

The programme will incorporate responsive measures to climate change to the debate at all levels: the stakeholders in the Villanueva River Sub-Watershed will articulate development/investment plans and municipal adaptation strategies, which in turn will provide usable examples for practical implementation and application of the National Water Law at a national level. Because of this feedback the programme will provide an experience of interest for Nicaragua, validating adaptive co-management methodologies for watersheds that raise local capacities for long term response to climate change impacts.

Since the water and agricultural sectors have been identified as the most vulnerable to climate change, the programme seeks to promote comprehensive socio-agro-environmental responses. From the production perspective, the intervention strategy not only addresses water supply but also the matter of demand. In addition to applying technologies and approaches focused on harvests and water storage, practices in the use of soils and water will seek to rationalize the water demand and in turn contribute to increasing water supply through approaches that include protection of underground water recharge areas, and activities to improve water infiltration in the production landscape. The programme's intervention strategy is, therefore, very comprehensive, addressing the requirements for effective responses to climate change at the local and the sub-watershed level on a range of critical fronts.

The concentration of programme resources in eight micro-watersheds located within the much larger area where MARENA is finalizing the Sustainable Land Management Project (MST) will capitalize the demonstration value of the individual farms supported by the MST while applying lessons learned in other participatory watershed management projects/programmes that demonstrate the importance of community organization for long-term sustainable investments. Additionally, by supporting and fostering the operation of the inter-institutional harmonization platforms in three municipalities, facilitating the participation of government and non-governmental institutions in their respective areas of competence, the programme will avoid the cost of duplicating functions inherent to programmes that replace (rather than reinforce) the functions of the national institutions that are present.

C. Describe how the 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.

a. National Policies, Strategies, Laws and Regulations

The Government for National Reconciliation and Unity promotes a model called "Citizen Power" that seeks the participation and involvement of stakeholders at all levels in ensuring healthy environmental management, the struggle against poverty, and solid economic management, including reduction of vulnerability to climate change and recent natural disasters. The ***National Human Development Plan (PNDH)*** and other development plans for

specific sectors prioritize water and agriculture as the sectors most vulnerable to climate change. The agricultural sector, in addition to being the main source of food security, provides employment and a livelihood for more than 60% of the population. The **National Plan against Drought** also underscores the need to reduce vulnerability to climate change.

On June 17th, 2009, the National Assembly approved **Resolution A.N. No. 003-2009 Climate Change and its Adaptability in Nicaragua** which states:

Due to the nature and potential impacts that climate change may cause in Nicaragua, it is of the utmost importance to articulate preventive actions, in the preparation and implementation of National Adaptation Strategies and Plans to increase the capacity for adaptation of the human systems most vulnerable to extreme events, climate variability and climate change, understanding that adaptation is not an option, but rather an inescapable reality.

Subparagraph viii (*The Environment, Production, Conservation, Development and Life*), in the list of principles of the **Agricultural, Livestock and Forestry Strategy** of the **PNDH**, states:

Sustainable management of land, water and forests is promoted by improving practices and instruments to face climate change, agricultural vulnerability to nature and the harmonization of life, placing human beings as part of a complex environmental and life system.

Another advance is a series of new government policies related to climate change and agro-ecological practices. Inter-institutional harmonization entities at the municipal level will be able to use these policies to guide the actions of its members in rural communities.

The National Environmental and Climate Change Strategy and the **2010-2015 Action Plan** were approved by the executive branch in April 2010. This strategy seeks to:

guarantee the participation of organized people and government institutions in developing actions to conserve and preserve our natural resources as the practical expression of the principles of the Universal Declaration of the Common Good of the Earth and Humanity that call for us to understand the Earth as alive and a subject of dignity.

It also affirms that:

environmental education is indispensable...in order to rescue the values, knowledge, and attitudes of love, care and protection of Mother Earth, affirming that this education is the basis for ensuring that the population carries out actions to defend and protect natural resources by making good use of agricultural soils through land use planning, water conservation, recovery, retention and harvesting, that contribute to mitigation, adaptation and risk management in the face of climate change...

To comply with this proposal, the strategy calls for a *grand alliance among the National Government, Municipal and Regional Governments, Private Enterprise, farmers, workers and social and environmental movements.*

Following instructions from the Presidency of the Republic, the Ministry of Agriculture (MAGFOR) is developing a new ***Policy for Development of Agro-Ecological Production***, which—in its current draft undergoing consultation—has as its objective:

to contribute to the transformation of the current production systems into sustainable systems, that based on ecological principles improve the living conditions of producers and consumers and guarantee healthy quality products to society, recovering and improving the capacities of ecosystems in the short, medium and long term.

Simultaneously, MAGFOR is revising all existing national agricultural policies to bring them in line with this new policy. The mission statement proposed in the current draft of the new ***Agricultural Technology Policy***, for example, calls for the agricultural technology system

...to induce changes in the agrarian system, reinforcing it with new production practices that incorporate ecological and environmental concepts for ecosystem and agro-ecosystem management in a context of climate change and variability.

These approved and draft documents demonstrate political will and an express mandate on the part of the National Government to achieve the articulation that must exist among the different institutions at different levels of authority and government in order to face the situations created by climatic variability. All these policies point toward the need to implement the lessons learned in participatory watershed management.

There are also three legal instruments that guide the manner in which the programme will approach its work in relation to water resources. ***Law 620, National Water Law***, approved in 2007, calls for the development of plans and instruments to advance in an integrated approach to water resources. It sets forth the legal framework for sustainable water use and exploitation, as well as the relations among government institutions, private parties, and citizen organizations in managing the resource. The Law defines water as *a finite and vulnerable resource essential for existence and development, constituting a strategic natural resource for the country; therefore, its access is a right associated to human life and health that must be guaranteed by the State for the Nicaraguan people*. In particular, the Law assigns high importance to management at the level of the watershed, the sub-watershed and the micro-watershed as a platform to coordinate and articulate a broad range of interests and differentiated impacts.

During the month of May 2010, the National Assembly approved ***Law 722, Special Law for Drinking Water and Sanitation Committees***, which provides legal grounds for over 5000 existing drinking water and sanitation committees (CAPS) in rural areas, which are the strongest and most organized expression of the interest of local communities in water issues. Among the CAPS' functions, this Law states that they are to *monitor and protect sources of supply..., avoid their contamination and help to protect the micro-watersheds of the water supply sources* (Article 17 h). It confirms the support of national government entities by establishing that:

...the Ministry of the Environment and Natural Resources, the Ministry of Health, the National Forestry Institute, the Nicaraguan Development Institute, and the Social Emergency Investment Fund, in coordination with the respective municipalities, will

support the CAPS with training in administration, sustainability, service operations, water quality control, care of the environment and especially the protection and conservation of water sources. (Article 29).

In August 2010, together with the Minister of the Environment and Natural Resources, the President of the Republic signed the new **Regulations to Law No. 620, National Water Law, Decree 44-2010**. These regulations recognize the Drinking Water Committees and the Drinking Water and Sanitation Committees (CAPS) – as well as the Watershed Organizations and the Watershed Committees (both pending creation) – as institutions directly linked to water resources, and states that:

The Watershed Organizations will promote...the creation of as many Sub-Watershed and/or Micro-Watershed Committees as are needed in the watershed...with the purpose of guaranteeing adequate citizen participation. (Article 36- Decree 44-2010)

In addition, the Regulations also establish the responsibilities of the government bodies that will participate in the programme activities in the Villanueva River micro-watersheds and sub-watershed, stating:

In coordination with INTA, MAFOR will promote research and technological transferes for use of biological and natural products in agriculture, among other clean production practices in order to prevent soil and water quality contamination. Efficiency and the use of environmental technologies will be part of the criteria for granting economic aid... (Article 72, Decree 44-2010), and

MARENA will regulate and govern through technical criteria the definition, mechanisms and flow management of the minimum flows to maintain ecological balance and sustain biodiversity in the watersheds. (Article 84, Decree 44-2010)

The programme design is consistent with these guidelines by attributing to MAGFOR and INTA—this last supported by universities with which it has agreements—the responsibility for guiding the activities of Component 2 and by assigning MARENA direct responsibility for the monitoring process and assessment of impacts, in addition to its responsibilities as the executing entity for the programme as a whole.

b. United Nations Development Assistance Framework

In line with Millennium Development Goal 7, Cooperation Area 4 of the **United Nations Development Assistance Framework (UNDAF)** for Nicaragua is *Protection of the Environment and Risk Management for sustainable human development*. The direct effect expected in the UNDP program in this area is defined as *Strengthened capacities of public institutions, communities, civil society and the private sector to promote, formulate and implement policies, plans and programs that reduce the environmental vulnerability of the population and promote sustainable human development*.

