

Republic of Cape Verde



MINISTRY OF ENVIRONMENT AND AGRICULTURE

National Meteorology and Geophysics Institute

United Nations Framework Convention on Climate Changes

National Adaptation Programme of Action on



Climate Change



2008-2012

Executive Version
December 2007

Table of Contents

TABLE OF CONTENTS	II
PREFACE	III
NOTICE	IV
ACRONYMS AND ABBREVIATIONS	V
LIST OF FIGURES AND TABLES	VI
I. INTRODUCTION AND CONTEXT	1
1.1. NATIONAL GEOGRAPHY AND SOCIO-ECONOMIC CIRCUMSTANCES	1
1.2. CLIMATIC SITUATION	2
1.3. PURPOSE OF THE NATIONAL ADAPTATION PROGRAMME OF ACTION	3
1.4. NATURAL RESOURCES IN CAPE VERDE.....	4
II. ADAPTATION PROGRAMME FRAMEWORK	5
2.1. OBSERVED AND FORECASTED IMPACTS OF CLIMATE CHANGE.	5
2.2. FORECASTED IMPACTS OF CLIMATE CHANGE ON KEY SOCIO-ECONOMIC SECTORS	6
2.3. CLIMATE CHANGE AND THE NATIONAL DEVELOPMENT PROCESS	9
2.4. BARRIERS TO IMPLEMENTING THE NAPA.....	10
III. IDENTIFICATION OF THE PRIORITY ADAPTATION NEEDS	11
3.1. GOALS, OBJECTIVES AND PRIORITY SECTORS	11
3.1.1. <i>Integrated water resources management</i>	11
3.1.2. <i>Improvement and security of agro-sylvo-pastoral production</i>	11
3.1.3. <i>The protection of coastal zones/impact related to tourism</i>	12
3.2. STRATEGIES	12
3.2.1. <i>Capacity development for stakeholders in matters related to adaptation to climate change and climate variability</i>	12
3.2.2. <i>Increased investment in adaptive conservation and soil protection measures</i>	13
3.2.3. <i>Action research in order to improve the resistance of the population and the ecosystems</i>	13
3.2.4. <i>Information, education and communication campaigns for stakeholders on the risks due to the climate change and climate variability</i>	13
IV. CRITERIA FOR SELECTING PRIORITY ACTIVITIES	15
V. LIST OF PRIORITY ACTIVITIES	16
VI. NAPA PREPARATION PROCESS	17
6.1. STAKEHOLDER ORGANIZATION AND CONSULTATION	17
6.2. STUDIES UNDERTAKEN.....	17
6.3. PRIORITY SETTING	18
6.4. PROBLEMS ENCOUNTERED AND LESSONS LEARNED	18
6.5. IMPLEMENTATION.....	19
ANNEXES	21
1. REFERENCES AND INFORMATION SOURCES.....	22
2. THE NAPA TEAM AND CONSULTED STAKEHOLDERS	23
3. THE PRIORITY PROJECT PROFILES	25

Preface

Scientific conclusions indicate that the "warming of the climatic system is a reality", while it is "very likely" that anthropic activities play an important role in temperature rise. Effectively, global temperatures have risen by about one degree since the end of the nineteenth century, while the levels of CO² concentration in the atmosphere have increased and accumulated by approximately 30% during the same period. CO² is considered a major contributor to global warming and any increase in the concentration of this gas or any of the other greenhouse gases will provoke dramatic consequences such as the rise of the level of the sea, creating continuous variations in the pattern of precipitations and the frequency and acuteness of extreme meteorological phenomena. In this context, there is a need of urgent action to limit the effects of global warming that can endanger the most affected regions such as Sub-Saharan Africa and the small island states. Those effects exacerbate the existing development problems and endanger the gains in the socio-economic area.

Cape Verde, as an archipelago country of volcanic origin, presents an environment system with a high degree of fragility and vulnerability face the occurrence of extreme natural phenomena. In account of the fragility of the ecosystems, the insularity and vulnerability that characterize the country, the instruments for implementation of a development strategy have been elaborated with the aim of integrating environmental issues into the planning process and promotion of a sustainable development. The strategic axes of intervention in the areas of economy, environment, security and poverty reduction have been defined in the Growth and Poverty Reduction Strategy, in the Programme of Fight Against Poverty and in the National Environment Action Plan, and aim at the continued and sustained growth of the economy, the permanent consolidation of national cohesion, the improvement of the quality of life of Cape Verdeans, as well as a wider space for participation and a substantial affirmation of citizenship.

In the context of environmental protection, Cape Verde has signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the Convention on Desertification (UNCCD) as well as other protocols aiming at the preservation of the national and global environment. In 2000, Cape Verde submitted its First National Communication and the National Strategy on Climate Change to the UNFCCC.

Small island development states possess some common characteristics: small surface area, relatively high population density, inadequacy of infrastructure and the lack of natural resources, particularly of potable water resources. All these elements have repercussions not only on geophysical characteristics but also on these countries' economic and social development conditions. Certain features that are typical of island ecosystems, namely fishing resources and coral reefs, are threatened by climate change; islands are prone to natural catastrophes and all these elements can be aggravated by unplanned economic growth. This can have harmful consequences on certain economic sectors, such as tourism and agriculture, as well as on food security and nutrition. Several resource-dependent communities in poor countries have already started to feel the effects of climate changes. In this perspective, one of the objectives of the NAPA is the identification of urgent and immediate actions for expanding and broadening the range of climate change coping strategies applied by those communities, so that they may improve their capacity of adaptation to the current climatic variability and extreme events, and, consequently to future changes. In this context, the adaptation programme must be oriented towards increasing the resilience of the country to climatic change and variability, in order for them to achieve the Millennium Development Goals. Cape Verdeans identified adaptation strategic actions that include integrated management of water resources, production of food, ecosystems and tourism, development of the agro-silvo-pastoral production systems and protection and prevention of degradation of coastal zones.

Because vulnerability depends on communities' capacity to adapt to changing conditions, which is by itself a function of the poverty level, we believe that the national strategy for implementation of the National Adaptation Programme of Action on Climate Change (NAPA) must be articulated around policies and measures for the short and medium terms, in compliance with the temporal horizon of the Growth and Poverty Reduction Strategy and through priority projects, with indicators for progress monitoring and evaluation of the success and difficulties of adaptation strategies.

Notice

This is the Executive Version of the ‘National Adaptation Programme of Action on Climate Change’ of the Government of Cape Verde. The complete version, in Portuguese, contains additional details on the context, challenges, methodology and process, and the strategies for addressing urgent climate change adaptation needs in Cape Verde.

Acronyms and Abbreviations

CBA	Cost-benefit analysis
CC	Climate changes
CEA	Cost-efficiency analysis
CoP	Conference of the Parties (CoP) of the UNFCCC
CV	Climate variability
GPRSP/DECRP	Growth and Poverty Reduction Strategy Paper
IEC	Information, education and communication
IWRM	Integrated Water Resources Management
LDC	Least developed country
LEG	Least developed countries Expert Group
MCA	Multi-criteria analysis
NAPA	National Adaptation Programmes of Action
PANA	National Environment Action Plan
RGA/GAC	General Agriculture Census
SIDS	Small Island Development State
UNFCCC	United Nations Framework Convention on Climate Change
ZEE	Economic Exclusive Zone (ZEE)

List of Figures and Tables

FIGURES

Figure 1: Geographical location of Cape Verde

Figure 2: The monthly maximum and minimum temperatures and rainfall

Figure 3: Annual variability of temperature in Cape Verde, and recent trends

Figure 4: The relationship between annual maize production and the distribution of rainfall

Figure 5: The relationship between food security and the type of agro-sylvo-pastoral activity practiced

Figure 6: The Organizational Framework of Cape's Verde National Adaptation Programme of Action

TABLES

Table 1: Mortalities resulting from major floods

Table 2: Climate change phenomena in the water sector and associated impacts

Table 3: Climate change phenomena in the agro-sylvo-pastoral sector and associated impacts

Table 4: Climate change phenomena in the coastal zone management and tourism sectors and associated impacts

Table 5: The NAPA Team

Table 6: Consulted Stakeholders

PHOTOGRAPHS

Photo 1: Extreme flooding events are increasingly frequent

I. INTRODUCTION AND CONTEXT

1.1. National Geography and Socio-Economic Circumstances

The archipelago of Cape Verde is made up of ten islands and nine islets and is located between latitudes 14° 28' N and 17° 12' N and longitudes 22° 40' W and 25° 22' W. It is located approximately 500 km from the Senegal coast in West Africa (Figure 1).

The islands are divided into two groups: Windward and Leeward. The Windward group is composed of the islands of Santo Antão, São Vicente, Santa Luzia, São Nicolau, Sal and Boavista; and the Leeward group is composed of the islands Maio, Santiago, Fogo and Brava. The archipelago has a total land surface of 4,033 km² and an Economic Exclusive Zone (ZEE) that extends for approximately 734,000 km².



Figure 1: Geographical Location of Cape Verde

In general, the relief is very steep, culminating with high elevations (e.g. 2,829 m on Fogo and 1,979 m on Santo Antão). The surface area, geophysical configuration and geology vary greatly from one island to the next. Cape Verde, due to its geomorphology, has a dense and complex hydrographical network. However, there are no permanent water courses and temporary water courses run only during the rainy season. These temporary water courses drain quickly towards the main watersheds, where, unless captured by artificial means, continue rapidly to lower areas and to the sea. This applies equally to the flatter islands. The largest watershed is Rabil with an area of 199.2 km². The watershed areas on other islands extend over less than 70 km².

Cape Verde is both a least developed country (LDC) and a small island development state (SIDS). In 2002, the population of Cape Verde was estimated at approximately 451,000, of whom 52% were women and 48% men. The population was growing at an average 2.4% per year, and the urban population was estimated at 53.7 %.

Over the past 15 years, the Government has implemented a successful development strategy, leading to a sustained economic growth anchored on development of the private sector and the integration of Cape Verde into the world economy. During this period, the tertiary sector has become increasingly important, with strong growth in the tourism, transport, banking and trade sectors. Overall, the quality of life indicators show substantial improvements in almost all areas: housing conditions, access to drinking water and sanitation, use of modern energy in both lighting and cooking, access to health services and education.

Despite these overall socio-economic successes, the primary sector has witnessed limited progress. Weak performance in the primary sector has had a severe negative impact on the incomes and poverty risks faced by rural workers¹. Moreover, relative poverty has increased significantly during the past decade. The poverty profile shows that: (i) extreme poverty is mostly found in rural areas, although it has also increased in urban

¹ Source: Growth And Poverty Reduction Strategy Paper (GPRSP, 2004)

areas; (ii) poverty is more likely to occur when the head of the household is a woman; (iii) poverty increases with family size; (iv) education significantly affects poverty; (v) the predominantly agricultural islands of Santo Antão and Fogo have the highest poverty rates; (vi) unemployment affects the poor more than the non-poor; (vii) agriculture and fisheries workers are more likely to be poor than those in other sectors. Therefore, the fight against poverty and income inequalities remains one of the greatest challenges for Cape Verde authorities.

