

REPUBLIC OF GUINEA-BISSAU

National Programme of Action of Adaptation to Climate Changes



Ministry of Natural Resources and Environment
Government of Guinea-Bissau



December 2006

NAPA GUINEA-BISSAU

PREFACE

Climate changes constitute nowadays the greatest threat against life on earth and they are intimately related to the existence of poverty. Their impact varies according to different geographical zones. The least developed countries (LDCs), among which Guinea-Bissau, are the most affected ones due to their geo-climatic conditions, high reliance on natural resources and their limited capacity to adapt themselves to the negative impact of those changes.

Like many regions of the planet, and West Africa in particular, the country has witnessed in the last years a significant disruption in its rainfall and hydrometric patterns. Rainfall shortfall, coastal erosion and salt invasion area have as their main consequences an accentuated aridity of soils, a significant reduction in major humid zones and the disappearance of some rivers and lakes. Torrential rains and extreme temperatures are also climate phenomena that prove and demonstrate our country's vulnerability.

Guinea-Bissau is thus exposed to the negative effects of climate changes in almost all productive sectors of national life, particularly as regards its population and natural ecosystems. Among the foreseen consequences, we single out a fall in agricultural, forest and grazing production, loss of human lives arising from malnutrition and food insecurity, risk of endemic disease such as diarrhoea, cholera, typhoid fever, tuberculosis, etc.

In such a context, the preparation and finalisation of the National Programme of Action of Adaptation to Negative Effects of Climate Changes (NAPA), financed by the Global Environment Facility (GEF), under the country's joining of the Framework Convention on Climate Changes and the Kyoto Protocol, aimed at assessing the country's vulnerability to the above-mentioned phenomena and proposing steps and priority activities aiming at reducing and/or mitigating the negative effects of climate changes and implementing early warning and forecasting measures enabling a response to future catastrophes.

PANA preparation had as its focus the integration of the environmental dimension into sector strategies of the fight against poverty and national development. This exercise will lead to the identifying of the agrarian, water supply, health and coastal area sectors as the priority ones in the adoption of immediate adaptation steps and actions, representing an overall financial effort estimated at around US\$ 6.300,000, for whose materialisation Guinea-Bissau counts on the international community's invaluable support and solidarity.

Bissau 18 July 2007.

The Minister of Natural Resources and Environment



Soares S. C. B. B.

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ABBREVIATIONS AND ACRONYMS

| | |
|-----------------|--|
| AIA | Environmental Impact Evaluation |
| AIDS | Acquired Immunodeficiency Syndrome |
| AMA | Multilateral Agreements on the Environment |
| CIMA | Water Inter-ministerial Committee |
| CN NAPA | NAPA National Committee |
| CAN | National Water Committee |
| CNI | Initial National Communication on Climatic Changes |
| CO ₂ | Carbon Dioxide |
| CPDA | Letter on Agrarian Development Policy |
| CR NAPA | NAPA Regional Committee |
| CTA | Water Technical Committee |
| CTA | Centre of Agrarian Technical Assistance |
| DENARP | Poverty Reduction Strategy Paper |
| DGA | Directorate-general of Environment |
| DGADR | Directorate-general of Agriculture and Rural Development |
| DGFC | Directorate-general of Forests and Hunting |
| DGRH | Directorate-general of Human Resources |
| DP | Development Plan |
| EPAN-DB | Strategy and National Plan of Action for Biological Diversity |
| EEZ | Exclusive Economic Zone |
| EU | European Union |
| G.B. | Guinea-Bissau |
| GEF | Global Environment Fund |
| GGOB | Government of Guinea-Bissau |
| HDI | Human Development Index |
| HIV | Human Immunodeficiency Virus |
| IA/Portugal | Environment Institute |
| IBAP | Institute of Biodiversity and Protected Areas |
| IFAD | International Fund on Agricultural Development |
| INA | National Environment Institute |
| IUCN | International Union for Conservation of Nature |
| LDCs | Least Developed Countries |
| LVIA | Italian Non-Governmental Organization |
| MADR | Ministry of Agriculture and Rural Development |
| ME | Ministry of Economy |
| MF | Ministry of Finance |
| MINSAP | Ministry of Public Health |
| MRN | Ministry of Natural Resources |
| NAPA | National Programme of Action for Adaptation to Climate Changes |
| NGO | Non-Governmental Organisation |
| OMVG | Gambia River Basin Development Organisation |
| PAC | Common Agricultural Policy |
| PGBZCGB | Biodiversity and Coast Management Project |
| PIB | Gross Domestic Product |
| PNGA | Environmental Management National Plan |
| RT | Registered Tonnage |
| 2SN | Second National Communication |
| SPV | Vegetation Protection Service |
| WAEMU | West African Economic and Monetary Union |
| WB | World Bank |