The Framework also identifies integration of *the climate change mitigation and adaptation variable in the pertinent national strategies, programs and plans* as a specific product expected in the country program.

This programme will contribute to these effects, most particularly in the difficult area of improving implementation of pertinent national policies for climate change adaptation, reduction of environmental vulnerability and sustainable human development.

D. Describe how the programme meets relevant national technical standards, where applicable.

The programme will guarantee respect and consistent application of national standards for infrastructure construction.

The two major works are the irrigation systems designed for the Las Mercedes and Salale micro-watersheds. Due to the size of these works, and in accordance with Article 7 of *Decree No. 76-2006 Environmental Assessment System* and Article 31 of *Law No. 647, Reforms and Additions to the Law No. 217, General Law of the Environment and Natural Resources Act*, the programmes are not considered to be in Category I, II or III. They are identified as works that may cause *Low Potential Environmental Impacts*, and therefore they are *not subject to an Environmental Impact Study*. The only requirement is submission of environmental permit requests to the corresponding municipal authority.

As part of the feasibility studies for these two systems, the Millennium Challenge Account Foundation carried out this procedure and the Municipal Government of El Sauce granted the respective environmental permits³¹. Once the programme begins, the permits will be updated.

Aside from the municipal environmental permits, there are no other national standards and safeguards to which the anticipated programme works are subject. Nonetheless given the requirements of the Millennium Challenge Corporation, an environmental management plan was established to address any potential negative impacts of the reservoir and connected constructions. The environmental management plan was presented to municipal authorities as a basis for the issuance of the corresponding environmental permit. The environmental management plan is detailed in the feasibility study and the construction firm must comply with it, under the supervision of both the Municipality and the Departmental Delegation of MARENA. The programme will specifically enhance the capacities of these entities to follow up the construction and compliance with the specified environmental standards and remedial actions.

In addition to this, all UNDP supported donor funded programmes are required to follow the mandatory requirements outlined in the UNDP Programme and Operational Policies and Procedures (UNDP POPP). This includes the requirement that all UNDP development solutions must always reflect local circumstances and aspirations and draw upon national actors and capabilities.

Moreover, all UNDP supported donor funded programmes are appraised before approval. During appraisal, appropriate UNDP representatives and stakeholders ensure that the

³¹ See Annex 6

programme has been designed with a clear focus on agreed results. The appraisal is conducted through the formal meeting of the Programme Appraisal Committee (PAC) established by the UNDP Resident Representative. The PAC representatives are independent in that they should not have participated in the formulation of the programme and should have no vested interest in the approval of the programme. Appraisal is based on a detailed quality programming checklist which ensures, amongst other issues, that necessary safeguards have been addressed and incorporated into the programme design.

E. Describe if there is duplication of programme with other funding sources, if any.

Various noteworthy initiatives are underway in the programme area. Two of these are particularly relevant: the project *Sustainable Land Management (MST)* funded by GEF-UNDP and the *Comprehensive Watershed Management Project, Water and Sanitation (PIMCHAS)* funded by Canada, Denmark and Spain. Both projects are executed by MARENA.

The two ongoing programmes constitute a development baseline upon which the proposed programme would build. Although certainly not a main objective of these interventions, insofar as SLM approaches improve and maintain ecosystem services and functions, they contribute to climate change adaptation goals. However, these two programmes do not contemplate specific activities that will have as a primary objective the reduction of risks posed by increasing climatic variability and long-term climatic trends which indicate, *inter alia*, longer drought periods and more erratic rainfall during the wet season - which put even the single annual crop that is today feasible (the second crop is no longer a viable option in the upper and mid watershed) at risk.

Nonetheless, the contributions of these programmes to the development baseline go beyond their work on SLM. The work undertaken in terms of extension and farmer outreach support services has strengthened the capacity of MARENA (which executes both programmes and would execute the proposed initiative) to deliver on the ground training and capacity building, and to promote changes in land use practices (agricultural, livestock and agroforestry related). These efforts will now help to ensure that the activities contemplated under Component 2 can be efficiently and effectively developed and put into practice with a range of resource users within the targeted watershed.

Equally important, these programmes have laid the ground for improved community organizational arrangements within their system boundaries. Efforts have been ongoing with the municipal planning, environmental and water and sanitation units, as well as with the departmental MARENA office. Although there is only a marginal geographic overlap between the proposed programme and the two ongoing interventions (only 3 of the 26 municipalities within the latter two would participate in the proposed initiative), this would enable the proposed programme to build upon the successful efforts in these three municipalities to strengthen municipal capacities for sustainable natural resource management. Nonetheless, neither one of the two ongoing programmes have sought to mainstream CC considerations into efforts at municipal level, neither in terms of capacity building nor of development of land-use plans. Therefore, as noted above, these programmes constitute a foundation upon which the proposed intervention would build. In addition to this, through these two programmes the capacity of MARENA to execute projects/programmes has definitely been strengthened.

The PIMCHAS project, which will conclude most of its components in 2011 and close down in 2012, supports activities in the Rio Negro Watershed (Watershed 58), adjacent to the sub-watershed of the Villanueva River in Watershed 60. PIMCHAS is strengthening the approach to governance in Watershed 58 by increasing the capacity of municipal authorities to address environmental issues and it has also established a fund for small and medium farmers. These activities are particularly relevant in the municipality of Achuapa since its territory is largely within the Watershed 58.

Additionally, as part of a short-term work plan agreed upon with the municipal governments of Achuapa and El Sauce, during the last quarter of 2010 and throughout 2011 PIMCHAS will support a number of activities to strengthen the drinking water and domestic sanitation systems in four micro-watersheds. One of these is Salale, which will be one of the eight targeted micro-watersheds in this project. PIMCHAS's principal activities will include demarcation of the area around the source of the drinking water systems and capacity development for the leaders of the CAPS.

These activities will be complementary with those of the proposed programme. PIMCHAS' experience in other watersheds was taken into account in this programme design; the support for inter-institutional coordination entities at the municipal level in Somotillo and Achuapa will increase their ability to act in both Watersheds 58 and 60; improvements in the drinking water system and its local administration in Salale will contribute to the overall organization in this micro-watershed and help local residents prepare for the construction of the new irrigation system in late 2011.

The MST project, while will conclude in 2011, is promoting environmentally sustainable farm production systems in twelve municipalities, working closely with municipal environmental management units it has strengthened. In the design of Programme Component 2, the experience of the MST has been used advantageously. This programme will incorporate the production practices implemented by beneficiaries of the MST into the menu of validated agro-ecological practices. To this end materials printed by MST will continue to be used and the farms of MST beneficiaries will serve as living exhibits for farm families. By concentrating efforts in the geographic space of eight micro-watersheds, the programme will move forward from the MST's work, seeking a critical mass of changes in farm practices that generates measurable environmental impacts, particularly on the conservation of soils and groundwater recharge.

The following table outlines the relationship among the proposed Programme, the *Sustainable Land Management (MST)* and the *Comprehensive Watershed Management Project, Water and Sanitation (PIMCHAS)* in each of the proposed Programme components in the eight micro-watersheds and the three municipalities where the Programme activities will take place.

Components	MST	PIMCHAS	Proposed CCAF Programme
Water-retention infrastructure	Not present.	Not present.	Investments for all farm families in all eight micro-watersheds.
Climate resilient agro-ecological practices	Support for agro-forestry and silvo-	Protection of drinking water	Support for development and implementation of detailed farm transformation plans by all farm

		pastoral practices on 2 to 5 individual farms in each micro-watershed.	recharge area in Salale.	families. Support for protection of water recharge areas in all eight micro-watersheds.
Institutional development and capacity building	Micro-watersheds	Not present.	Support for local drinking water and sanitation committee (CAPS) in Salale.	Support for organization of micro-watershed committees in all eight micro-watersheds, involving CAPS, GPS, farm associations, cooperatives, and other organizations present in the communities.
	Municipal level	Strengthening of municipal environmental management units in El Sauce, Achuapa and Villanueva	Strengthening of municipal capacity for natural resource management in Achuapa	Strengthening of municipal agricultural production cabinets and formation of inter-institutional technical teams in El Sauce, Achuapa and Villanueva. Incorporation of climate change adaptation measures in municipal land use, water use and investment plans in nine municipalities in Watershed 60.
	Villanueva river sub-watershed	Not present	Not present	Development of sub-watershed management plan and operational organization.
Monitoring and analysis of climatic conditions and changes in land use, water flows and soil quality		Not present	Not present	On-going geo-referenced mapping of farm transformation plan implementation, changes in soil use, water flows and water quality in all eight micro-watersheds.