The various governments of Cape Verde over the last decade have demonstrated a commitment to improving governance, notably by encouraging a democratic culture that guarantees stability and democratic changes without conflicts. This democratic governance offers a space for a wider participation of citizens in public management and consolidates social cohesion. However, there are some remaining challenges related to democratic governance and the gains must be systematically monitored. Finally, it is worth emphasizing that the country's insularity has stimulated a movement to decentralized governance, although social inequalities and contrasts from one island to the next constitute, at the same time, challenges and opportunities.

1.2. Climatic Situation

The Cape Verde archipelago lies in the sub-Saharan African climatic zone. Hence, it is characterized by a dry tropical climate with two distinct climatic seasons: a dry season and a rainy season. Four systems determine the climate in the region and in the archipelago:

- the subtropical Azores and Santa Helena anticyclones;
- the low equatorial pressures;
- the Canary maritime current;
- the thermal depression over the African continent during the summer.

The Canary sea current flows from the northeast along the West African coast towards the islands, contributing to smooth temperatures and also influencing the variability and intensity of rainfall.

These factors result in significant spatial-temporal variability in rainfall and the presence of microclimates, including frequent drought events. In addition, the strong north-east winds lead to contrasting agricultural landscapes among the different islands. In general, a considerable surface area of the islands consists of a vast arid region.

The Dry Season in Cape Verde covers a period of approximately nine months from November to July, and is marked by an almost total absence of rainfall. Strong maritime winds also cause high evaporation rates, further aggravated by high solar radiation. The Wet Season corresponds to the months of July through October and is, generally, marked by rainfall events associated with intense soil cultivation, which starts by the seeding of the major rain-fed crops. During this season, the flow of tropical maritime air influences the archipelago, precipitations occur, sometimes very intensively. This season is also characterized by the passage of the African east waves and isolated convective systems that determine most of the precipitation occurring in this season. Rainfall The average annual rainfall across the islands is 225mm², although there are great temporal and spatial variations. The islands' relief is a major climate factor and precipitation is highest on the mountainous islands (Fogo, Santiago, Brava, Santo Antão and S. Nicolau). The graphs in Figure 2 illustrate the rainfall variability recorded at three meteorological stations on S. Vicente, Santiago and Sal. Some islands may have only two days of rain in an entire season. The records also show great inter-annual variability, with a coefficient of variation above 50%.

Temperature. The average monthly air temperature varies between 20 °C and 26 °C, and is higher during the wet season. In the arid coastal zones, the maximum absolute temperature may exceed 32 °C. The months of August and September are generally the hottest, with December through February being the coldest. Figure 3 illustrates the diverse annual temperatures, as well as the recent trends towards higher temperatures.

² Source: Ministry of Environment and Agriculture, National report on Cape Verde, GEF UNDP ACCC Project (2006)

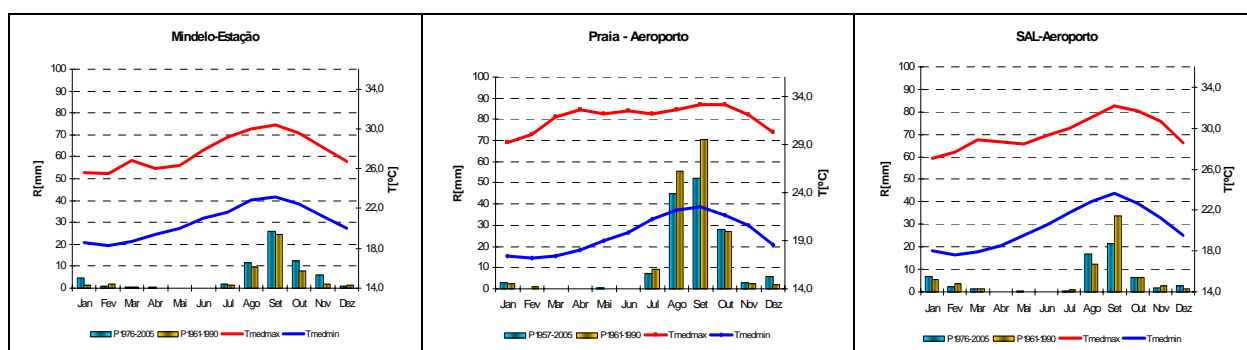


Figure 2: The monthly maximum and minimum temperatures and rainfall

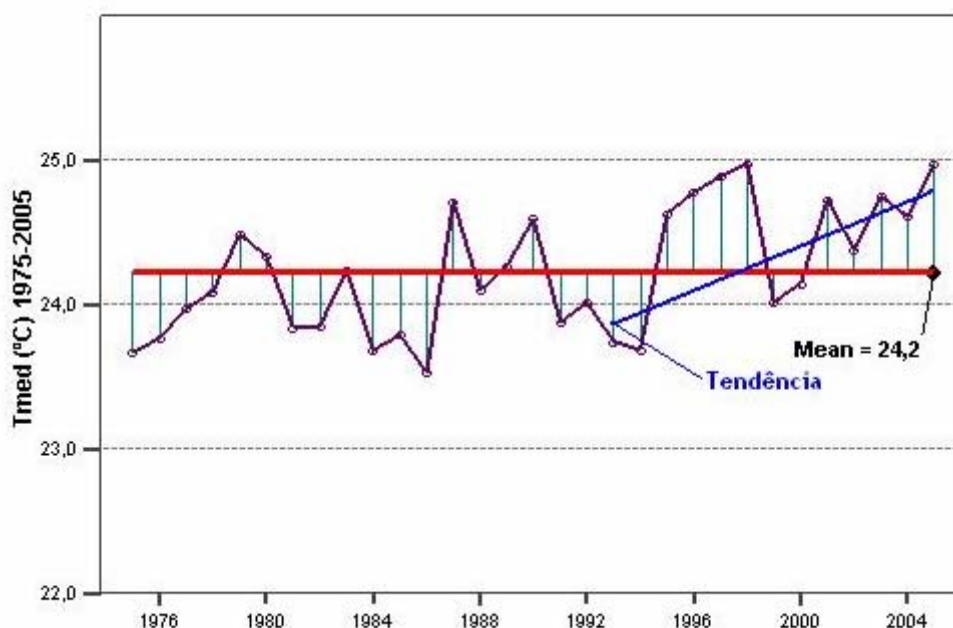


Figure 3: Annual variability of temperature in Cape Verde, and recent trends

1.3. Purpose of the National Adaptation Programme of Action

The Annotated Guidelines for the Preparation of National Adaptation Programmes of Action (NAPA), based on Decision 28 of the 7th Conference of the Parties (COP7) of the United Nations Framework Convention on Climate Change (UNFCCC), provides the methodological basis for the development of NAPAs in least developed countries (UNFCCC, 2002). In line with these guidelines, the main goal of the NAPA exercise is the identification of the urgent and immediate needs and concerns of the least developed countries (LDCs), relating to adaptation to the adverse effects of climate change". As per the guidelines, the formulation of the Cape Verde NAPA followed a participatory process that involved those most affected by climatic impacts, that is rural people and the poor. Moreover, the NAPA process builds upon existing coping strategies implemented by local communities in order to enhance their adaptation capacity.

More specifically, the objectives of the NAPA project were: (1) to understand the main characteristics of climate hazards in Cape Verde (notably floods, droughts and sea level rise); (2) to understand coping mechanisms to climate hazards and climate change at the grassroots level; (3) to understand existing programmes and institutional arrangements for addressing climate hazards and climate change; (4) to identify and prioritise adaptation activities to climate hazards and climate change.

1.4. Natural Resources in Cape Verde

Water resources are very scarce in Cape Verde, a problem that is exacerbated by the fact that a high percentage of the rains fall within a very short time period and there is not enough capacity to capture and store the water. The random nature of the rains and the deficient infrastructure in the water sector, in combination with increasing water consumption (due to agriculture, pastoral activities, civil construction, tourism, industry, etc.), have greatly increased the pressure on water resources. This has led to increased scarcity of water, with negative environmental repercussions.

It is estimated that about 60,000 m³/day are currently being used to irrigate about 1,600 ha of land, meaning that 50% of the available volume of water is used for irrigation. The overall water needs for livestock across the country are estimated at 1,896 m³/day. The demand for water for industrial use³ and tourism are estimated to be 5,500 m³/day. The fast development of tourism is placing increased pressure on water resources, creating major water management challenges, both with regards the quality and the availability of water. In general, Cape Verde has considerably more surface water than underground water. However, in Cape Verde, the exploitation of surface water is seriously limited by the nature of the drainage system and the torrential-like nature of rainfall. The construction of dams (e.g. Poilão) is one envisaged solution for capturing larger amounts of surface runoff. This should allow greater availability of water in the surrounding areas.

Agro-sylvo-pastoral resources The agro-silvo-pastoral sector is characterized by the limiting conditions within which the activities take place, i.e. the scarcity of the natural resources (water and soil), the low-tech exploitation systems and climate. According to the General Agriculture Census (RGA) 2004, the total arable land surface is 44,358.8 ha, of which 40,294.8 ha is rain-fed and 3,475.5 ha irrigated. Agriculture is mainly practiced in very small holds - about 70 % of arable land are within units smaller than 1 ha.

The main islands supporting rain-fed agriculture are Santiago, Fogo and Santo Antão: these represent more than 88% of rain-fed agriculture. The number of agricultural enterprises is estimated at 33,895, most of them in Santiago Island (20,393), followed by Fogo Island (5,090) and Santo Antão Island (4,563) (RGA, 2004). However, rain-fed agriculture is practiced on all islands.

The major crops are combinations of maize and beans: feijão pedra (*Lablab dolichos*), bongolon (*Vigna unguiculata*), sapatinha (*Phaseolus vulgaris*), fava (*Phaseolus lunatus*) and feijão congo (*Cajanus cajan*). In high altitude zones, sweet potatoes, Irish potatoes, cassava and different types of vegetables are still cultivated. Peanut (*Arachis hypogaea*) is another important rain-fed crop, mainly on the island of Fogo. The above mentioned crops are often cultivated in marginal lands and in agro-climatic zones unsuitable for cropping, namely in arid and semi arid zones and zones with steep sloping soils, low in nutrients content and with low water retention capacity. The main irrigated crops are sugar cane, bananas and vegetables such as tomatoes, carrots, collards, onions, peppers, etc, as well as roots and tubers, namely sweet potatoes, Irish potatoes and cassava.

Animal husbandry (mostly cattle and sheep) also constitutes an important sector in the rural economy, representing about 25% of the income for rural populations. It is estimated that about 35% of the national territory is used for pastoral and silvo-pastoral activities. Livestock rearing is characterized by a low production and productivity, due to the scarcity of resources, fragility of the environment, the unreliable nature of climate and the use of rudimentary rearing techniques.

Land and soil Only 10% of the land is potentially arable; of this, 95% is utilized for rain-fed agriculture, while the remainder 5% is for irrigated agriculture. Arable lands are, to a large extent, located in the semi-arid and arid zones. The soils are generally rich in mineral elements but poor in organic matter and nitrogen. This situation is the result of a combination of factors, such as erosion, poor plant cover and the use crop residues as fodder and fuel. Soils are, to a great extent, shallow, poorly developed and with low water retention capacity. However, fertile alluvium and colluviums soils are found in valleys, constituting the major areas for irrigated agriculture.