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EXECUTIVE SUMMARY

Participatory evaluations on vulnerability and adaptation carried out under NAPA on the basis of various studies and sector consultations already made, revealed that the sectors that ensure the subsistence of the overwhelming majority of Guinean households and constitute the country's economic basis are the most vulnerable ones to climate change: the agrarian sector (agriculture, forests and livestock), the sector of water resources and the fishing sector. Anthropogenic pressure on natural resources, with increasingly onerous and worrying impacts, aggravates this vulnerability.

It is obvious that climate changes and variability in weather patterns may seriously affect the economic growth of countries with scarce resources and hence exacerbate poverty and social inequity.

In Guinea-Bissau the impact of those changes were already being felt in the economy for some time, especially due to a diminishing rainfall and the gradual rise in temperature. In terms of water resources, this can be seen in aquifers that have decreasing quantities of water and are more easily flooded by salt water, ground waters increasingly deeper and dried-up lakes; concerning the agrarian sector, production of Guinean staple food (rice), has diminished markedly, also due to the salinity and acidity of hydromorphous soils and the flooding of rice fields. Air temperature is higher as a result of a considerable rise in the sea level and, consequently, high tides increase in frequency and are more powerful; the dry season lasts longer, especially in the hinterland (eastern regions); and the surface belonging to humid zones has decreased.

Guinea-Bissau is one of the poorest countries in the world and it lack means to tackle problems arising from climate changes. Thus this programme aims at defining priority actions to be implemented with assistance from multilateral and bilateral partners and/or domestic partners with a view to meeting their requirements and concerns regarding adaptation to the nefarious effects of those changes.

A number of priority strategic actions were defined, through a widely participatory exercise, to deal with concerns felt by the most vulnerable groups relative to climate changes. Those actions aim essentially at enhancing the level of rural populations' food security so as to reinforce their adaptation capabilities, reduce pressure on forest and fishing resources and improve access to potable water for human consumption and livestock, because climate changes exert a negative influence on the quantity and quality of water resources through a reduction in rainfall. 14 projects were chosen in order to achieve these strategic objectives namely: (i) Diversification of Food Production; (ii) Improvement in the Supply of Potable Water in Rural Areas; (iii) Reinforcement of Preventive Capacity and Protection of Mangrove Rice Fields against High Tides; (iv) Observatory for Mangrove Monitoring and Evaluation; (v) Follow up of Erosion on Coastal Zones; (vi) Evaluation of Climate Changes Impact in Productive Sectors; (vii) Promotion of Small scale Irrigation on Embankments of Geba and Corubal rivers; (viii) Prevention of Natural Catastrophes (ix) Protection, Conservation and Enhancement of Fishing and Coastal Resources; (x) Integrated System of Information on Food

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Security (SISA); (xi) Environmental Education and Communication on the coastal zone; (xii) Rehabilitation of Small Perimeters of Mangrove Soils for Rice- Growing in Tombali, Quinara, Bafatá and Oio; (xiii) Support to Production of Short-Cycle Animals; (xiv) Reforesting of Degraded Zones.

The criteria adopted for the selection and sorting of the above-mentioned options are as follows: (1) level of significance of impacts; (2) contribution for poverty relief; (3) synergy with multilateral agreements on the environment (AMA); (4) costs; (5) gender; (6) number of beneficiaries.

This programme does not constitute an isolated initiative but it is rather integrated in a set of sector-wide development programmes as well as in the decision processes and national planning.