Other programmes run by the Nicaraguan Institute of Agricultural Technology (INTA), the National Forestry Institute (INAFOR) and the Ministry of Agriculture, Livestock and Forestry (MAGFOR) seek to increase food security in the programme area. These projects are fully complementary to the proposed programme and the participation of agricultural sector institutions in micro-watersheds and in inter-institutional harmonization bodies at the municipal level will ensure that lessons learned in one programme can be communicated fluently to the executing agencies of others.

The Estero Real estuary at the bottom of Watershed 60 is a large protected area given high priority in the UNDP-GEF financed project to strengthen MARENA's National System of Protected Areas (SINAP). Specific projects focus on the lower watershed, both addressing tri-national cooperation in the Gulf of Fonseca and—with support from the AECID and Spanish Friends of the Earth—developing CAPS and promoting biological connectivity between the protected areas in the Department of Chinandega. MARENA will ensure fluid communication between these initiatives and the proposed programme, especially when the National Water Authority (ANA) initiates preparation of the overall Watershed Organization. The hydrological study of the Villanueva River basin and the experience developed by the programme in implementation of the National Environmental and Climate Change Strategy will be valuable contributions for the future work of the Estero Real River Watershed Organization, once it is established by ANA.

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

During programme execution lessons learned will be identified through brief periodic reports, annual progress reports, midterm evaluation and final evaluation. The presence of a team of agro-ecology and anthropology students, guided by the programme team and professional staff from relevant sector agencies, will ensure detailed study of the production, social and organizational processes in each micro-watershed. Through Component 4 (see pp. 21-22) the experience will be documented and reflected in digitalized maps that track changes in land use and facilitate the analysis of relations between them and water flows. Moreover, the electronic information posts set up in each micro-watershed will strengthen the regional node of the National Environmental Information System of Nicaragua (SINIA) and provide MARENA with the capacity to register relevant data, extract, analyze and organize the lessons derived from the implementation of all programme components.

The MARENA Directorate for Climate Change will exercise the national direction of the programme and will ensure that relevant lessons for climate change adaptation help increase adaptive capacities nationally and are used as a basis for future responsive measures.

In its work with the other municipalities in the Estero Real River watershed, and its coordination with MAGFOR and ANA, MARENA will determine how best to apply the lessons being learned in other micro-watershed, municipality and watershed level management efforts in watershed 60 and throughout the country.

In particular, MARENA will seek to apply the lessons learned in the development of new work programs for the highest part of Watershed 69 (Rio San Juan) and for 7 prioritized municipalities (San Rafael del Norte, La Concordia, Jinotega, La Trinidad, San Isidro, Sébaco and Ciudad Darío) in the Rio Viejo and Lake Apanas sub watersheds where the Environmental Programme for Disaster Management and Climate Change receives IADB support, as well as in new initiatives in prioritized sub watersheds of Lake Nicaragua in the Departments of Boaco and Chontales, in the middle and higher parts of the Rio Coco or Segovia Watershed, and in the Rio Punta Gorda Watershed in the buffer zone of the Indio Maiz Biological Reserve in the South Atlantic Autonomous Region (RAAS).

It is expected that the intensive experience of planning, action, analysis and monitoring of results in the eight micro-watersheds will be a learning process not only for local families and the students who accompany them, but also for the professionals in government and non-governmental institutions who participate in their respective agency roles. In this way, the analysis of lessons learned by MARENA's programme management team and their dissemination through SINIA, will be accompanied by the professional development of staff in the national institutions that have a mandate to implement the upcoming national agro-environmental policy and the *National Environmental and Climate Change Strategy*.

Additionally, through the implementing agency, liaisons will be established with the UNDP-GEF Adaptation Learning Mechanism to ensure that the lessons of this programme reach a wider audience in Central America and beyond, including other donors and agencies involved in similar initiatives in other countries.

G. Describe the consultative process, including the list of stakeholders consulted, undertaken during programme preparation.

Annex 7 presents a list of stakeholders consulted during programme preparation. The following table summarizes the matters addressed in the meetings with diverse institutions, organizations and officials.

Entity or person(s) consulted (s)	Issues Addressed	Components discussed
MARENA Planning Directorate Climate Change Directorate	Programme scope; organization criteria; official counterpart of the programme formulation process. Review of draft ProDoc.	1-2-3-4.
Territorial Delegation MARENA-León MST Programme SINIA Regional Node	Technical information about the programme area; MST's experience; organization of the consultation process with local stakeholders.	1-2-3-4.
MAGFOR General Policy Director General of Policy Director of Technological Policies Specialist in Territorial Organization	Programme scope; MAGFOR role in Component 2; new agro-ecological policy; general policy review; coordination of PRO-RURAL actors.	1-2-3-4. Especially 2.
Social Emergency Investment Fund (FISE) Operations Division Ministry of Transportation and Infrastructure Environmental Management Coordination Construction Control and Registry	Technical requirements and criteria for small water works	1
INTA Coordinator of the Sustainable Agriculture Sub-Program Outreach Worker, El Sauce Municipality Sustainable Agricultural Subprogram Specialist – CEO	Component 2. Agricultural and Livestock practices developed by INTA.	2-3-4 Especially 2.
Nicaraguan Institute for Territorial Studies (INETER) Deputy Director General Division of Water Resources	Coordination; willingness to train local stakeholders for gathering water data; Hydrological Study and Map of El Sauce Watershed.	1-2-3-4.
Las Mercedes Community, Municipality of El Sauce	Information of the Irrigators' Association. Levels of articulation of the community around care of water sources. CAPS: 13 years in operation with 80 families.	1-2-3
Salale Community, Municipality of El Sauce	Information about irrigators' associations. Meeting date Presence of 24 farmers. Programme scope. Farmers feel worn out; they have waited for a long time. One of them does not want to grant the right of way but the commitment is that they will all convince him.	1-2
Production Cabinet, El Sauce Mayor, Deputy Mayor, MAGFOR, President of UNAG, Community Leaders, World Vision, COFODEC, Office for Development, others	Programme rationale. Situation in Salale and Las Mercedes. Other possible micro-watersheds. Coordination with the Cabinet.	1-2-3-4
Municipality of El Sauce Mayor & Deputy Mayor Planning Director Head of Environment Unit	Programme scope; Need to establish level of commitment by the municipal government and its articulation with institutions at the national level.	1-2-3-4.
Procurement officer in El Sauce	Capacity of the municipalities to execute the procurement processes for works, goods and services with sufficient juridical security.	1-2
Leader from Petaquilla Community	Need for a programme of this nature in other communities, where the population is convinced that a	1-2

	change must take place but only need support.	
National Agricultural and Stockbreeders Union (UNAG) President, Municipal Chapter, El Sauce	This organization of farmers and stockbreeders, which is one of the largest in the country, is willing to make a commitment with this type of programme and to support each and every one of its actions.	2
Municipality of Achuapa Mayor and Deputy Mayor	Programme scope; Need to establish level of commitment by the municipal government and its articulation with institutions at the national level.	1-2-3-4.
INTA Deputy Director	New agro-ecological guidelines. Watershed approach. Agreements with UNAN León and UNAN Managua. Value of students, particularly of anthropology.	1-2-3-4.
Municipality of Achuapa Head of Infrastructure Unit	Information about 8 existing CAPS in the municipality.	1
Municipality of Achuapa Head of Environment Unit	Existing inter-institutional coordination	1-2-3
Francisco Paz Silva Foundation, Achuapa	They will develop organic practices	2-3
Municipality of Villanueva Mayor	Programme scope; Need to establish level of commitment by the municipal government and its articulation with institutions at the national level. Major environmental problem: annual flooding in the Apacunca sector, forcing many families to emigrate and abandon all of their household goods. Possibility of working in the upper part the Villanueva River basin.	1-2-3-4.
Municipality of Villanueva Head of Environment Unit	Identification of micro-watersheds and communities proposed for interventions by the UNDP programme.	1-2-3.
Municipality of Somotillo Mayor	Causes of annual flooding. Changed courses of Gallo and Negro rivers; sediments in Villanueva River. Impact on Apacunca, and Teocinte Natural Reserve. Human impacts of climate change and variability.	1-2-3-4.
Municipality of Somotillo Head of Environment Unit	Cooperatives in the lower part of the Villanueva River sub-watershed, especially organic growers.	2-4.
Millennium Challenge Account Foundation Deputy Director Transportation Programme Director	Background study of the watersheds. Programmes studied for Watershed 60. Background study proposed to determine the causes of flooding.	1-2-4
Team of Hydrology Engineers	Costs and duration of a hydrological study of flooding causes on the lower Estero Real River Watershed.	4
Municipality of Somotillo Head of Agriculture Unit	Rapprochement with Apacunca leaders. This community has leaders from Villanueva and Somotillo.	4
Visit to Apacunca Community	Families affected by floods can only leave their homes by using water transportation and most families do not have this. Area background. Effects of Villanueva River dredging. Proposal to continue with the dredging.	4
Associations of Municipalities of Northern Leon (AMULEON) and Northern Chinandega (AMUNORCHI); Executive Directors	Programme scope, inter-institutional articulation in the different components.	1-2-3-4.
Institute for Rural Development (IDR),	Relevance of:	2-3