³ The industrial units consuming most water are principally in the brewery and soft drink sector.

II. ADAPTATION PROGRAMME FRAMEWORK

2.1. Observed and Forecasted Impacts of Climate Change.

Cape Verde is highly vulnerable to climate change, with low capacity to adapt. Models of future climate change suggest that temperature increases of up to 4°C and decreases in rainfall by up to 20% can be expected by 2100. In the more immediate planning horizon (next 10-20 years), climate induced changes include seasonal water shortages at an increasing number of economically important sites and year round shortages at other sites. In addition, climate variability is predicted to increase, with more storms, floods and droughts and a shorter rainy season.

Floods Extreme events (devastating floods, droughts, sudden changes in temperature) are the highest points of variability and climate change, and have a strong socio-economic impact. Extreme events seem to be taking place more and more frequently (see Photo). Torrential rains, an increasingly frequent phenomenon in Cape Verde, lead to great loss of agricultural soils, human lives, animals, and infrastructures.



Photo 1. Extreme flooding events are increasingly frequent

The intense, short duration rains can cover an entire watershed within a short period of time (3 to 6 hours). For example, torrential rains in 1984 resulted in deaths and economic losses (destruction of roads, arable soils, bridges, such as the bridge of Calhetona, S. Miguel). The Government was forced to declare a state of emergency in the affected areas. Table 1 presents information on mortalities from recent floods in urban and suburban areas in the estuary of key watersheds.

Table 1: Mortalities resulting from major floods

Zone	Deaths 1955	Deaths 1961	Deaths 1966	Deaths 1984
Praia (Santiago) and R. Grande (S. Antão)		11		6
Galinheiro (Fogo)			15	28
S.Catarina (Santiago) Mindelo (S.Vicente)	1			

Source. Study on adaptation and vulnerability of water resources

High intensity precipitations are the cause of these floods. At times, over 200 mm rainfall is recorded in less than 24 hours. For certain events, economic losses of agricultural soils have been estimated at about 2,000,000 USD. In the future, the number and intensity of these floods is predicted to increase.

Droughts Increased local and general droughts are also foreseen. These are forecasted to contribute to the reduction of plant cover and the degradation of the ecosystem, thereby affecting livelihoods and agriculture.

Agro-silvo-pastoral As in water resources sector, activities in the agro-silvo-pastoral sector are highly dependent on the climate. The occurrence of significant precipitations, in any period of the year, benefits and stimulates agricultural activities at any point of the archipelago. However, persistent rainfall deficits have led to droughts and food insecurity, mainly for small vulnerable farmers. Low rainfall, and the over-exploitation

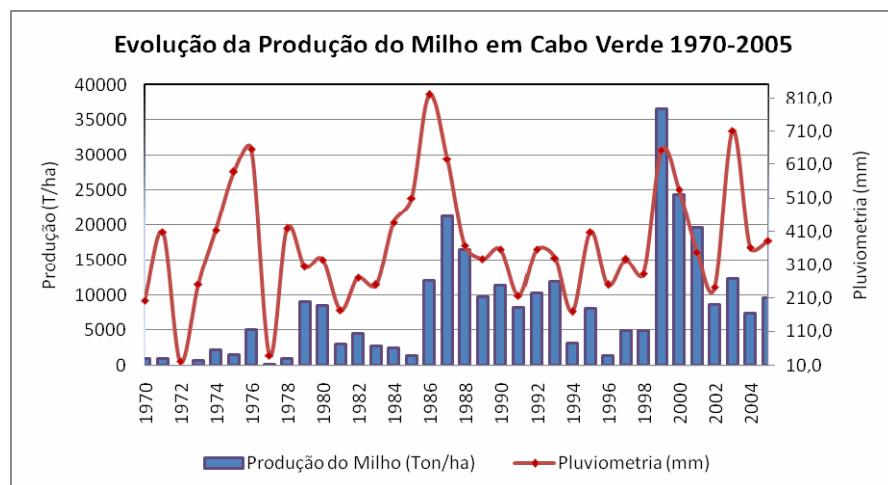


Figure 4: The relationship between annual maize production and the distribution of rainfall

of water resources, affects the sector, causing direct economic impacts and increased prices for agricultural products. This also leads to the abandoning of agricultural lands on some islands, with further economic consequences for small farmers. Figure 4 indicates the relationship between rainfall and the variability of agricultural production (maize) at the national level.

Coastal zones. Previous studies have revealed the sensitivity of coastal zones to sea level rise and to the associated increases in tidal surges and sea storms.

These effects are exacerbated by the man-made destruction of natural barriers along the coastal edge, particularly through the mining of sand, and the over-exploitation of wells. Examples of impacts seen more frequently include:

- strong winds provoking dust storms and increasing coastal erosion;
- strong waves and high tides contributing to the degradation and even total destruction of coastal protection structures;
- saline intrusion leading to salinization of water sources and agricultural fields near beaches and in low lying river beds.

Socio-economic In Cape Verde, climate plays a fundamental and very important role in the economy. Reductions of rainfall and consequent reduction of available surface water in seasonal rivers will have direct consequences on the recharge of reservoirs and filling of dams. In turn, it will have negative socio-economic impacts on the lives of small vulnerable farmers. This can be expected to lead to an increase in the rural exodus – in turn causing increased pressure on urban resources.

2.2. Forecasted Impacts of Climate Change on Key Socio-Economic Sectors

The following tables present the phenomena associated with climate change and the forecasted impacts on the key socio-economic sectors. As discussed in the previous section, to some extent these phenomena and impacts are already being observed.

Table 2: Climate Change phenomena in the water sector and associated impacts

Phenomena and events of climatic nature	Impacts of the climate change
➤ Less rainfall	✓ Decrease of agricultural production for irrigated and rain fed crops
➤ Reduction of the length of the rainy season	✓ Increase in the water demand
➤ Microclimate alterations	✓ Increase of conflicts on water
➤ Occurrence of torrential rains and flooding	✓ Over exploitation of the aquifers
➤ Increase surface drainage and water erosion	✓ Saline intrusion
➤ Frequent droughts	✓ Abandonment of water wells
➤ High erosion rates	✓ Insufficient water for domestic, industrial supply, and others
➤ Sea level rise	✓ Degradation of sanitary conditions
➤ Tides above protection walls	✓ Biodiversity degradation
➤ High intensity of the maritime currents	✓ Water deficit
➤ Heat and dust waves	✓ Reduction of the availability of surface water
	✓ Reduction of underground waters
	✓ Reduction of the flow of water from springs and wells
	✓ Transportation of basalt blocks – soil erosion
	✓ Reduction in crop yields
	✓ Flooding
	✓ Low animal raising productivity
	✓ Abandoning of agricultural lands
	✓ Reduction of the regenerative capacity of soil
	✓ Acceleration of desertification
	✓ Reduction of forage
	✓ Salinity of soils and water sources near the coastal areas
	✓ Erosion of the coastal line
	✓ Degradation of the vegetation and loss of marine habitats
	✓ Degradation of water quality
	✓ Increase of poverty
	✓ Water borne diseases
	✓ Reduction of the income of families
	✓ Reduction of jobs
	✓ Irrational exploration of natural resources

Table 3: Climate Change phenomena in the agro-sylvo-pastoral sector and associated impacts

Phenomena and events of climatic nature	Impacts of the climate changes
✓ Reduction of rainfall ;	✓ Reduction of the duration of the rainy season and increase of the dry season;
✓ Reduction of atmospheric humidity;	✓ Reduction of water availability;
✓ Increase of temperature;	✓ Increase of water needs
✓ Increase of the frequency of	✓ Increase of arid and semi-arid areas in detriment of the humid and sub humid areas;
	✓ Increase of the incidence of pests and vectors of illnesses;
	✓ Possible reduction of certain cryptogrammic leaf diseases and increase of others;
	✓ Increase of the rate of soil erosion;
	✓ Reduction of the photosynthetic capacity of crops;
	✓ Reduction of crop yields for both irrigated and rain fed

Phenomena and events of climatic nature	Impacts of the climate changes
<ul style="list-style-type: none"> torrential rains; ✓ Occurrence of flooding ; ✓ Increased evapo-transpiration; ✓ Frequent droughts ; ✓ Increase of solar radiation; ✓ Increase of aerosols 	<ul style="list-style-type: none"> crops; ✓ Increased exploitation of water tables; ✓ Reduction of the productivity of agricultural lands in zones affected by droughts ; ✓ Reduction of agricultural production; ✓ Saline intrusion in watersheds and water tables; ✓ Agricultural land abandonment; ✓ Salinization and abandonment of wells; ✓ Alteration in deposits of sediments; ✓ Rural exodus; ✓ Alimentary deficit ; ✓ Deficit of pasture; ✓ Poor animal nutrition; ✓ Increase of thermal stress in animals; ✓ Reduction of animal productivity; ✓ Increase of arid and semi-arid lands; ✓ Reduction of productivity in pasture lands affected by drought; ✓ Increase of water needs; ✓ Likely increase of morbidity and mortality; ✓ Reduction of incomes of rural populations ; ✓ Protein deficit

Table 4: Climate Change phenomena in the coastal zone management and tourism sectors and associated impacts

Phenomena and events of climatic nature	Impacts of the climate changes
<ul style="list-style-type: none"> ✓ Uncontrolled extraction of inerts in coastal zones ✓ Marine and coastal pollution ✓ Unregulated construction of tourism infrastructures and others along the coastal line ✓ Lack of respect for legislation on coastal zone ✓ High water erosion ✓ Tropical storms ✓ Frequent events of extreme temperature variations ✓ Torrential rains ✓ Increase of intense precipitation events 	<ul style="list-style-type: none"> ✓ Erosion of the coastal line ✓ Alteration of the coast due to erosion ✓ Alteration of the coastal morphology ✓ Disappearance of beaches ✓ Destruction of the land/sea natural protection ✓ Degradation of the marine and coastal environment ✓ Saline intrusion in the coastal rivers and aquifers located 500 m from the coast ✓ Water contamination due to toxic dejects ✓ Abandonment of water sources due to salinization ✓ Flooding of the coastal zones ✓ Alteration of the intensity of maritime currents ✓ Abandonment of tourism infra-structures and coastal properties (houses, agricultural lands, etc.) ✓ Food insecurity of the populations ✓ Frequency of intense and dry sand storms ✓ Increase of air aridity ✓ Increase of potential evapo-transpiration ✓ Increase of water consumption ✓ Loss of interest for the country as a tourist destination ✓ Change of tourist destinations ✓ Cancelled flights – poor visibility ✓ Commercial disturbances