1. BACKGROUND

It is recognized by science and the community of nations that climate changes that occur in our planet constitute a threat to life and mankind. There is a strong probability that those changes will have dramatic consequences on least developed countries (LDCs), particularly concerning losses of human lives and negative effects on the economy and investment. The starting assumption is that LDCs' vulnerability may be dictated by the following factors:

- Their geographical situation and climate conditions
- The extreme dependency of their populations on natural resources
- Their backwardness and economic frailty
- Their limited capacity to adapt to negative climate developments.

Climate changes and variability in weather patterns may affect the rate of economic growth, exacerbate poverty and social inequalities, and jeopardise chances of success of development policies meant to fight poverty.

As an unequivocal way to address this situation, the Conference of Parties to the United Nations Framework Convention on Climate Changes approved in 2001 the preparation of National Programmes of Action for Adaptation to Climate Changes (NAPA) for LDCs. NAPA's role consists in proposing immediate and urgent activities that are to be implemented in order to raise capacity of adaptation, and as result, of resistance to current and future negative effects of climate changes and extreme meteorological phenomena. Guidelines on NAPA's preparation process were defined in this Conference (Directive 28/C.P.7). This Directive asserts that the approach behind NAPA's preparation will be underpinned on (i) complementary aspects based on existing national development plans and programmes with a view to advancing broader objectives aimed at poverty reduction and sustainable development, and (ii) search for synergies between NAPA and Multilateral Agreements on the Environment focusing on adaptation and capacity building. The present NAPA was prepared under the framework towards the enactment of this Directive. The aim is to have NAPA not as an isolated occasional action but rather as part of a set of development sector programmes and an integral part of decision-making and planning processes at the national level. It constitutes a first stage of Guinea-Bissau efforts towards the implementation of initiatives geared at the implementation of initiatives seeking adaptation to long term climate changes and variability in weather patterns.

Starting from the reality that Guinea-Bissau lacks sufficient means to fight problems arising from climate changes, NAPA should allow Guinea-Bissau to define and implement priority actions hereby identified, so as to meet its needs and deal with its concerns in the field of adaptation to the effects of those changes.

2. INTRODUCTION AND PARAMETERS

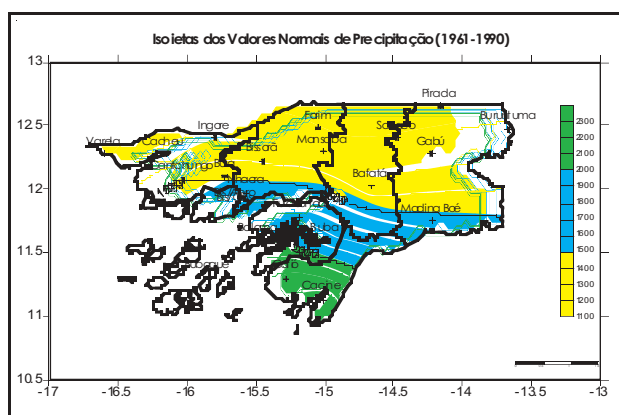
The present NAPA was prepared as per Directive 28/C.P.7 following the 1st Guinea-Bissau National Communication. It has to be recalled that the said communication argued that Guinea-Bissau's vulnerability in general, and in its coastal zone in particular, results from:

(1) the own nature of its geological and geomorphologic formations, and the littoral's dynamics; (2) the concentration in this zone of its main biodiversity resources, which therefore implies a strong demographic pressure on those resources, thus inducing the existence of factors of climate change. Coast rim's formations are essentially of a sedimentary nature, with a alluvial deposits of low altitude and with recent sedimentary deposits (quaternary age) as it is the case of the whole delta area of the Guinean coast and the Bijagós archipelago, whilst in the interior the geological and geomorphologic formations are older (primary and secondary ages). Two thirds of Guinean territory have an altitude inferior to 50 meters and most of this surface is situated in coastal areas. This characteristic favours coastal erosion, which worsens as temperature rises, accompanied by a resulting rise of average sea level.