Managua Delegation	- working with departmental production cabinets - use of thesis university students - use of PRORURAL structures - use of a hands-on learning methodology with farmers	
Institute for Social Research and Management (INGES) President of the Board of Directors	Information about the Achuapa Agreements and other information relevant to the programme area.	1-2-3
National University of Nicaragua, UNAN-Managua. Director of the Anthropology Department	Coordination to assess the methodology to incorporate anthropology students to induce cultural changes in communities.	2-3-4
MAGFOR Policy Workshops	Draft National Agro-ecological Policy. Draft National Agricultural Technology Policy.	2
Regional University Center (CURS) Somotillo	Coordination to assess methodologies to incorporate agro-ecology students to field practices.	2-4
National Institute for Technical Education (INATEC) El Sauce		
PIMCHAS Head of Institutional Development	PIMCHAS's plans in the upper part of the Rio Negro and Estero Real watersheds.	2-3
Friends of the Earth	Intervention in lower Estero Real Watershed	3-4
National Water Authority Executive Director	Programme Scope Relation with ANA	1-2-3-4.

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

Component 1 – Investments in infrastructure for storing and using rain and surface water in eight micro-watersheds in the upper watershed of the Estero Real River.

Baseline (without AF resources)

Government efforts are underway to implement the *National Water Law*, the *National Environmental and Climate Change Strategy*, and the *Special Law for Drinking Water and Sanitation Committees* in the upper part of the Estero Real River watershed. Investments to improve domestic water supply systems are underway or planned in four communities, including one located inside one of the targeted micro-watersheds. Local Drinking Water and Sanitation Committees have been newly recognized by law and they provide an initial organizational base for community-level water management. Municipal Environmental Management Units have been strengthened by MARENA and they are working together with national government agencies responsible for agricultural development to coordinate water management and agricultural development activities. MARENA has plans to introduce climate change considerations into the municipal planning discussions and the National Institute of Agricultural Technology is developing specific climate resilient crop varieties.

Increasingly frequent climate induced water shortages, however, pose a major barrier to the success of these efforts. Lack of water retention and high rates of erosion during the rainy season augment the conditions that lead to increasingly poor yields and frequent crop failure; water stress and crop failure impede access to credit and reinforce fatalistic attitudes toward

the future. In these conditions, local farm families find it difficult to make use of available technical support and to organize for communal water management.

Additionality (with AF resources)

Investment in local infrastructure to harvest rainwater and retain part of the surface water available in eight micro-watersheds in the municipalities of Achuapa, El Sauce and Villanueva will increase the water supply available for domestic and productive use during the crop cycle. With sufficient water to ensure at least one annual harvest, farm families will be able to adopt agro-ecological practices and observe their effects in increasing yields and enriching soils. This will reduce the risk of climate-induced water shortages and provide a starting point for development of individual and communal capacities to adapt to climate variability and long-term climate change.

The concentration of water retention investments in micro-watersheds in the upper Villanueva River basin will have a cumulative effect on soil erosion and sedimentation. This will enable sub-watershed planning and investments aimed at curbing flood devastation in the lower watershed.

Government efforts to implement the Water Law, the Climate Change Strategy and agro-ecological policies will be supported by geographically concentrated investment in low-cost infrastructure that has the potential to eliminate a major barrier to the development of capabilities for adaptation to climate change.

Component 2 – Introduction of climate resilient agro-ecological practices to make effective use of available water.

Baseline (without AF resources)

The governmental agencies responsible for rural development have made significant efforts at the national level to promote ownership, harmonization and alignment through the ProRural sector program. On model farms located throughout the proposed programme area, MARENA is working with municipal governments and the ProRural agencies to support agro-forestry and silvo-pastoral land management measures. Many beneficiary farms are demonstrating significantly increased yields. The upcoming *Policy for Development of Agro-Ecological Production* will encourage institutionalization of the extension practices used to achieve these benefits.

To date, agro-forestry and sustainable land management extension methodologies have focused on individual farms. Existing projects promoting agro-ecological practices have not concentrated their operations geographically to generate a critical mass of innovations capable of producing measurable effects on water flows.

Farm families have not yet realized the need to minimize climate change risks in their production processes. Their timeframes are typically short-term concerns related to production during the next season. Geographic frameworks are limited to the individual farm and do not take into account cumulative effects.

Additionality (with AF resources)

The programme will apply validated methodologies for introducing agro-ecological practices to farm families concentrated in eight micro-watersheds selected because of their importance for

collective adaptation to climate change effects in the Villanueva River basin. Making use of existing materials and living demonstrations of model production practices, the programme will capitalize the outputs of programmes financed by UNDP-GEF and bilateral donors.

By providing additional support for recent agreements between the National Institute for Agricultural Technology (INTA) and university agro-ecology departments, the programme will simultaneously stimulate the implementation of new national agro-ecological policies, help institutionalize the results of earlier programmes, and facilitate the acquisition of appropriate knowledge, attitudes and promotional behavior by the extension staff of the national governmental agencies responsible for rural and agricultural development. This innovation will be reinforced by timely input from national agro-ecological producers' associations and guided by agricultural extension staff on the programme team selected because of their experience in application of agro-ecological practices at the micro-watershed level.

By focusing its interventions on farm families that also benefit from the water retention and irrigation system investments included in Component 1, the programme will minimize the risk that, due to drought, new agro-ecological practices fail to improve crop yields. At least 140 hectares will be converted to water-conscious and climate resilient agro-ecological production in each micro-watershed.

By sustaining this geographic focus over a four year period, the programme will also maximize the likelihood of achieving measurable effects in soil conditions and water flows at the micro-watershed level. This will enable farm families to visualize the cumulative effects of new farm practices on water availability and stimulate their willingness to participate in collective activities to manage climate change risks by protecting at least 50 hectares in each micro-watershed in water system recharge areas and riparian zones by means of water-retention chambers, artisanal dikes, natural regeneration and—where needed—reforestation with native species.

The programme will stimulate, organize and support the sustained intervention of teams composed of programme staff, municipal staff, national governmental agency staff, university students, local cooperatives and national agro-ecological producers over a four year period in each micro-watershed. This intervention will be grounded in patient accompaniment of over 1000 farm families in the preparation and implementation of agro-ecological farm transformation plans. Through this intensive sustained effort, the programme will seek to ensure that these farm families continue to use their own newly increased resources and available credit for ongoing implementation of their agro-ecological farm transformation plans once the programme is over, and that they will be accompanied in this endeavor by national and municipal staff who have become fully experienced in promoting and supporting the introduction of water-conscious and climate resilient agro-ecological production practices at the micro-watershed level.

Component 3 – Institutional development and capacity building in micro-watersheds, municipalities, and participating national institutions.

Baseline (without AF resources)

The degree of community organization in the micro-watersheds is relatively strong, with elected leaders, active political parties, CAPS, and religious organizations. Some farm families in

each micro-watershed have had training in good agricultural practices with an environmentally conscious approach. Organizational development and technical training, however, coexist with deeply rooted traditional practices and fatalistic attitudes typical of subsistence farmers. The drastic effects of droughts and hurricanes are accepted as inevitable; the area is perceived as poor by nature, and it is considered normal for young people to travel to the capital or other countries in search of opportunities to improve the quality of life for their families.

At the municipal level, agricultural production cabinets function as harmonization bodies that seek to ensure information exchange and varying levels of work plan coordination among the municipal government, agencies of the national government, producers associations, cooperatives, NGOs and any relevant programmes. Climate change adaptation, while recognized as an important issue, has not been incorporated into municipal plans and inter-institutional strategies. In the municipalities of El Sauce and Achuapa, most of the members of the agricultural production cabinets have participated in workshops to prioritize water management issues in the micro-watersheds that compose the upper watersheds of the Villanueva River and the Negro River. During 2011 climate change issues will be addressed in further workshops about watershed management.