Phenomena and events of climatic nature	Impacts of the climate changes
<ul style="list-style-type: none"> ✓ High intensity Flooding ✓ Aggressive waves ✓ Extreme high tides with increased undulation ✓ Rise of sea water ✓ Persistence and occurrence of prolonged dry dust (bruma seca) ✓ Intense and long droughts 	<ul style="list-style-type: none"> ✓ Negative modifications of the economic structure ✓ Increased economic losses ✓ Increase of damages caused by flooding ✓ Increased costs in the economy ✓ Increase of the risk of deaths and infectious epidemics ✓ Increase of damage in the coastal ecosystems such as coral reefs ✓ Destruction of infra-structures (roads, ports, housing, agricultural lands, hotels, beaches, coastal villages, bridges, protection walls, etc.) ✓ Coastal and marine pollution ✓ Destruction of tourism spaces ✓ Air pollution ✓ Increase of the intensity of coastal degradation due to alteration of the amplitudes and aggressiveness of the tides ✓ Abandonment of agricultural lands ✓ Reduction of the potential of agricultural production in the lower coastal zones ✓ Saline intrusion ✓ Appearance of tropical diseases such as malaria, cholera, blood pressure, lung diseases ✓ Destruction of coastal products of tourist interest ✓ Migration of the coastal populations to the interior of islands ✓ Degradation of the environment

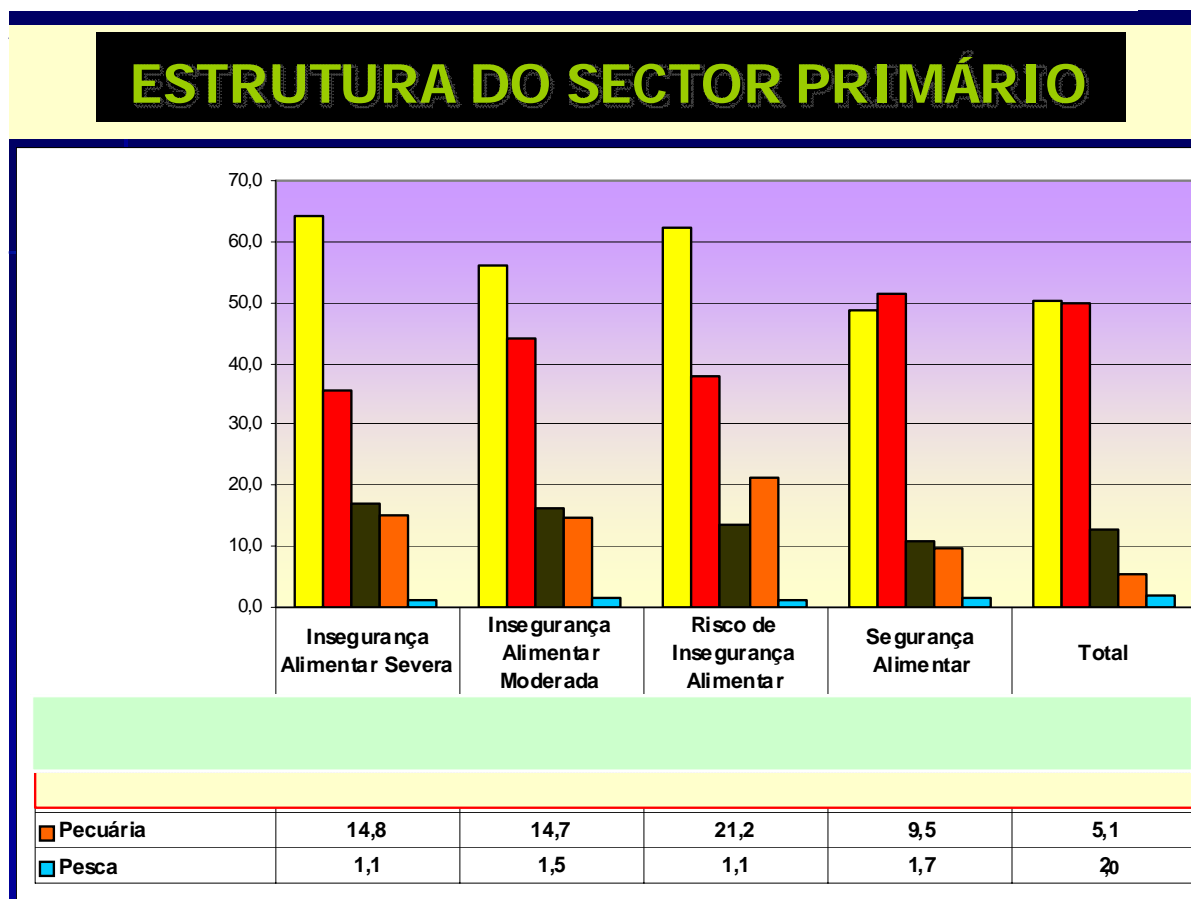
2.3. Climate Change and the National Development Process

As with all sub-Saharan countries, climate change will increasingly exacerbate development challenges in Cape Verde, including, food and water insecurity, general poverty, and gaps in governance. Moreover, as a Small Developing Island State (SIDS), Cape Verde faces specific challenges associated with its small size, inadequate infrastructures and lack of natural resources. The communities that will be most affected by climate change are those that are already confronted with social and economic challenges: communities that cultivate marginal and degraded land, those that live in poverty, those touched by HIV/AIDS and other infectious diseases, those facing conflicts related to natural resources, the marginalized communities, as well as other communities whose voices weigh very little in the national decision-making processes.

Notably, the role of the primary sector is very relevant to poverty alleviation and the country's economy given that the activities of the agriculture, livestock and fisheries sectors are essential, particularly to poor people. The primary sector guarantees food security of the diverse layers of the population, mainly the most vulnerable. Figure 5 indicates that the activities related to the agro-silvo-pastoral sector are the ones that most contribute to the food security, with higher prominence for the two types of cropping (subsistence and rent). This situation is associated to the fact that a large proportion of the population depends on agriculture and livestock activities for their survival.

The poor populations already feeling the effects of climate change have started to adapt their ways of life to this new reality. But there are clearly limits to what they can do. Their efforts will only be effective if they are supported by strategies and national policies and by international financial assistance.

Figure 5: The relationship between food security and the type of agro-silvo-pastoral activity practiced



2.4. Barriers to Implementing the NAPA

The barriers to the implementation of the NAPA can be categorized as follows:

- Limitations in available human resources. Limited technical capacity to develop and implement specific measures may be a barrier to effective implementation of the NAPA;
- Institutional limitations. For example, in the water sector, the water tariff regime and the approach to resolve water conflicts remain incomplete. In addition, there are many aspects to implementing legislation that remain difficult, namely: (i) the proliferation of institutions operating in the sector without an efficient coordination mechanism (ii) a deficiency in the functioning of the regulatory entity (iii) overlapping of attributions among State institutions (iv) insufficiency of regulatory texts for the protection of water resources (v) deficient knowledge of the law by the institutions intervening in the sector (vi) poor participation of the population in the resolution of the problems of the sector;
- Financial limitations. These may be further exacerbated in the future as Cape Verde is to exit the group of LDCs, and this may significantly change Cape Verde's situation in relation to development financing mechanisms, namely through the reduction of budgetary support. This may also discourage the Government from investing in so-called "non-productive" projects and programmes. On the other hand, the increased efficiency in resources management, the achievement of results in the field, and increasing regularity and transparency in the management of funds, will all facilitate financial support from donors;
- Enhanced climatic data and monitoring capacity. Data, models and ability to collect and use these is a limit to designing the optimal investments, and;
- Low awareness of the public.

III. IDENTIFICATION OF THE PRIORITY ADAPTATION NEEDS

The Cape Verde NAPA has established a Goal and a series of contributing Objectives. In addition, a series of cross-cutting strategic approaches to reaching the goals and objectives have been identified. The adaptation programme will be implemented during the 2008-2012 period, in line with the GPRSP.

3.1. Goals, objectives and priority sectors

The Goal of this adaptation programme is to increase the capacity of resistance of Cape Verde to climate change (CC) and climate variability (CV) in order to achieve the development objectives set in its Growth and Poverty Reduction Strategy Paper. This programme complements the recently concluded *National Strategy Action Plan against Climate Changes* which focuses mostly on the reduction of emissions of greenhouse gases.

In order to reach the Goal, this programme has three priority sectoral Objectives, as identified through the vulnerability analysis undertaken by the broad stakeholders groups during the participatory process to prepare this NAPA. These three Objectives are:

- 1) Promoting integrated water resources management in order to guarantee water for the people, for the production of food, for the ecosystems and for the tourism industry;
- 2) Developing the adaptability of the agro-silvo-pastoral production systems in order to ensure and improve national food production;
- 3) Protecting and preventing degradation of the coastal zones, caused by climatic aggressions and by tourism.

Further information on each of these is provided in the following sections.

3.1.1. Integrated water resources management

The existing scarce water resources have represented and continue to represent one of the most limiting factors for economic development in Cape Verde. The water shortages reduce the probability of a good harvest in rain-fed areas. Furthermore, the average yields and productivity are determined by the great annual variability in rainfall. Finally, parts of Cape Verde are sometimes confronted with intense rains that cause floods in the estuaries of some watersheds, and severe damage upstream through floods. Both of these phenomena are set to worsen due to global climate change.

Hence, the issue of protecting and managing scarce water resources remains at the core of the adaptation challenge in Cape Verde. The most viable option is to mainstream climate change issues into integrated water resources management (IWRM), which deals with all the uses of the resource (domestic, agricultural, industrial, ecosystem, etc.). IWRM will lead to a better use of the existing water, a diversification of sources and improved availability, the treatment of used waters, and the protection of ecosystems in particular of their function to regulate the water cycle. This is the starting point for adapting the water sector to climate change, and to increasing resilience to climate change in the water sector. The Objective is to develop a climate-change proof IWRM in Cape Verde.

3.1.2. Improvement and security of agro-silvo-pastoral production

Climatic conditions also determine the agro-silvo-pastoral activities, hence the vulnerability of this sector to the anticipated changes in climate and climatic variability. The analysis of the future agro-climatic development indicates that, under the anticipated conditions of increasing aridity resulting from decreasing

rainfall (-10 to -20%) and under increasing temperature (up to 3.5°), the amount of food Cape Verde will be able to provide as a percentage of its requirements will drop dramatically, thereby exposing a large portion of the population to food deficits and food insecurity by 2020.

Accordingly, it is essential for Cape Verde to take preventive measures in order to decrease the risks on agricultural production resulting from the harmful impacts of climate change and climatic variability. Within the framework of an alternative agro-silvo-pastoral production strategy, a reevaluation is essential with regards to the distribution of the agro-climatic zones and the structure of crops, and the development and intensification of animal raising in arid regions, and on the use of alternative crops, on the promotion of small-scale irrigation, on the reinforcement and maintenance of soil and water conservation schemes, and finally on the establishment and the diffusion of a crop calendar to farmers.

Adapting to climate change and climatic variability also means making it possible for ecosystems to continue to provide a multitude of essential goods and services, especially to the most vulnerable populations. These goods and services include: providing fertile soils; providing food and other raw materials; supplying water; providing pharmacological substances; and providing leisure and recreational functions (e.g. entertainment, educational, cultural, spiritual, aesthetic, and tourism values).

3.1.3. The protection of coastal zones/impact related to tourism

The coastal zones of Cape Verde are negatively affected by the harmful effects of the high population density in certain centers, by tourist activities, by the occasional leak of hydrocarbons, by the abusive and uncontrolled extraction of inert materials (sands and stones) and by saline intrusion. These impacts continue into marine areas, which in most cases are very scarped and vulnerable to the effects of tides.