Guinea-Bissau climate framework is strongly marked by an extreme fluctuation of rainfall levels, irregularity in rainfall patterns, longer dry season in some regions of the country, increase of yearly average temperatures (around 1 ° C), and, concurrently, of average sea level. Projections made by the Meteorology Office for the 2100 time horizon point to a decrease in rainfall hovering around 11.7 %, a rise in temperature of 2 % and a rise in the average sea level of 50 cm. (source: 1st National Communication on Climate Changes, 2004).

The figure below illustrates the evolution of rainfall patterns over time.

Figure n.º 1 : Superposing of isohietes of normal rainfall figures.



Participatory evaluations of vulnerability and adaptation carried out under NAPA preparation and based on various sector studies-diagnoses, revealed that the sectors that ensure means of subsistence to the overwhelming majority of Guineans and that constitute the basis of the country's economy, may be the ones that are most affected by climate changes and the

variability in weather patterns, namely: the agrarian sector (agriculture, forests and livestock), water resources, fisheries and public health.

This finding, supported by technical data provided in reports on sector studies, PRSP and others (cf. bibliography), arises from the fact that (i) the economy is largely dependent on agriculture, whose activity relies on rainfall intensity and regularity, and where cashew is the predominant crop, contributing with 62.6% for the GDP in 2004, against a share of only 12.2% for industry and 25.2% for services in the same year; (ii) a large part of population is concentrated on the coastal zone (80%) and depends vitally on the direct exploration of natural resources for its survival, (iii) infrastructure being highly concentrated on coastal areas, (iv) difficult economic and social conditions, characterised by extreme poverty and high unemployment rate, (v) very fragile soils, exposed to rain-driven and coastal erosion (vi) expansion of agricultural production associated to forest felling and slash-and-burn practices (itinerant agriculture), (vii) bad soil occupancy, due to a lack of agricultural zoning, (viii) an accelerated destruction of forests, estimated at 30,000-60,000 ha/year, with negative effects on current sequestration capacity estimated at 11,288,401 atmospheric CO₂, (ix) a relatively high rate of population growth (2.05% nationwide, and 4% in the capital, Bissau), (x) water-related problems, (xi) outdated and/or ill applied legislation, or even not applied legislation, (xii) weak or non existent intervention capacity on the part of institutions, (xiii) absence of protection rules and norms against climate risks linked to the construction of infrastructure, (xiv) the very precarious nature of traditional housing (made of mud and covered with straw).

The country has survived, at a painful cost for its populations, to cycles of chronic crises, characterized by a worsening of access to water for agricultural purposes, human and animal consumption; a marked fall in agricultural production, staple food items (rice in particular); a rise in costs of some foodstuff, particularly in urban and semi-urban centres, a deterioration in prices of cashew and cotton and a increase in food insecurity.

Potential impacts of this evolution, especially due to decreasing levels of rainfall and a rise in average temperatures, are already empirically noticeable in many areas. Here are some examples:

In terms of water resources, we see aquifers with less water and more easily penetrated by salt water in coastal zones, increasingly deeper ground waters and dried-up lakes; in the agrarian sector, the production of populations' main staple food (rice) had markedly decreased, due also to salinity and acidification of hydromorphous soils, destruction of protective dykes, flooding of rice fields, abandonment of degraded land, erosion and others;

Greater pressure on uplands, with the consequent deforesting arising from upland agriculture and timber exploration; higher air temperatures), higher average sea levels, resulting in more frequent and impetuous high tides; narrower river beds due to silting; longer dry season, particularly in countryside regions (eastern part of the country), leading to the displacement of whole villages; longer cattle transhumance involving a larger number of animals (especially cattle and goats); smaller humid zones surfaces; existence of a greater number of areas of ecological reduction of some aquatic species, fish in particular that are

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changed/affected or even destroyed; increasing trends of HIV/AIDS and hepatitis were added to traditionally endemic diseases (malaria and tuberculosis).

It is our belief that both actual and potential impacts of foreseen climate changes may affect adversely the country's development efforts made along many decades, especially as regards the fight against poverty towards a sustainable development.