The newly created National Water Authority (ANA) has a mandate to create a watershed committee for the Rio Villanueva sub-watershed and a watershed management body for the Estero Real River watershed.

Additionality (with AF resources)

In each community the programme will work with water management bodies (CAPS, irrigators' associations), producers associations (cooperatives, affiliates of sector organizations or national bodies), farm families, umbrella community organizations (citizen power cabinets, others), and other groups present (women's groups, youth groups, churches, others) to identify the appropriate role for each organization and group in the preparation and implementation of micro-watershed management plans. Simultaneously, both through implementation of components 1 and 2, and through an educational process capitalizing on the experience of MARENA's Climate Change Directorate and INETER's General Directorates of Meteorology and Water Resources, the programme will assist local stakeholders in acquiring the information needed to ensure that their micro-watershed management plans are climate resilient and likely to increase water retention, soil conservation and food security. It is expected that within the first eighteen months of the programme the stakeholders in each micro-watershed will have created or selected an organization that functions as the micro-watershed committee.

The programme coordinator and programme outreach workers will become active members of the municipal agricultural production cabinets³² in El Sauce, Achuapa and Villanueva in order to ensure that all participants are kept up to date on programme activities and to facilitate the coordination of governmental and non-governmental agency work-plans in the micro-watersheds located in each municipality.

The programme team will engage in ongoing analysis of the evolving experience in the micro-watersheds, and endeavor to identify the need for normative instruments to help build climate

³² And in any other relevant inter-institutional harmonization bodies.

change resilience at the community level. The programme director will invite the municipal cabinets to help draft such instruments and to propose them for adoption by the pertinent authority, be this the National Water Authority, a government ministry or the local municipal council. Care will be taken to ensure that each proposal is grounded in the analyzed experience in the micro-watersheds.

Analysis of the experience acquired in the three participating municipalities in efforts to support climate resilient micro-watershed management processes will be the basis of a proposal for the creation and operation of a Villanueva River sub-watershed committee. MARENA, together with the municipalities and other participating entities in the municipal cabinets, will submit this proposal to the National Water Authority.

The programme team will also assist the Climate Change Directorate in MARENA in workshops with the other six municipalities with significant territory in the Estero Real River watershed. The primary goal of these workshops will be to facilitate the incorporation of climate change adaptation measures in municipal land use plans, investment plans, water use plans and any related normative instruments. The workshops will capitalize both MARENA's experience to date in this topic and the lessons learned in the upper Villanueva River basin.

Throughout the duration of the programme the coordinator will keep abreast of progress in the formation of a governing body for the Estero Real River watershed and will endeavor to facilitate active participation in this process by the municipal governments and other stakeholders in the upper watershed of the Villanueva River.

In summary, through experientially-based enhancement of institutional capacities at the micro-watershed and municipal levels, the programme will facilitate the incorporation of climate change adaptation measures in work plans, policies, and normative instruments in the Villanueva River basin, and the watershed of the Estero Real River.

Component 4 – Ongoing monitoring and analysis of climatic conditions and changes in land use, water flows and soil quality.

Baseline (without AF resources)

For over a decade, the capacities for prevention and early warning systems have been strengthened to address disaster risks. The National Environmental Information System (SINIA) has developed information and diagnostic studies on various environmental variables in several areas of the country, as well as monitoring and evaluation systems that support more targeted and informed decision making processes. Recently, MARENA launched a Regional Environmental Information Center—the Pacific North Node León—which has a database on environmental management and health, as well as research and diagnostic studies conducted in the Departments of León and Chinandega.

Although SINIA effectively compiles national data, maps and reports generated by MAGFOR, INETER and MARENA's own projects and territorial delegations, the system has not yet linked its information gathering and processing capacities directly with community-level processes for developing and implementing land use and water management plans at the farm, micro-watershed and sub-watershed levels. In some areas, crucial information is missing. In the Villanueva River basin, for example, despite the apparent causal links between soil erosion in the upper watershed and annual flooding in the lower watershed, there has been no hydrological study to determine if and how the existing impacts of accumulated sediment can be mitigated

through hydraulic works so that improved soil management will be able to significantly reduce flooding in the future. Where information does exist, there is a large gap between the amount and organization of the data available on line in urban centers and the information with which rural producers and community organizations make their decisions.

Additionality (with AF resources)

MARENA will undertake a hydrological study of the lower part of the Estero Real River watershed, identifying the hydraulic works needed to reduce the flooding caused by accumulated sediments from the upper Villanueva River basin.

With assistance from INETER and MAGFOR, students of agro-ecology and interested members of local farm families will be trained to monitor water flows and quality, soil conditions, and land use changes at the farm and micro-watershed levels. This information will be digitalized at electronic information posts in each targeted micro-watershed. The information posts, working together with the regional node of SINIA, will select and present relevant national and global climate information. This information, digitalized local monitoring data, and maps of local land use, water flow and soil quality changes will be provided to farm families and local organizations in the micro-watersheds, as well as to the members of municipal cabinets and the interested users of SINIA.

As a result, the information gap will be reduced and SINIA's usefulness enhanced; local farm families will have access to available relevant data, including the data compiled in their own micro-watersheds; and the results and lessons learned about building climate change resilience in vulnerable rural communities will be nationally disseminated.

The results of the action-research undertaken by the programme in the Villanueva River sub-watershed will be made available to relevant stakeholders in other countries that face similar difficulties in implementing national climate change adaptation strategies in impoverished rural communities.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for programme implementation

The Government of Nicaragua will execute this four year programme with UNDP support under the National Implementation Modality (NIM). The Ministry of the Environment and Natural Resources (MARENA), as the regulatory and normative entity responsible for implementation of the country's environmental policy, will be the executing agency. MARENA will be responsible for the delivery of programme outcomes and outputs. It will be responsible for ensuring that the stated programme objective and outcomes are delivered, and that resources are allocated and disbursed as indicated in the programme Document. Similarly, MARENA will be responsible for ensuring effective coordination between this programme and other relevant programmes in Nicaragua.

For its part, UNDP will provide support to the Director and the Coordinator of the programme, in order to maximize its reach and impact as well as the quality of its products. Moreover, it will be responsible for administering resources in accordance with the specific objectives defined in the Programme Document, and in keeping with its key principles of transparency,

competitiveness, efficiency and economy. The financial management and accountability for the resources allocated, as well as other activities related to the execution of Programme activities, will be undertaken under the supervision of the UNDP Country Office. UNDP will undertake the internal monitoring of the Programme and of evaluation activities, taking into account from the outset local capacities for administering the programme, capacity limitations and requirements, as well as the effectiveness and efficiency of communications between ministries and other institutions that are relevant to the programme.

UNDP will be fully accountable for the effective implementation of this programme. As a Multilateral Implementing Entity, UNDP is responsible for providing a number of key general management and specialized technical support services. These services are provided through UNDP's global network of country, regional and headquarters offices and units and include assistance in: programme formulation and appraisal; determination of execution modality and local capacity assessment; briefing and de-briefing of programme staff and consultants; general oversight and monitoring, including participation in programme reviews; receipt, allocation and reporting to the donor of financial resources; thematic and technical backstopping; provision of systems, IT infrastructure, branding, and knowledge transfer; research and development; participation in policy negotiations; policy advisory services; programme identification and development; identifying, accessing, combining and sequencing financing; troubleshooting; identification and consolidation of learning; and training and capacity building.

As outlined in UNDP's application to the Adaptation Fund Board for accreditation as a Multilateral Implementing Entity, UNDP employs a number of programme execution modalities determined on country demand, the specificities of an intervention, and country context. Under the national execution modality proposed to be used for this programme, UNDP selects a government entity as the Executing Entity based on relevant capacity assessments performed by UNDP. Please note that UNDP uses slightly different terminology to that used by the operational policies and guidelines of the Adaptation Fund. In UNDP terminology, the "executing entity" is referred to as the "Implementing Partner" in countries which have adopted harmonized operational modalities and the "Executing Entity" in countries which have not yet done so. The Executing Entity is the institutional entity entrusted with and fully accountable to UNDP for successfully managing and delivering programme outputs. It is responsible to UNDP for activities including: the preparation and implementation of programme work plans and annual audit plans; preparation and operation of programme budgets and budget revisions; disbursement and administration of funds; recruitment of national and international consultants and programme personnel; financial and progress reporting; and monitoring and evaluation. As stated above, however, UNDP retains ultimate accountability for the effective implementation of the programme.