As climate change intensifies, these problems are set to become increasingly intense. This leads to the need for urgent action to stop the loss of "the maritime habitat" and the disappearance of some species, and to stop the associated loss of national economic opportunities. Moreover, the accelerating advance of sea waters quickly reduces the margin of "the interface" between the sea and the land, and increases soil salinity and reduces its productive capacity, again having important negative effects on agricultural activities in coastal zones.

3.2. Strategies

This adaptation programme, which aims to reduce the vulnerability of Cape Verde to the consequences of climate change in the three sectors described above, will be implemented through four cross-cutting strategic approaches:

- Capacity development for stakeholders in matters related to adaptation to climate change and climate variability;
- Increased investment in adaptive conservation and soil protection measures;
- Action-research in order to improve the resistance of the population and ecosystems;
- Information, education and communication campaigns for stakeholders on the risks due to climate change and climate variability.

3.2.1. Capacity development for stakeholders in matters related to adaptation to climate change and climate variability.

In order to face the impacts of climate change and climate vulnerability, the stakeholders should develop new knowledge, attitudes and practices. For this reason, the development of capacities was identified as one of the crosscutting adaptation strategies. There is a need to acquire knowledge and goods, within an institutional framework that encourages stakeholders to develop new aptitudes in order to assume new responsibilities, attitudes and values in face of climate change and climate vulnerability. This applies to all sectors.

The local populations have already started to adapt as best as they can to their transforming environment. However, there are limits to what the populations can do without receiving wider support. Their efforts will only be rewarded if they are supported by national strategies and policies. However, such national support requires, in turn, basic changes in the culture of public institutions, and in the attitudes and behaviour of government actors. Accordingly, it is a strategic imperative for Cape Verde to promote these changes in the concerned sectors, both for the performance of its institutions and for the economic growth strategy. Achieving these transitions will require a more global strategic approach and a gradual intervention, over the short, medium and long terms.

The capacity development needs, at the institutional, organizational and individual level, have been clearly set out through the recently completed National Capacity Self Assessment exercise.

3.2.2. Increased investment in adaptive conservation and soil protection measures.

This adaptation programme is results-oriented and intends to make real impacts in the field. Accordingly, investments in conservation and resources protection measures are given a high priority. These hard and soft adaptation investments constitute the core costs of each of the three Objectives. By making these investments, the Government of Cape Verde reiterates its willingness to help the local populations in their adaptation efforts. In part, this is about replicating at the large scale the best practices observed locally. In part, this is about the government assuming responsibility for large investments that the local populations are unable to undertake.

3.2.3. Action research in order to improve the resistance of the population and the ecosystems

Participatory action-research is the best way to lead to concrete applications that satisfy the needs of local communities and that contribute to policies. The action research on adaptation places stakeholders from the affected local communities in contact with decision makers and researchers, in the framework of a common process of "learning by practice". It links local knowledge to science and to the validation of adaptation strategies. The links between researchers, responsible for policies, and communities, which are at the core of these activities, help to assure that the research promoted by the programme is based on the demands of resource users and is not driven by research institutions.

3.2.4. Information, education and communication campaigns for stakeholders on the risks due to the climate change and climate variability.

Activities related to information, education and communication (IEC) will complement and are built upon the capacity building and action-research strategies. The sharing and implementation of the knowledge that will be generated through the capacity building activities and action research is strategic for the sustainability and continuity of the programme.

Through these crosscutting measures, the programme will support the elaboration of didactic material (visual and in the national language) that targets the local population (including the highly vulnerable groups), the political authorities (including the local politicians) and researchers. The IEC programme will also support the communication and functioning, through the network, of activities at the national and at the international (regional) levels. It will partly be about facilitating the sharing of knowledge and supporting Cape Verde effective participation in international fora. Through these activities, the programme will try to support national stakeholders so that they become better organized in preparing the "response" to the climate change and in building a common position on certain strategic issues related to climate change management and its impacts in Cape Verde.

The links between the goals, the objectives and the cross-cutting strategic approaches are illustrated in Figure 6.

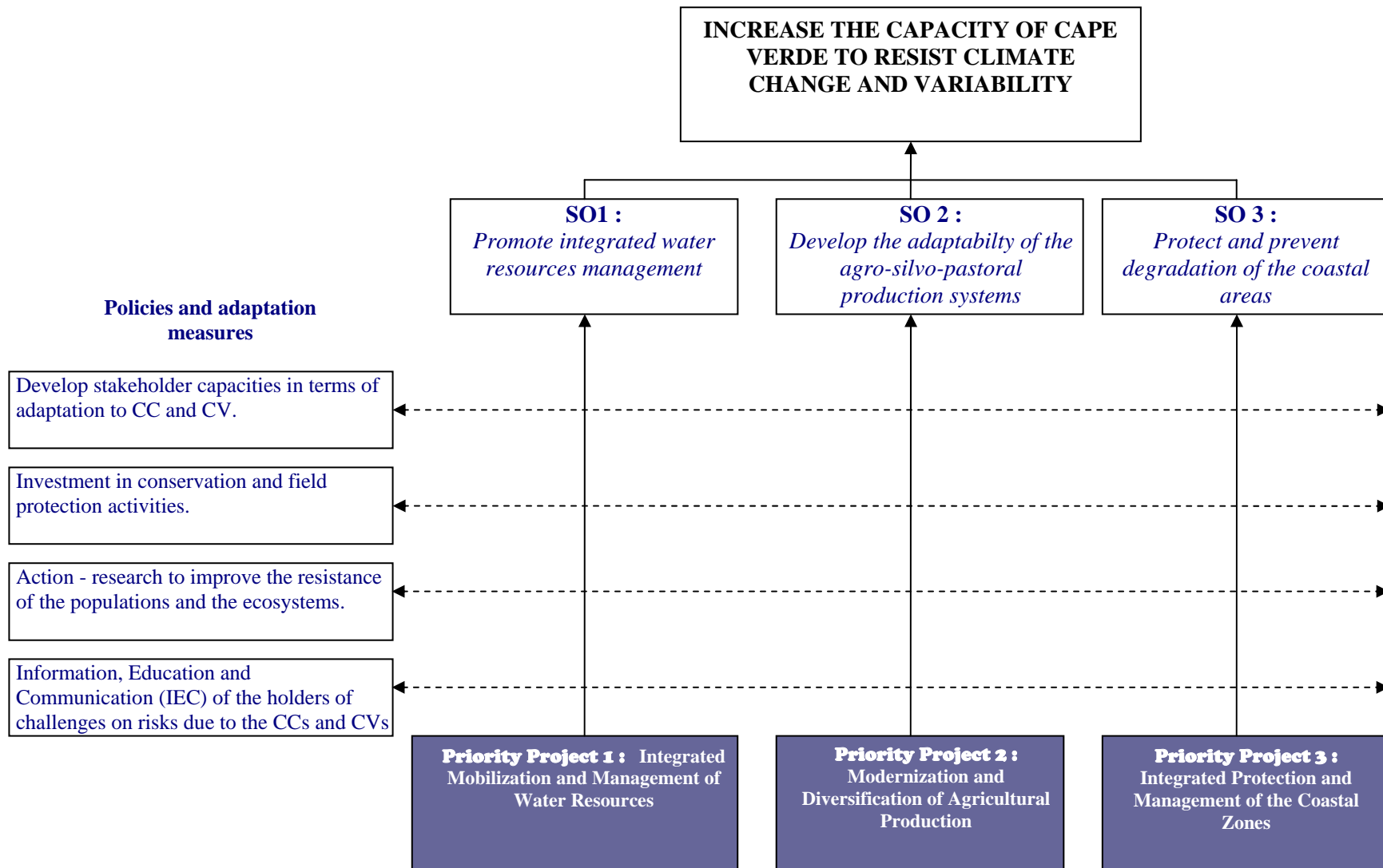


Figure 6: The Organizational Framework of Cape’s Verde National Adaptation Programme of Action

IV. CRITERIA FOR SELECTING PRIORITY ACTIVITIES

Following on from the analyses of the major socio-economic sectors, in relation to different climatic scenarios, and to the expected negative impacts of climate change, the first step was to propose a set of adaptation measures to these negative impacts.

Next, the proposed measures were analyzed in greater depth in order to determine whether they responded effectively to the most urgent and immediate adaptation necessities. As a result of this analysis, some measures were removed. Next, the five following criteria were used to determine priority actions:

1. Contribution to the resolution of the immediate and urgent problems related to climate change. This is considered the most fundamental criteria, in line with the least developed countries expert group (LEG) recommendations;
2. Capacity to contribute to poverty reduction. Again, in line with LEG guidelines, this is a most fundamental criteria;
3. The number of beneficiaries. This criterium was added by the Cape Verde NAPA team to the criteria proposed by the LEG. The Cape Verde NAPA stakeholders felt it important that the adaptation activities respond to the needs of a sizeable group of the community;
4. The synergies among the different instruments of environmental policy. In line with the LEG criteria, it was felt important that the proposed activities build synergies with other environmental actions, including actions to implement global environmental agreements in Cape Verde;
5. The overall cost of the action, and the anticipated benefit, in monetary terms if possible.

In the process to select priorities, the first two criteria were given additional weight, since they reflect, respectively, the extent to which the measure will address the immediate and urgent problems of climate change, and, the extent to which the measure will contribute to improving the lives of the poorer and more vulnerable target populations.

V. LIST OF PRIORITY ACTIVITIES

Based on the previously mentioned criteria, and through the participatory validation process, the following set of priority interventions were identified for the priority sectors:

Priority Measures
Construct infrastructures for collection, supply and storage of water and recharge of aquifers.
Reinforce actions to protect watersheds in order to improve food security.
Diversify income-generating activities in rural areas.
Modernize and diffuse localized irrigation technologies.
Invest strongly in environmentally sustainable production techniques.
Use varieties and species that are adaptable to changing climatic conditions.
Diversify activities and measures to support the populations that live off the exploitation of coastal resources.
Support diversification of alternative activities to artisanal fishing (e.g. training, equipment, micro-credit).
Continue the actions of preservation and management of protected areas.
Rehabilitate and/or construct infrastructures for protection of coastal zones.
Strengthen equipment and modernization of artisanal fishing;
Support implementation of initiatives to use renewable energies (solar and wind) in particular at the level of rural communities.
Modernize the network of climate and maritime monitoring stations.
Stimulate production and establishment of endemic plants.
Conserve and sustainably use medicinal species.
Promote research on species that are threatened and vulnerable to the climate change.

These priority interventions have been further developed into five project concepts. Three of these are included in Annex 3. The remaining two are to be circulated for financial support at a later date.

VI. NAPA PREPARATION PROCESS

The process to prepare the NAPA followed closely the LEG recommended methodology and focused on optimizing participation, in particular the participation of the groups to be affected by climate change.