Aware of the urgent need to prepare the country to tackle the threats and challenges that climate changes represent to mankind and life on earth, the government decided, as a major goal, to commit itself to the preparation of a NAPA for Guinea-Bissau. It is a document axed on the country's short-medium term development objectives, which concur for the attainment of adaptation objectives, and thus raise their effectiveness.

It is under such a perspective that priority actions were selected bearing in mind available adaptation options to meet this new challenge. Meanwhile, NAPA implementation will call for a great deal of solidarity from the international community taking into account that Guinea-Bissau is a poor country that has a weak economy and, accordingly, very limited financial resources and know how, NAPA implementation will require a great deal of solidarity from the international community.

GEOGRAPHICAL SITUATION

3. COUNTRY'S BROAD CHARACTERIZATION

3.1- GEOGRAPHICAL SITUATION

Guinea-Bissau is situated on the West African coast (latitude 10° 59' N, between 13° 38' and 16° 43' W meridians). It has a surface of 36,125 km², maximum latitude of 193 km and a maximum longitude of 330 km. The country has common borders with Senegal to the north and Guinea-Conakry to the south and east, and has the Atlantic Ocean to the west. Its territory is divided into a continental zone and an insular one, the latter being constituted of a contiguous chain of islands - Jeta, Pecixe, Areias, Caiar, Como e Melo and the Bijagós archipelago, made up of 88 islands and islets of which only 21 are inhabited.

3.2 METEOROLOGIC AND CLIMATE PROFILE

There are two climate regions: the sub-Guinean humid tropical region and the Sudanese tropical one. The first one coincides with the coastal zone and is characterised by intense rains (1,500-2,500 mm/year), average temperature variations and heavy air humidity throughout the year. The second region (Sudanese type), covering the country's eastern half, is characterised by weak rainfall (1,000-1,500 mm/year), high temperature variations, heavy air humidity throughout the rainy season and light humidity over the dry season.

Average yearly temperature nationwide in Guinea-Bissau is 26.8° C and the low temperature variations (3-4 °C). High temperatures are recorded in March-May (hot season), when maximum temperatures reach 32-39 °C and coolest temperatures stand at 20-24 °C. In the coolest time period of the year (December-February) top temperatures reach 25-30 °C and minimum ones vary between 16° and 20 °C, whilst average relative humidity hovers around 70 %.

Figure n.º 2 Distribution of minimum temperatures (°C), 1950-1994

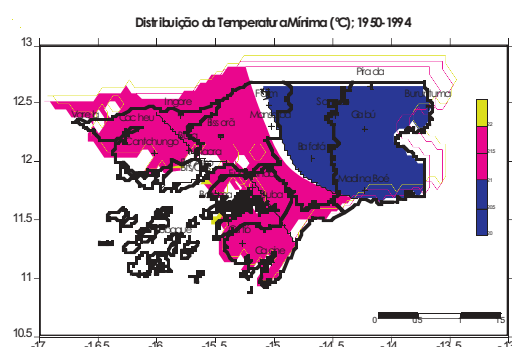
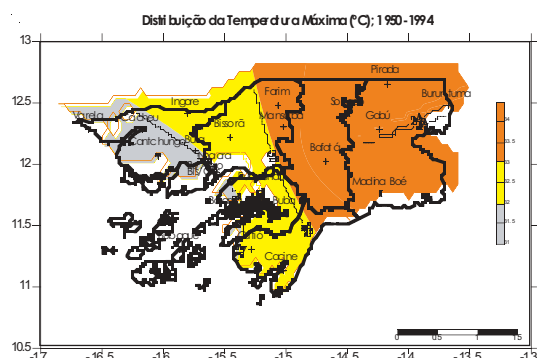


Figure n.º 3 Distribution of maximum temperatures (°C), 1950-1994



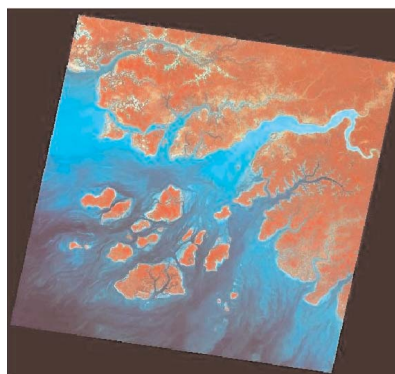
Sunshine varies on average 8 hours per day. July-September are usually the months of the year with fewer days of sunshine, since it is the time period with greater and more marked nebulosity. Sunshine does not constitute a constraining factor on agricultural production.