MARENA will prepare an annual Work Plan that incorporates programme activities and results to be delivered through it. The Plan will define the execution time frame for each activity and the parties responsible for its implementation. The first Work Plan will be finalized and incorporated into the programme Document within 30 days of its signature. The participation

of programme counterparts will be essential for the success of the planning phase, during which the Annual Work Plan will be prepared.

Once the programme is approved and an annual operational work plan has been prepared, the UNDP office in Nicaragua may in specific cases agreed with the programme partners charge the programme directly for its Execution Support Services, based on transactions and using a universal price list.

Given the various components that make up the programme and in order to achieve greater impact during implementation, various institutional stakeholders will participate in their areas of authority. Such inter-institutional articulation is mandated in several instruments that express the will of the Government to implement the measures of adaptability to climate change.³³

The programme will be coordinated through a Programme Coordination Committee (PCC), which will provide support for the operational management. The PCC will be chaired by the Director General of Climate Change of MARENA, and include a representative of UNDP-Nicaragua, a representative of the Ministry of Agriculture and Forestry (MAGFOR), as the governing body of the Agriculture Sector, and a representative selected jointly by the municipal governments of El Sauce, Achuapa and Villanueva.

The PCC will be assisted by an Inter-Agency Support Committee (IAC) composed of representatives of the Nicaraguan Institute of Territorial Studies (INETER), the National Water Authority (ANA), the Rural Development Institute (IDR) and the Nicaraguan Institute of Agricultural Technology (INTA).

The PCC will meet at the beginning of the programme and then at the end of three months, in order to verify the mechanisms established for programme implementation. At these two moments, the representatives of the Inter-Institutional Support Committee will be present in order to confirm that the commitments of each of the institutions within the scope of their areas of competence are clearly defined in the programme Work Plan. Thereafter, the PCC and the IAC will meet every six months.

The programme execution structure will be constituted by a National Programme Director (NPD) and a Programme Coordinator supported by a technical team. The National Programme Director will be the Director of Climate Change of MARENA. The establishment of an NPD is a requirement within the Nicaraguan protocol for management of external grants. The NPD will act as the administrative and executive manager of the activities described in the Programme Document.

The NPD will work with the Programme Coordinator (PC). Through monthly meetings, the PC will coordinate with the Departmental Delegation of MARENA-León.

MARENA will follow the rules and procedures detailed in the UNDP NIM Manual for programme execution. The UNDP will provide support to the NPD and the CP, in order to maximize the programme's impact as well as the quality of its products. Moreover, it will be responsible for administering resources in accordance with the specific objectives defined in the programme

³³ Resolution A. N. No. 003-2009, approved on June 17, 2009. *On Climate Change and its Adaptability in Nicaragua – National Environment Strategy and Climate Change, National Human Development Plan.*

Document, and in keeping with the key principles of transparency, competitiveness, efficiency and economy. The financial management and accountability for the resources allocated, as well as other activities related to the execution of programme activities will be undertaken under the direct supervision of the UNDP Country Office.

The PC will be located in the programme area and will be supported by a technical team. The technical team will consist of three outreach workers, a civil engineer specializing in rural water works, and an administrator. Each of the three outreach workers will work as a facilitator in the targeted micro-watersheds of one of the municipalities in the upper Villanueva River Sub-Watershed. The civil engineer will have overall responsibility for oversight of water works construction contracts provided for in Component 1. The PC will be contracted for four years, while the administrator and outreach workers will have 22-month contracts renewable for 24 additional months³⁴. The civil engineer's contract will be for 22 months, renewable for another 12 months, assuming that all water works are built by the end of the third year of the programme.

Climate change poses a serious threat to agricultural production activities due to the close relationship between water resources and soil resources. That is why the context of adaptation must be addressed through a series of fundamental changes regarding the use and management of these resources—changes that need to be culturally accepted. It is therefore appropriate that the PC be a professional with expertise in promoting processes of social and organizational change and with knowledge about Nicaraguan government at the national and, in particular, the municipal levels. This profile can be met by a university graduate in anthropology, sociology, social psychology, or adult education. Alternatively, it could be a professional in agronomy with experience in introducing a gender approach in adaptive management of river watersheds.

Both the PC and the outreach workers will act as facilitators of the processes for coordination at the municipal level, where they will work hand in hand with producer associations, the municipal agricultural production cabinets, and any and all relevant bodies for citizen participation and civic and institutional harmonization that facilitate the learning processes and technology transferences that take place within the framework of the programme. In each of the municipalities of El Sauce, Achuapa and Villanueva the outreach workers will facilitate and/or support the integration of a Municipal Technical Team (MTT) composed of the staff of the Municipal Environmental Management Unit (UGAM), MAGFOR, INTA, INAFOR, the National Union of Agricultural Producers (UNAG), and relevant local cooperatives, producer associations, NGOs and other organizations involved in the production cabinet or any other established forum for inter-institutional harmonization.

At the community level, efforts will be coordinated with existing water users' associations, churches, political parties, cooperatives and other forms of affiliation that facilitate the processes of information transmission and learning. In these spaces, the facilitation team will

³⁴ The PC should have two months to participate in the selection of technical team members; hence the other contracts will begin two months after the PC's contract, which will start at the beginning of the project.

do what is needed to ensure that people have the elements and information needed to request support and technical assistance as required from the MTT members as well as other institutions with responsibilities in the area of rural development.

Implementation by Component

Component 1

The Municipal Procurement Act, Law 622, published in La Gaceta No. 119 of June 25, 2007, establishes rules and procedures to regulate the procurement and contracting of works, goods and services, leasing, consulting and construction of public works that in the exercise of its powers, are carried out by a Municipality. These processes have the same legal certainty as those carried out under the ***Government Procurement law***. Law 622, however, is better adapted to the actual situation in rural areas of the country, and its processes are much more expeditious.

To avoid delays and promote local economic development, the procurement of infrastructure works will be undertaken under Law 622, recognizing that in each of the three municipalities there is a procurement office with staff trained to carry out these processes. To this end, MARENA will celebrate agreements with each of the Municipal Governments of El Sauce, Achuapa and Villanueva so that the latter can receive a quarterly transfer for the implementation of Programme works contained in the municipal budget for that period.

During the first months of the Programme, the necessary documentation will be prepared to start the processes for contracting the execution of works in the next dry season. Prior to the construction contracts the commitments of the beneficiaries of the works should be determined: both their commitments before and during construction, and for post-construction maintenance. In year 2 (and, if necessary, in year 3) of the programme, the same procedures will be used for the works that were not identified in the first year.

Under coordination of the PC, the person responsible for the implementation of Component 1 will be the civil engineer on the programme technical team.

Component 2

The programme team outreach workers will work with the communities, facilitating hands-on learning processes, in coordination with the other members of the MTTs. To attain local ownership of programme activities, the outreach worker will normally stay for several consecutive days in each community.

At the start of the programme the PC will work closely with INTA to define the terms of an extension of its agreement with UNAN-Leon and to consider the possibility of complementing this agreement with agreements with INATEC-El Sauce and CURS-Somotillo to ensure that students of agro-ecology—and possibly agronomy—are able to undertake work study programs in the micro-watersheds in terms that enable them to gain the knowledge, capabilities and practical skills needed to facilitate the planning and implementation of agro-ecological practices by farm families. Thirty-two students are required: four each year in each micro-watershed for three months. They will stay with families in the communities, paying for their room and lodging out of financial support provided by the programme.

The purchase of materials to be supplied to the farm families for implementation of the agro-ecological practices contemplated in their farm transformation plans and approved by the corresponding outreach worker will be undertaken by the Municipal Procurement Offices following the same procedures described for the works contracting contemplated in Component 1.

Under the coordination of the PC, the person responsible for the implementation of Component 2 in each micro-watershed will be the Programme outreach worker assigned to the municipality.

Component 3

Supervision and coordination of Component 3 activities is the direct responsibility of PC. At both the micro-watershed and municipal levels, the PC will work closely with the corresponding Programme outreach worker and other members of the MTT.

For additional support at the micro-watershed level, at the start of the Programme the PC will work closely with INTA to define the terms of an extension of its agreement with the Department of Anthropology at the UNAN-Managua, so that anthropology students can conduct practical work studies in the micro-watersheds. Under the coordination of the PC and with the support of the Department of Anthropology, anthropology students will advise the outreach workers on the programme team, other MTT members, and the agro-ecology students participating in each micro-watershed about ways to ensure that climate resilient agricultural practices are culturally accepted and farm families take ownership of them. An anthropology student is required in each micro-watershed during three months each year. They will stay with families in the communities, paying for their room and lodging out of financial support provided by the Programme.