On the basis of previous work, the multidisciplinary NAPA team first defined the priority sectors⁴. The adaptation needs were then identified through sectoral vulnerability and adaptation studies and discussed in workshops with partners. Next, vulnerability analyses were carried out in the priority socio-economic sectors, in relation to changes in the climatic parameters. This also led to an understanding of the expected negative impacts. Consequently, a set of measures to adapt to the likely negative impacts were proposed and discussed in detail in two regional workshops. These workshops involved actors and partners from all islands and most municipalities.

The remaining sectors⁵ will be dealt with through the Second National Communication on Climate Change, due to the fact that the vulnerability analysis will need to be carried out in greater detail.

6.1. Stakeholder organization and consultation

A participatory situational analysis was undertaken. The following activities were undertaken with concerned partners in order to determine the current situation of the partner in terms of vulnerability to climate change:

- Survey of the situation (in the different institutions), involving the different partners that deal with the identified issues, through the use of individual and semi-structured interviews;
- Analysis of data and legislation pertaining to the partner institutions;
- Compilation of data and information in order to elaborate a study on the partner's capacity;
- Organization of a national workshop with the participation of all institutions that deal with climate change issues. The workshop allowed participants to discuss the proposals and to define the guidelines for elaboration of the NAPA. In addition, the workshop enabled participants to formulate recommendations in line with the commitment and capacity of the different partners to the implementation of the NAPA.

6.2. Studies undertaken

Stakeholder assessment. The study permitted the identification of a set of government, non-government and private institutions that should contribute to the implementation of the NAPA project.

Survey on climate change. A survey was carried out to allow for a wider diffusion of the process and involvement of people from all social levels. The objective was to evaluate the degree of knowledge and vulnerability of the population to the adverse effects of climate change and to raise their awareness and interest in this issue. This also helped identify potential partners in the implementation of the NAPA project. The survey was undertaken in all 19 municipalities of the country, and included approximately 426 individuals, with at least 20 from each municipality.

Study on climate variability. The study aimed to characterize the climate of Cape Verde through the analysis of diverse climate parameters that directly influence the climatic system of the country. The inter-annual variability of climate parameters and their influences on the different socio-economic development sectors constituted one of the main objects of the study.

⁴ I.e. water, agro-silvo-pastoral resources, tourism and coastal zones, biodiversity, fisheries and energy.

⁵ I.e. health, transportation, industry, and to a certain extent, energy.

In addition, vulnerability assessments of key development sectors and surveys were conducted in local communities, municipalities and amongst civil society. These led to:

- An assessment of the adverse effects of CC on key sectors such as water resources, agriculture, biodiversity, coastal zones, tourism, energy, fishery, etc.
- An assessment of the vulnerability of socio-economic activities, of the means and conditions of living induced by CC, CV and of extreme meteorological phenomenon;
- A determination of the level of vulnerability of some islands, including S. Antão, Brava, Boavista, Maio, Sal, etc;
- A better understanding of the populations perception of climate change, across socio-professional groups, and;
- An assessment of the priority and urgent adaptation needs, with regards to available resources and intervention capability.

6.3. Priority setting

The Multi-Criteria Analysis (MCA) approach was used to set priorities amongst likely interventions. The MCA was used instead of cost-benefit analysis (CBA) and Cost-Efficiency Analysis (CEA) because:

- The quantification and evaluation of costs and/or benefits in monetary terms was considered very difficult;
- In the environment sector, several elements of analysis are often based on variables that are difficult to quantify but are equally important for the decision making process. Hence CBA and CEA would provide limited results;
- The MCA analysis permits collecting certain information and necessary data from the analysis of vulnerability/risks and respective impacts, carried out in the previous steps, and therefore saves time in the NAPA process;
- The MCA analysis allows for a combination of objective and subjective assessments. This process, led by qualified and experienced staff, was through the attribution of ratings to priority measures/options as a function of the defined criteria.

6.4. Problems encountered and lessons learned

Problems encountered

- Lack of instruments for modeling and developing of climate scenarios;
- Lack of a complete series of climate data (for certain parameters);
- The fragmented nature of the country does not favor an ample diffusion of actions at the partner's level;
- The time allowed for local consultations was insufficient and it did not allow the local consultants to travel to all islands for better data collection and diffusion of information on the NAPA process;
- Insufficient data relating to certain types of urgent and immediate activities (for example: protection walls, anti-salinization dams, among others);
- Difficult to estimate costs in certain projects where several partners participate.

Lessons learned

- The identification of participants and their level of contribution enabled the mobilization of key partners to the implementation of the NAPA process;
- The capacity building workshop for participants under the NAPA process was very useful in terms of understanding the process, the roles and responsibilities of the stakeholders at all stages of the NAPA;
- The consultative workshops, both at the central and at the local level, permitted a better participation of the civil society, the municipalities and the socio-professional groups in the process;
- The survey of the climate change situation at municipal level gave a pertinent indication of the participant's comprehension of the subject, but also of his/her vulnerability to climate change;

- The engagement of the Municipal Environment Departments in the NAPA process, from the beginning of the activities, facilitated a reinforcement of synergies between this programme and other environmental projects and programmes;
- The sectoral studies carried out served as the basis for identification of vulnerability related to climate change as well as the measures and adaptation options;
- The synergy among the three conventions (Biodiversity, Desertification and Climate Change).

6.5. Implementation

Many institutions were involved in the planning process and should be involved in the NAPA implementation. This includes Ministries, Municipalities, non-Governmental organizations, farmers associations, specialized international organizations, international financing organizations and representatives of multilateral and bilateral cooperation.

Monitoring and evaluation is an integral part of the programme. This consists of a system for the collection, treatment and analysis of information. This system will contribute to improved execution and functioning of the programme. Evaluations will be undertaken in accordance with established performance indicators and each NAPA phase will be the subject of lesson learning. The monitoring and evaluation modalities of the major programme donors will be used as a basis for this purpose.

VII. CONCLUSION

The present National Adaptation Programme of Action to Climate Change represents the will and policy of the Government of Cape Verde with respect to the climate change phenomena, in particular its impacts on key socio-economic sectors and on the country's vulnerability due to from its isolated nature.

This Programme results from a thorough, participatory process with all stakeholders which allowed the identification of priority adaptation measures and led to the elaboration of five urgent priority project profiles. Implementation of these adaptation projects will contribute to minimizing the negative effects of climate change on the most vulnerable people and on the most fragile ecosystems in Cape Verde. It is urgent to mobilize the necessary financial resources in order to implement these projects and respond to needs of poor people and to limit the impacts on key sectors - water, agro-silvo-pastoral and coastal zones/tourism.

The Government of Cape Verde, well aware of the fragility of the ecosystems and of the isolation and the vulnerability that characterize the country, has elaborated the instruments for implementation of its development strategy. The aim of this initiative is to mainstream environmental and climate change adaptation issues into the planning process and to promote sustainable development. Accordingly, this present Adaptation programme is to be implemented in connection with: the 2006-2011 Government Programme; the Growth and Poverty Reduction Strategy (DECRP); the Programme to Fight Poverty and; the second National Environment Action Plan (PANA II). These latter strategic documents define the axes of intervention in the areas of economy, environment, security and poverty reduction.

ANNEXES

- 1) References and Information Sources
- 2) The NAPA Team
- 3) The Priority Project Profiles

1. References and Information Sources

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The United Nations Institute on Training and Research, www.unitar.org

2. The NAPA Team and Consulted Stakeholders

Table 5. The NAPA Team

No	Name	Function/ Title
1	Adama Daou	UNDP/GEF Cape Verde
2	Adylson Sousa	Coord. NCSA Project/DGA
3	Alcides Varela	Director INDP Praia
4	Aline Rendall Monteiro	Biologist / INIDA
5	Angela Antunes	Assist. Project/INMG
6	Arlinda Neves	Agronomy Eng./ANMCV
7	Carlos Moniz	UNFCCC Focal Point/INMG
8	Clarimundo Gonçalves	Agronomy Eng./DGASP
9	Domingos Barros	UNCCD Focal Point
10	Emanuel Monteiro	Hydro-Geologist/INGRH
11	Emanuel Soares	Coord. Project NAPA/INMG
12	Ester Araújo de Brito	Presidente INMG
13	Eugénio de Barros	Agronomy Eng./DGASP
14	Francisco Correia	Agro-Meteorologist/INIDA
15	João Spencer	Agro-Meteorologist/INIDA
16	José Levy	UNDP GEF Cape Verde
17	José Pimenta Lima	Director of NAPA Project/INMG
18	Luisa Morais	Agronomy Eng. /INERF
19	Manuel Adilson Fragoso	Chemical Engineering/DGA
20	Nuno Ribeiro	Biologist/DGA
21	Orlando Monteiro	Dept. Statistics /INE
22	Sónia Araújo	CDB Focal Point
23	Suely Fragoso	Tourism/Cabetur
24	Tatiana Osório	Hydro-geologist/INGRH
25	Vital Tavares	Geographic /INGRH

Table 6. Consulted Stakeholders

Nº	NAMES	INSTITUTION	CONTACT
1	Adama Daou	PNUD- Santiago island	2609655
2	Adelina Pires Morais	MAA – Boavista island	2511131/9922864
3	Adylson Hoffer de Sousa	DGA-Praia- Santiago island	2618984/9920772
4	Aguinaldo David	Assoc. Garça Vermelha	2323692
5	Alberto Lima	PAM –Rib.Grande S. Antão island	2212736/9922652
6	Alcides Varela	INDP- Santiago island	2612865/2612502
7	Alcidia Rodrigues Lopes	Del.MAA S.Vicente island	2321199/9924576
8	Aline Rendall	INIDA- Santiago island	2711127/2711133
9	Angela Antunes Gomes	INMG – Sal island	2411658/9936395
10	Angela Borges	UNOTUR Sal island	2419021/9913623
11	Aniceto Tavares	ETMA S.Domingos- Santiago island	2681298/9973200
12	Antonio Barbosa	ISECMAR	232110
13	Antonio J. Morais Monteiro	PAM-RG S. Antão island	2212736/9922569
14	Antonio Pedro Mendes	AMIPAUL S. Antão island	2231050/9915982
15	Arlinda Neves	ANMCV – Praia- Santiago island	2624944
16	Carlos Dias	MAA- Maio island	2551348/2551346
17	Carlos Moniz	INMG-Sal island	2411276
18	Charles Ivon Rocha	DGP/MFAP- Santiago island	2624944
19	Clarimundo Gonçalves	DSA/DGASP- Santiago island	2648184/9937913