Component 4

Early in the first year of the programme the MARENA will tender the contract for a hydrological study on the causes of floods in the lower part of the Villanueva River Sub-Watershed. Once the study has identified the necessary hydraulic works, MARENA will work with PNUD to identify potential sources of funding, communicating the results of the study to the Presidency of the Republic, MAGFOR, MTI, other relevant national government institutions, the municipalities of Somotillo and Villanueva, agricultural producers in the area, and donor agencies.

Supervision and coordination of other Component 4 activities will be a responsibility of the coordinator of the SINIA Regional Node, in coordination with the PC. A fulltime staff position in the Node will be financed by the programme to ensure effective coordination of the Component, along with eight positions for computer technicians with the ability to generate digital maps. The technicians will be located in the micro-watersheds where they will reside in the local communities for 4 years.

For implementation of the activities in each micro-watershed, the programme outreach worker assigned to the corresponding municipality will provide support in identifying appropriate locations for the electronic information post and micro-watershed office.

Describe the measures for financial and programme risk management.

Risk		Responsive Measure
Farm families do not understand the imperative and/or the possibility of responding to and planning for climate change risks.	M	The programme will provide up-to-date climate change information and programmed scenarios to communities in the micro-watersheds and will accompany farm families on visits to farms that have adopted new practices which – in combination with water catchment works – represent a feasible path for adaptation.
Limited access to credit may limit the adoption of new technologies.	M	Rain water catchment works and irrigation systems will allow farm families to have at least one harvest per year. This is a notable risk reduction that should make farmers more solvent and facilitate access to credit. The Programme will provide seed capital for the first new agro-ecological investments and thereafter will liaise with funding institutions including the new government bank <i>Banco Produzcamos</i> which aims to increase funding for small and medium sized producers, and to give a preference to agro-ecological production.
Key national and municipal stakeholders do not come to an agreement to promote an adaptation strategy at the watershed level.	L	During implementation, strong mechanisms for collaboration will be advanced in the watershed, based on government policies relating to Climate Change and Agro-ecology. The programme will work closely with municipal level harmonization entities, especially the Agricultural Production Cabinets.
Natural events delay programme execution.	M	Construction works will be scheduled for the dry season.

A comprehensive risk management strategy will be a core component of programme management activities. This is in line with UNDP's stringent risk management approach which is corporate policy. The respective UNDP CO provides support to the programme team and executing agency for constant and consistent risk monitoring, and the results are tracked and reported in UNDP's internal risk monitoring system. The results are also reported in the yearly evaluation undertaken for each programme. The risks identified concern issues that are at the core of what the programme seeks to achieve in terms of establishing locally-driven adaptive planning to face climate-induced difficulties at the farm, community, micro-watershed, sub-watershed and watershed levels. Lesser risks, specific to each component, will be addressed in annual workplans and monitored accordingly.

In addition to this, and again in keeping with UNDP practice, a dedicated budget line exists for Monitoring and Evaluation, to ensure that the necessary resources are allocated to execute the Monitoring and Evaluation framework.

A. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.
Programme monitoring and evaluation (M & E) will be carried out by the Programme Team and the UNDP-Country Office in accordance with established UNDP procedures. The Results Framework defines performance indicators as well as their means of verification.

Type of M&E Activity	Responsible Parties	Budget US\$ <i>Does not include time of the Programme personnel</i>	Time Frame
Inception Workshop	Programme Coordinator UNDP-CO	\$500	Within first two months of programme start up.
Initial Report	Programme Team UNDP-CO	None	Immediately after Inception Workshop.
Measurement of Means of Verification for Programme Purpose Indicators	Programme Coordinator	None	Start, mid and end of programme
Measurement of Means of Verification for Programme Progress and Performance (measured on an annual basis)	Programme Coordinator	None	Annually, prior to yearly reports and to the definition of annual work plans
Monthly Reports	Programme Team	None	At the end of each month
Annual Reports	Programme Team MARENA UNDP-CO	\$500	At the end of each month
Programme Coordination Committee Meetings	Programme Coordinator UNDP-CO	None	After the Inception Workshop and thereafter at least once a year.
Technical Reports	Programme Team External Consultants	None	To be determined by the Programme Team and UNDP CO
Mid-Term External Evaluation	Programme Team UNDP-CO External Consultants	\$ 20,000	At the mid-point of programme implementation
Final External Evaluation	Programme Team UNDP-CO External Consultants	\$ 20,000	At the end of programme implementation
Final report	Programme Team UNDP-CO	None	At least one month before the end of the programme
Publication of Lessons Learned	Programme Team	\$ 17,500 (average of \$ 3,500 per year)	Yearly
Audit	UNDP-CO Programme Team	\$ 45,000 (average of \$ 11,250 per year)	Yearly
Field Trips (UNDP staff travel costs to be charged to IA fees)	UNDP-CO MARENA	\$2,000	Yearly
Total Indicative Cost		\$ 105,500	

B. Include a results framework for the programme proposal, including milestones, targets and indicators.

Objective: Reduce risks from drought and flooding generated by climate change and variability in the watershed of the Estero Real River					
	Indicators	Baseline	Final Programme Goals	Sources of Verification	Risks and Assumptions
Programme Objective Reduce risks from drought and flooding generated by climate change and variability in the watershed of the Estero Real River	Number of farm families in the targeted micro-watersheds with at least one annual harvest.	400	1005 ³⁵	Monitoring records in each micro-watershed	Climate change information and agro-ecological demonstrations convince farm families of the need and possibility of adaptation.
	Number of farm families included in Sub-Watershed management proposal.	0	7120 ³⁶	Sub-watershed management proposal	
Outcome 1 Increased availability of water for small scale domestic and productive uses and reduced risk of water stress and drought.	Percentage of farms in each micro-watershed with access to irrigation by means of hydraulic works built with programme funds.	0%	90%	Records of farms and works built.	Municipalities administer funds effectively. Cost estimates are accurate. Construction in dry season is undisturbed by weather events.
	Percentage of farmers in each micro-watershed, the water use of which is rated as satisfactory in relation to the relevant technical guidelines.	5%*	90%	Record of evaluations made by programme team	
Outcome 2 Enhanced food security and eco-systemic resilience through agro-ecological practices and effective use of available water in the eight targeted micro-watersheds.	Percentage of farm families in each micro-watershed implementing agro-ecological farm transformation plans.	5%*	80%	Monitoring records of farm plans in each micro-watershed	Technical teams establish effective communication with farm families. Financing available to farm families for expanded agro-ecological production.
	Increase in percentage of land in each micro-watershed with vegetation coverage.	25%*	50%	Digitalized maps based on farm plans	
Outcome 3 Enhanced institutional capacities for the incorporation of climate change adaptation measures in work plans, policies, and normative instruments in the Villanueva River sub-watershed, and the watershed of the Estero Real River.	An experientially-based proposal endorsed by three municipal governments for the operation of a Sub-Watershed Committee for the Villanueva River basin.	0	1	Proposal submitted to the National Water Authority	Irrigators establish and follow technically correct water use guidelines. Agricultural production cabinets and/or other inter-institutional harmonization mechanisms function at the municipal level.
	Municipalities in watershed with climate change adaptation measures included with their official plans and related normative instruments.	0	9	Municipal ordinances	

³⁵ Exact number of farm families currently living in targeted micro-watersheds to be confirmed at project start-up.

³⁶ Exact number of farm families currently living in Villanueva River Sub-watershed to be confirmed during year one of the project.

Outcome 4 Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities.	Local Stakeholders in each micro-watershed measure water quality and amount, soil conditions and changes in their use.	0	8	Monthly reports of the electronic information posts	Mechanisms are available to establish electronic communications in the micro-watersheds. Information technology specialists willing to reside in micro-watersheds.
	Lessons learnt in eight micro-watersheds and the Villanueva River Sub-Watershed available in SINIA.	0	4 annual reports	SINIA WEBSITE	

*These percentages vary by watershed and will be updated at the start of the programme.

Total Budget and Workplan and Gantt Chart

Award ID:	00059776	Project ID(s):	NIC10-00074925
Award Title:	AF - 4448 - NIC - Estero Real watershed		
Business Unit:	NIC10		
Project Title:	Reduction of Risks and Vulnerability Based on Flooding and Droughts in the Estero Real River Watershed		
PIMS No.:	4448		
Implementing Partner (Executing Agency)	Ministry of Environment and Natural Resources		

Outcome/Atlas Activity	Responsible Party/Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
OUTCOME 1: Increased availability of water for small scale domestic and productive uses and reduced risk of water stress and drought.	000878	AF		71300	Local Consultants	14,000	20,000	19,000		53,000	
				71600	Travel	1,215	4,000	4,000	3,000	12,215	
				72100	Contractual Services (companies)	730,000				730,000	
				72300	Materials & Goods	550,000	550,000	550,000		1,650,000	
				72500	Office Supplies	3,000	3,000	3,000	3,000	12,000	
				75700	Workshops	5,000	5,000	5,000	5,000	20,000	
					Total Outcome 1	1,303,215	582,000	581,000	11,000	2,477,215	
OUTCOME 2: Enhanced food	000878	AF		71600	Travel	19,250	19,250	19,500	19,000	77,000	
				72300	Materials & Goods	294,000	410,800	386,000	79,000	1,169,800	

Outcome/Atlas Activity	Responsible Party/Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
security and ecosystemic resilience through agro-ecological practices and effective use of available water in the eight targeted micro-watersheds.				72500	Office Supplies	3,000	3,000	3,000	3,000	12,000	
				75700	Workshops	13,035	10,950	11,500	8,500	41,200	
					Total Outcome 2	329,285	444,000	420,000	109,500	1,302,785	
OUTCOME 3: Enhanced institutional capacities for the incorporation of climate change adaptation measures in work plans, policies, and normative instruments in the Villanueva River sub-watershed, and the watershed of the Estero Real River.	000878		AF	71300	Local Consultants	36,000	36,000	36,000		108,000	
				71600	Travel	8,500	8,500	8,500	8,500	34,000	
				72500	Office Supplies	3,000	3,000	3,000	3,000	12,000	
				75700	Workshops	54,000	75,000	75,000	42,000	246,000	
					Total Outcome 3	101,500	122,500	122,500	53,500	400,000	
OUTCOME 4: Disseminated results and lessons learned about building climate change resilience in vulnerable rural communities.	000878		AF	71300	Local Consultants	36,260	36,260	36,260	36,260	145,040	
				72100	Contractual Services (companies)			120,000		120,000	
				72800	Information Technology Equipment	64,500	10,000	10,000	10,000	94,500	
				74200	Audiovisual and Printing Production	4,500	4,500	4,500	4,000	17,500	
				75700	Workshops	15,740	15,740	15,740	15,740	62,960	

Outcome/Atlas Activity	Responsible Party/Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
					Total Outcome 4	121,000	186,500	66,500	66,000	440,000	
PROJECT MANAGEMENT UNIT (This is not to appear as an Outcome in the Results Framework and should not exceed 10% of project budget)	000878		AF	71300	Local Consultants	96,000	96,000	96,000	96,000	384,000	
				71600	Travel	3,000	3,000	3,000	3,000	12,000	
				72200	Equipment and Furniture	30,000				30,000	
				72500	Office Supplies	3,000	3,000	3,000	3,000	12,000	
				74500	Miscellaneous	3,000	3,000	3,000	3,000	12,000	
					Total Management	135,000	105,000	105,000	105,000	450,000	
				PROJECT TOTAL		1,990,000	1,440,000	1,295,000	345,000	5,070,000	

Summary of Funds:³⁷

	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Total
AF	1,990,000	1,440,000	1,295,000	345,000	5,070,000
TOTAL	1,990,000	1,440,000	1,295,000	345,000	5,070,000

³⁷ Summary table should include all financing of all kinds: AF financing, cofinancing, cash, in-kind, etc...

Gantt Chart

	Yr-1				Yr-2				Yr-3				Yr-4				TOTAL BUDGET (USD)
	QR-1	QR-2	QR-3	QR-4	QR-1	QR-2	QR-3	QR-4	QR-1	QR-2	QR-3	QR-4	QR-1	QR-2	QR-3	QR-4	
OUTCOME 1: Increased availability of water for small scale domestic and productive uses and reduced risk of water stress and drought.																	
Output 1.1: Two communal irrigation systems supply family farms in two micro-watersheds.			727,215													727,215	
Output 1.2: At least 880 rainwater collection and storage facilities supply family farms in eight micro-watersheds.			576,000		505,000				569,000							1,650,000	
Output 1.3: At least 1000 farm families organized and trained in management, efficient use and maintenance of their communal and individual irrigation systems and water storage facilities.																100,000	
SUB TOTAL			1,303,215		582,000				581,000						11,000	2,477,215	
OUTCOME 2: Introduction of climate resilient agro-ecological practices to make effective use of available water.																	
Output 2.1: At least 1000 farm families with agro-ecological farm transformation plans and using their own resources and available credit for their ongoing implementation.			25,985		53,000				49,000						5,000	132,985	
Output 2.2: At least 140 hectares converted to water-conscious and climate resilient agro-ecological production in each micro-watershed.			285,800		360,000				350,000						74,000	1,069,800	
Output 2.3: At least 50 protected hectares in water system recharge areas and riparian zones in each micro-watershed.			17,500		31,000				21,000						30,500	100,000	
SUB TOTAL			329,285		444,000				420,000						109,500	1,302,785	


OUTCOME 3: Institutional development and capacity building in micro-watersheds, municipalities, and participating national institutions					
Output 3.1: Local organizations in eight micro-watersheds prepare and implement climate resilient management plans to increase water retention, soil conservation and food security.	91,500	108,500	108,500	41,500	350,000
Output 3.2: Inter-institutional coordinating bodies in El Sauce, Achuapa, and Villanueva coordinate governmental and non-governmental agency work plans in the micro-watersheds in the Villanueva River basin.	10,000	10,000	10,000	10,000	40,000
Output 3.3: Validated proposals for normative instruments to build climate change resilience and for the operation of a Villanueva River sub-watershed committee.					0
Output 3.4: Nine municipalities in the Estero Real River basin incorporate climate change adaptation measures in their land use, investment and water use plans and related normative instruments.		4,000	4,000	2,000	10,000
SUB TOTAL	101,500	122,500	122,500	53,500	400,000
OUTCOME 4: Ongoing monitoring and analysis of climatic conditions and changes in land use, water flows and soil quality.					
Output 4.1: A hydrological study of the lower part of the Villanueva River basin, identifying the hydraulic works needed to reduce the flooding caused by sediments from the upper watershed.		120,000			120,000
Output 4.2: Ongoing participatory monitoring of water flows and quality, soil conditions, and land use changes.	56,505	24,665	24,665	24,165	130,000
Output 4.3: Electronic information posts in each targeted micro-watershed present relevant national and global climate information, digitalize local monitoring data, and prepare maps of land use, water flow and soil quality changes for farm families, local organizations and users of the National Environmental Information System (SINIA).	64,495	41,835	41,835	41,835	190,000
SUB TOTAL	121,000	186,500	66,500	66,000	440,000
EXECUTION COSTS	135,000	105,000	105,000	105,000	450,000
GRAND TOTAL	1,990,000	1,440,000	1,295,000	345,000	5,070,000

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

A. RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT³⁸ *Provide the name and position of the government official and indicate date of endorsement. If this is a regional 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:*

Denis Fuentes Ortega Planning Director Ministry of the Environment and Natural Resources National Focal Point before the Adaptation Fund	Date(10/20/2010)
Telephone and electronic mail: 505-22632862 / 22632864	

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, the National Environmental and Climate Change Strategy and subject to the approval by the Adaptation Fund Board, understands that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 Yannick Glemarec Director Environmental Finance UNDP	
Date: October 22, 2010	Tel. and email:yannick.glemarec@undp.org
Project Contact Person: Julia Wolf and Pradeep Kurukulasuriya	
Tel. And Email: + 1-212-906-6843, Pradeep.kurukulasuriya@undp.org	

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

List of Annexes

- Annex 1: Maps of the Estero Real River Watershed and Villanueva River Sub-Watershed
- Annex 2: Types, Capacities and Costs of Rain and Surface Water Catchment Structures
- Annex 3: Preparatory Study and Final Design of Las Mercedes Irrigation System
- Annex 4: Report on Studies and Designs of the Salale and Las Mercedes Irrigation Systems
- Annex 5: Outline of Menu of Production Practices for Adaptation to Climate Change and Variability
- Annex 6: Environmental Permits for the Salale and Las Mercedes Irrigation Systems
- Annex 7: List of Stakeholders Consulted
- Annex 8: Detailed Budget
- Annex 9: Terms of Reference for the Programme Coordinator and the Technical Team
- Annex 10: Gender and Family Role Workshops
- Annex 11: UNDP Environmental Finance – Specialized Technical Services
- Annex 12: List of Acronyms