National Adaptation Programme of Action on Climate Change

20	Clemente Rodrigues	Del. M Educ.S.Vicente island	2321219/1320
21	Cristina Coutinho	DGASP- Santiago island	2647539/9918298
22	Domingos Barros	PF-DGASP-DSS- Santiago island	2647547
23	Edésio Cardoso	OASIS- Santiago island	2731038/2731040
24	Emanuel F. S. Soares	INMG – Sal island	2411276/1658
25	Emanuel Monteiro	Gab. Ministro- Santiago island	2610458
26	Ester Araújo de Brito	INMG – S.Vicente island	2324021/9914895
27	Fernando Frederico	ETMA – Maio island	2551395/9926185
28	Fernando M de Carvalho	ETMA – Picos- Santiago island	2721240/9914865
29	Francisco Correia	INMG - Praia- Santiago island	2617891/9937212
30	Gabriela O. Lopes	PAM S.Vicente island	2319883
31	Janaina Almeida		2321119
32	João Soares Gomes	ETMA Tarrafal Santiago island	2662724/9929956
33	João Spencer	INIDA- Santiago island	2711127/2711133
34	José A Andrade	DGOT- MDHOT	
35	José Mario Lopes Tavares	Guarda Costeira	2323242/9817545
36	José Pimenta Lima	INMG – Sal island	2141658
37	Judite Neves Santos	ETMA – Sal island	2413921/9965298
38	Liana Maria N.Delgado	PAM-Paúl S. Antão island	2232056/9964659
39	Luisa Morais	INERF/MAA- Santiago island	2647536/48
40	Luzia Mendes Oliveira	ETMA Sta Catarina	2654116/9925317
41	Manuel Adilson C. Fragoso	DGA Praia- Santiago island	2618984/9920858
42	Manuel Costa da Rosa	CITI-HABITAT Praia	2644008
43	Manuel de J. Morais Brito	As.Pes.Sto Antão island	2251112/9932255
44	Marcos Cruz	ADECO/CCIASB	2327033
45	Marcos Freitas Santos	CMP –S.Vicente island	2319818/9915825
46	Maria de Fatima Almeida	ETMA –S.Vicente island	2321507
47	Maria Helena Delgado	ETMA Praia- Santiago island	2619302
48	Orlando Delgado	PAM - CMPN	2228045/9914678
49	Orlando Monteiro Freitas	MAAA-Sto Antão island	2211275/9926652
50	Oscar Monteiro	INDP	2321370
51	Pedro Lopez Suarez	ONG-Boavista island	2511054/9927869
52	Renato Ramos Delgado	INDP-Sto Antão island	2251210/9978187
53	Sónia Indira Arújo	DGA – Praia- Santiago island	2618984/2611254
54	Vera Figueiredo	DGA- Santiago island	2618984/9927307
55	Virginia Cardoso	ADAD- Santiago island	2612650/2621731
56	Xisto Francisco S. Baptista	ETMA Boavista island	2511116

3. The Priority Project Profiles

PROJECT 1: MOBILIZATION AND INTEGRATED WATER RESOURCES MANAGEMENT

PROJECT JUSTIFICATION :

In the context of the studies on vulnerability and adaptation to the climatic change in Cape Verde, the water resources sector was identified as being the most vulnerable and, as a consequence, considered as one of most priorities in what concerns the sectors that must benefit of urgent and immediate measures of adaptation aiming at facing the negative impacts of climate alterations.

Effectively, Cape Verde is undergoing a considerable reduction of rainfall since the decade of the 70s in the past century. The annual average of precipitation is currently around 225 mm.

All rainfall projection scenarios up to 2020, made with an adjustment of percentages of plus or minus 10% and 20% starting in 1990, had indicated values that are inferior to the average during the period under consideration (373,3 mm). However, one can observe the existence of periods with annual values that are both superior and inferior to the normal.

Although the real causes of this phenomenon are yet to be determined, all scenarios in the sub-Saharan Africa sub-region indicate a reduction of the current average rainfall in the order of 20% and an increase of temperature in the order of 4°C up to 2100. Cape Verde being inserted in this sub-region will also be negatively affected by these alterations, which could become even more aggravated due to the insularity conditions.

Parallel to this reduction of rainfall, one observes the decrease of the length of the rainy season, the spatial-temporal variability is getting greater and greater and the torrential character of these confers negative impacts to a wide array of variables, namely:

- Poor agricultural production and the negative effects on food security;
- Over exploration of the water sources, drilled wells and wells, as well as the consequent degradation of water resources;
- The increase of rural exodus, exacerbating the inherent socio-economic problems;
- The generalized degradation of the living conditions of the populations and the increase of the poverty incidence index.

With exception of desalinized water, all water used in Cape Verde originates from underground sources which are fed by precipitations. However, the volume of surface water is in general considerably superior to the volume of underground waters. Effectively, some studies had indicated infiltration values that vary between 13% and 17%, against 20% and 51% for draining.

This way, the current problems facing the water resources sector impose the need for preventing that the increasing water scarcity constitutes a barrier to the desired socio-economic development. Besides the increasing search for forms of mobilizing new resources, such as seawater desalinization, it is necessary to identify all possible means to ration use of water, with the objective of getting maximum benefits for the population.

In spite of innumerable initiatives (plans/projects/programmes) implemented in the last decade in matters related to mobilization and capture of water resources, evidence shows that the access and supply of water to families still remains deficient, mainly in rural areas.

Thus, the mobilization and integrated management of water resources project is one of most priority, allowing operationalization of a set of immediate and urgent adaptation measures, identified during the NAPA process.

PROJECT DESCRIPTION

Global Objective

The global objective of this project is integrated within the context of the development objectives, as indicated in several key Cape Verde macro-policy instruments such as the Great Options of the Plan, the DECRP (Growth and Poverty Reduction Strategy Document), the Millennium Development Objectives (MDGs), and sectoral plans such as the 2004 -1014 National Environment Action Plan (PANA II) and the Agricultural Development Strategical Plan for the 2015 Horizon.

Effectively, the global objective of this project is to contribute to concretization of the development goals as indicated:

1. Contribute to the sustainable development on the basis of the integrated and participatory valorization of natural resources and on the local socio-economic sector.
2. Contribute to the improvement of living conditions of target populations, with improvement and amplification of the productive basis of agro-silvo-pastoral and maritime resources.

This global objective is, in a general way, valid for the other projects identified.

Specific Objective

The specific objectives of this project are reduction of the vulnerability of the water resources sector in face of the negative impacts of climate change and increased capacity for capture, provision and storage of surface waters.

Components, Results and Activities

COMPONENT 1 : *Reinforcement of stakeholder's capacities in matters of adaptation to the climate and variability changes under the systemic, organizational and individual point of view*

Result 1: *The precise status of water resources in Cape Verde is known and a favourable environment to Integrated Water Resources Management (GIRH) is created;*

Activities :

- Update of the water balance of Cape Verde;
- Elaboration of decentralized management plans on water production and distribution infra-structures;
- Training of stakeholders in GIRH techniques;
- Technical, material and organizational support from the institutions (central and municipal) and from the community base organizations for water resource management;
- Adoption of norms on water quality.

COMPONENT 2 : *Investment, conservation and field protection activities*

Result 2: *The volume of water mobilized for domestic, agriculture, industry and tourism use is significantly increased.*

Activities:

- Construction of small family size cisterns, communitarian cisterns and respective collection surfaces, reservoirs, capture, provision and water storage infrastructures, small dams or aqueducts, and promoting diffusion of localized and drip irrigation, particularly for fruit and vegetable crops;
- Promote installation of water harvest systems from clouds in high altitude zones;
- Construction of infrastructure for recharge of aquifers and retention in order to diminish the losses through underground draining in direction of the sea, such as underground filters;
- Replacement of the traditional water provision installations (open sky piping) for irrigation under closed conditions;
- Construction of residual water treatment infrastructure.

COMPONENT 3 : *Research-action for improvement of the resistance of populations and ecosystems.*

Result 3: *The knowledge on the state of the water resources and the traditional practices of adaptation to the variations of the water cycle are better known and new techniques associated to the GIRH better are adopted.*

Activities :

- To carry out a participatory survey on the relative knowledge of the state of the water resources in the aquifers sheets, supply sources and wells;
- To establish modelling maps and an information and monitoring system on water resources ;
- To carry out participatory research on the knowledge of traditional practices of adaptation to the variations of the water cycle;
- To experiment new techniques of adaptation of GIRH in the field, in the perspective of replication on a wider scale.

COMPONENT 4 : *Mobilization, Information, Sensitization of the stakeholders on the risks associated to climate change and variability*

Result 4 : *The stakeholders are aware of the risks associated to the variations of the water cycle and know the urgency measures to be taken in case of need.*

Activities :

- Preparation of a sensitization campaign for the populations on the eventual risks due to the modifications of the natural water cycle (storms, flooding, droughts, and others) and urgency measures to be taken in case of need;
- Support the participation of Cape Verde in the information exchange networks on issues of adaptation to the climate change and integrated water management ;
- Creation of a multiple stakeholder platform, according to directives of the Global Water Partnership (GWP).

Project Cost Estimates

COMPONENTS	%	COST ESTIMATES (\$)
1. Reinforcement of stakeholder's capacities in matters of adaptation to the climate and variability changes under the systemic, organizational and individual point of view	18%	2,462,000
2. Investment, conservation and field protection activities	57%	7,797,600
3. Research/action to improve resistance of the populations and ecosystems	14%	1,915,200
4. IEC of the stakeholders on the risks associated to the climate and variability changes	7%	957,600
5. Project management costs	4%	547,200
TOTAL*	100%	13,680,000

Potential donors identified

- Government of Cape Verde
- Global Environment Facility (GEF)
- United Nations System in Cape Verde
- Luxembourg Cooperation
- Austrian Cooperation
- Global Water Partnership

PROJECT 2: MODERNIZATION AND DIVERSIFICATION OF AGRICULTURAL PRODUCTION FOR FOOD SECURITY IMPROVEMENT

PROJECT JUSTIFICATION

Similarly to the Water Resources, the agricultural sector is characterized by a great vulnerability due to scarcity of natural resources (water and soil) and to the climatic conditions.

Extreme events, such as landslides and floods, signal the culminating points of vulnerability and climate change with great socio-economic impacts. The frequency of these events seems higher at the global level. The frequent torrential rains in Cape Verde provoke enormous losses of infrastructure, agricultural production, means of subsistence, large amounts of water into the sea and, at times, displaced families, or even loss of human lives.

Despite this vulnerability, agriculture, like other sectors in the agrarian area, is important for the country, allowing for subsistence of a large number of families, whose family life organization is highly associated to the land, although they are not able to achieve alimentary self-sufficiency.

According to RGA 2004 data, the total agricultural population was 222,254 people, making up for 47.35% of the population projected for 2004, which is an indication of the socio-economic weight of this sector, despite the vulnerability and fragility of the productive tissue. This importance is particularly accentuated for women since the female agricultural population varies between 45.9%, in the Paul region of the island of Santo Antão and 56.1%, in the Tarrafal region, island of Santiago.

As a sub-Saharan country, Cape Verde suffered very intensely the catastrophic effects of droughts⁶. This climatic particularity characterized by the extreme insufficiency and irregularity of precipitations, both temporally and spatially, associated to the scarcity of agricultural lands and its strong degradation through soil erosion, is the root cause of vulnerability and fragility of the agricultural sector.

Rain fed agriculture that represents the greater potential of agricultural production of the country is practiced in very steep hillsides of the humid and sub-humid regions of the watersheds, where water erosion is very important and human pressure becomes greater and greater. This phenomenon leads to an annual loss of arable land of considerable proportions and, as a consequence, to the increase of crop practice in marginal soils, using the association of maize and beans, a technique that further aggravates the soil erosion process.

Despite the important efforts already undertaken in the area of water and soils conservation, the necessity of protection against erosion, in particular water erosion, continues to be an imperative all over the humid and sub humid bioclimatic strata. On the other hand, particularly for the lower lying communities, the maintenance and improvement of the hydrologic balance becomes essential, mainly in what concerns reduction of surface draining.

Similarly, the establishment of integrated protection systems that allow for a rational and sustainable exploration of water, soil and vegetation resources on the part of local farmers/raisers, has a capital importance role in reduction of vulnerability and the negative effects of climate change, having in account its contribution for the recharge of aquifers, soil protection, increase of firewood production and fodder, use of marginal lands for rain fed crops through adoption of agro-forestry systems and increase of agricultural productivity.

On the other hand, besides the contribution for protection and restoration of the environment that is in a current process of accelerated degradation, the project will also contribute to improve the conditions of life of several poor rural families who depend almost exclusively on land productivity for their subsistence. It will also allow, at the medium term, to place a large potential of labor in the field and, in the long term, to generate some self-employment in the silvo-pastoral domain.

Thus, the relevance of implementation of this project is to gradually make agricultural activity less vulnerable to the negative impacts of climate change, improving simultaneously the level of income of the families and the perspective of alimentary security, in particular that of the most vulnerable families in the rural world, where the rates of poverty and extreme poverty are higher, mainly because their survival strategies depend to a great extent on agricultural activity.

PROJECT DESCRIPTION

Specific Objective

To adapt the agro-silvo-pastoral production systems to the climate change and variability, aiming at reducing food insecurity.

Duration

The estimated duration of the Project is five (5) years.

Components, Results and Activities

COMPONENT 1 : *Reinforcement of stakeholder's capacities in matters of adaptation to the climate and variability changes under the systemic, organizational and individual point of view*

⁶ In the past 265 years, there were 97 years of drought, that is, one year of drought on the average in each 3 years. From the droughts that were registered, 14 had a duration of 3 years or more (2002-2005 National Sustainable Food Security Strategy, cited in the 2004-2007 DECRP, pag. 22).

Result 1: *The stakeholders are better organized and trained in sustainable production techniques*

Activities:

- Training of stakeholders in sustainable production techniques (integrated production and protection, hydroponics, greenhouse production, among others);
- Technical, material and organizational support to the institutions and community base organizations, for the integrated and participatory management of watersheds;
- Rehabilitation and transformation of rainfall stations into climatological or agro-meteorological stations, in the zones more exposed to the climatic risks,
- Reclassification of the agro-ecological zones;

Result 2: *The policies and the planning instruments of the agro-silvo-pastoral sector take into account the vulnerability and the impacts associated to the climate changes.*

Activities:

- Revision of the policies and planning instruments of the agro-silvo-pastoral sector in order to take into account the vulnerability and impacts of climate change;
- Integration, socialization and validation of the results of activity 1.

COMPONENT 2 : *Investment, conservation and field protection activities*

Result 1 : *The production and productivity capacity of the agro-silvo-pastoral systems is increased and the vulnerable production bases (watersheds, forests, etc.) are protected.*

Activities:

- Intensification and diversification of production of vegetable and fruits crops through the introduction of more adapted crops;
- Support to the practice of vegetable and fruit crop production in pluvial zones, using drip irrigation;
- Construction of torrential correction levees, small walls for correction of ravines in the hillsides, terraces, and other mechanical WSC structures;
- Creation of a rotating fund (micro-credit) for financing income generating activities based essentially on the valuation and the rational management of natural resources;
- Promotion of the use of plant species (*Agave sisalana*), «Barnelo» (*Grewia villosa*), bamboo (*Bambusa vulgaris*) and caniço (*Arundo donax*) against soil erosion (formation of shrub sebes) and utilization of those species for valorization of national handicrafts.

COMPONENT 3 : *Research/action on the varieties adapted to the current climate conditions*

Result 1 : *New agro-silvo-pastoral techniques are experimented and innovative adaptation mechanisms are implemented.*

Activities:

- Experimentation of varieties that are best adapted to the climatic conditions;

- Promotion of knowledge and traditional practices of adaptation of agro-silvo-pastoral production systems to climate change;
- To perfect a methodology for elaboration of the crop calendar, as a function of weather forecasts;
-

COMPONENT 4 : *Mobilization, Information, Sensitization of the stakeholders on the risks associated to climate change and variability*

Result 1 : *Awareness of stakeholders and the adoption of positive attitudes towards the aggravating factors (forest fires, slopes, deforestation, etc.) of the vulnerability to the climate changes and variability.*

Activities:

- Collection of extreme meteorological and climatological data and its diffusion to the stakeholders and the rural communities, in order to guarantee the security of the production systems;
- Campaign of sensitization of stakeholders on the negative impacts of the climate change and the climatic variability on natural resources and human activities;
- Promotion of improved and adapted cultural techniques to the climate change;
- Vulgarization of technological packages on adapted varieties.

Project Cost Estimates

COMPONENTS	%	COST ESTIMATES
1. Reinforcement of stakeholder's capacities in matters of adaptation to the climate and variability changes under the systemic, organizational and individual point of view	15%	225,000
2. Investment, conservation and field protection activities	45%	675,000
3. Research/action to improve resistance of the ecosystems	20%	300,000
4. IEC of stakeholders and rural communities	10%	150,000
5. Project management costs	10%	150,000
TOTAL	100%	1,500,000

Potential donors identified

- Government of Cape Verde
- Global Environment Facility (GEF) - (OP-15 Sustainable Management Terra)
- United Nations System in Cape Verde
- European Union
- African Development Bank (ADB)
- International Fund for Agricultural Development (FIDA)
- Global Mechanism CCD.

PROJECT 3: INTEGRATED PROTECTION AND MANAGEMENT OF COASTAL ZONES

PROJECT JUSTIFICATION

The insular character of Cape Verde (small islands) already constitutes by itself a potential vulnerability in relation to an eventual rise of the sea. It is estimated that 80% of the population in the archipelago, today, is concentrated in the coastal zones. Comparing the relief of the islands and the level of the sea, the flat islands such as Sal, Boavista and Maio are considered the most vulnerable.

A sensible variation of the level of the sea may constitute a danger for Cape Verde's economic sector, particularly the tourism sector, since tourist infrastructures (most of them hotels, airports, fishing zones, and others) are located along the coastal zones. Sal Island, due to the large tourism investments carried out there, constitutes one of the most vulnerable zones of the country.

On the other hand, Cape Verde's coastal zones are negatively affected by the large population density in certain centres, by tourist activity, by the occasional discharge of hydro-carbons, by the abusive and uncontrolled extraction of inert materials (sands and rocks) and by saline intrusion, besides the orography of the maritime edges that, in most cases, is very scarped and very vulnerable to the effects of the tides.

Extreme events such as floods mark the culminating points of vulnerability to the climate changes, with high socio-economic impacts. In Cape Verde, the frequent torrential rains have provoked large losses of infrastructure, agricultural production, enormous amounts of water into the sea, and at times, they originate displacement of families or loss of human lives.

These problems require an urgent action since they may cause loss of maritime habitats, having as main consequences the disappearance of species, the decrease of national potentialities in what concerns leisure places, the fast advance of seawaters, thus reducing the interface edge between the sea and the land, the increase of soil salinity and the reduction of its production capacity, with serious negative repercussions for the agricultural activities developed along the coastal zones.

The climate changes, namely those related to the rise of the level of the sea, accentuate the pressures on the coastal zones, thus leading to the aggravation of the degradation of ecosystems, infrastructure and economic activities. They can also aggravate the amplitude of the current aggressions, provoking flooding of the low altitude zones, displacement of populations, contamination of potable water sources and threatening the means of subsistence of the coastal populations, limiting the development options of the countries where the coastal zones contribute considerably for the economy.

On the other hand, the regional project "*Adaptation to Climate Change: Responding to shoreline Change and its human dimensions in West Africa, through integrated coastal area management (ACCC)*", that includes Cape Verde and has as objective the reinforcement of the capacities of adaptation to the climate change, is being implemented and constitutes the basis of this programme.

As a complement to the ACCC regional capacity reinforcement project, this project insists on field activities, in order to strengthen the resistance of the coastal zones to variability and climate change.

PROJECT DESCRIPTION

Specific Objective

The specific objective of this project is to increase the capacity of resistance of coastal zones to climate change, through integrated management of the coastal resources, in order to invert the trend of established degradation.

Duration

The estimated duration of the Project is five (5) years.

Components, Results and Activities

COMPONENT 1 : Reinforcement of stakeholder's capacities in matters of adaptation to the climate and variability changes under the systemic, organizational and individual point of view

Result 1 : *The central governmental, decentralized and communitarian structures are equipped to contribute significantly for management of the coastal regions.*

Activities:

- Revision of the national regulatory framework for integration of the protection needs of the coastal zones in terms of adaptation to climate variability and climate change;
- Harmonization and integration of management activities in the coastal zones within the existing regulatory frameworks;
- Qualification of the decentralized and communitarian governmental structures, in order to allow them to implement the laws and the programs that facilitate adaptation to climate change in coastal regions;
- Elaboration of a contingency plan for the high risk coastal zones;

COMPONENT 2 : Investment, conservation and field protection activities

Result 2 : *The resistance capacity of the coastal zones is increased and the pressure on coastal resources is decreased.*

Activities:

- Installation and rehabilitation of coastal protection systems (flexible and rigid);
- Anti-erosive fight along the coasts through construction of channels, reforestation, fight against deforestation and exploration of inert materials, among others;
- Diversification and rationing of income generating activities for explorers of inert materials, through the creation of a micro-credit fund;
- Installation of weather radar for detection and monitoring of significant meteorological phenomena.

COMPONENT 3 : Research/action in matters related to utilization and exploration of inert materials in coastal zones

Result 3 : *Alternatives to utilization of coastal resources (inerts) are utilized in construction of infrastructure*

Activities:

- Experimentation of materials and alternative means of construction, in order to reduce pressures over the coastal resources;
- Diffusion of technological packages.

COMPONENT 4 : Mobilization, Information, Sensitization

Result 4: *An early warning system is created and the populations under risk are aware of their status and prepared to manage eventual calamities.*

Activities:

- Creation of an early warning system linked to the sub-regional and global network;
- Elaboration and diffusion of project informative and promotional documents;
- Creation of a multi-partner platform according to the GWP orientations;
- Preparation of a sensitization campaign for the coastal populations on the eventual risks due to climate changes and variability and the urgency measures to take in case of need;
- Cooperation and support to the participation of Cape Verde in the information networks on issues related to adaptation to climate changes and coastal management.

Project Cost Estimates

COMPONENTS	%	COST ESTIMATES
1. Reinforcement of stakeholder's capacities in matters of adaptation to the climate and variability changes under the systemic, organizational and individual point of view	20%	300,000
2. Investment, conservation and field protection activities	45%	675,000
3. Research/action in matters related to utilization and exploration of inert materials in costal zones	15%	225,000
4. IEM stakeholders on the risks inherent to the MCs and VCs	15%	150,000
5. Project management costs	10%	150,000
TOTAL	100%	1,500,000

Potential donors identified

- Government of Cape Verde
- Global Environment Facility (GEF)
- United Nations System in Cape Verde
- European Union
- African Development Bank (ADB)
- Global Mechanism CCD