Winds that predominate in the cooler parts of the year blow from the N and E quadrant, oscillating from the N to NE. the predominance of winds in the NW and WSW quadrants is more marked during the first half of February. During the hot season, winds come mostly from the N to W and S to W quadrants, with persistence on the WNW, W, SW and SSW directions. Over the rainy season (monsoon), winds predominate on S to W, SSW, the time of the year where winds blow at their maximum speed. Concerning evaporation/ transpiration, potential figures (ETP), are high in the dry season, with variation between 2.7 and 5.9 mm/day, due to the frequency of dry and hot winds, with predominance on N and NE quadrants, coinciding with the Harmattan period.

3.3 GEOMORPHOLOGY

Low altitude predominates throughout the country. The highest spot does not go beyond 300 m (Colinas de Boé, in the country's south-eastern extreme). The geomorphology is marked by a littoral of wide prairies that sprawl to the countryside where low altitude uplands start to appear (30-40 m), on a gradual basis, up to the Fouta Djallon mountain chain. The coast is sliced recortada from north to south (see picture below) where sedimentary and recent formations predominate.

Figure 4:- Spot Image of the Guinea-Bissau Coastal Zone(Source: J. Biai, 2005)

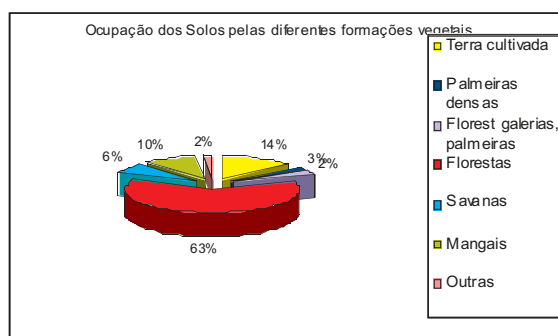


The sedimentary cover on the sandy littoral is not consolidated, in contrast to the mangrove type with recent deposits from the quaternary age. The escarpment-type littoral is rare, but there is nonetheless a coast marked by steep slopes in well defined segments in the country's northernmost (Varela) and in some islands in the Bijagós archipelago (Bubaque, João Vieira, Meio, Carache and Unhocomo).

3.4 SOILS AND HYDROGRAPHIC BASINS

Around two million hectares may have an agricultural, grazing pastoral or forest vocation. If we exclude litho soils (22%), upland soils have an iron content (33% of overall surfaces). Hydromorphous soils (40% of the territory) comprise sweet-water bas-fonds (14%) and sea alluviums (26%). Phosphorus shortages are widespread. See below a graphical representation of soil occupancy in Guinea-Bissau:

Figure n.º 5 – Soil occupancy in different vegetation formations



Hydrographical basins, ie., a set of land where rain waters flow into a large waterway, are part of important coastal and continental ecosystems in Guinea-Bissau. The most important hydrographic basins are those from Farim River (Surface em km²), Geba (2,225 km²) and Corubal (22.000 km²). In the sub-regional context, Guinea-Bissau is part of the Organisation for the Development of the Gambia River Basin (OMVG), possessing less than 1% of the said river's basin.

3.5 FAUNA AND FLORA

Sub-humid forests, natural palm tree plantations, open forests, bushy savannahs and mangroves constitute the main formations of vegetation cover in Guinea-Bissau. The literature consulted gives account of the existence of 1,186 species all over the country, grouped into about 160 families, of which around 12 species are endemic ones.

palm



Figure 5:
**Sub-humid forest,
dry savannah
and natural
tree plantation**



The fauna is rich and diversified consisting of 374 species of birds grouped into around 31 families, of which about 30 species are made up of gulls, seagulls and pewit-gulls. The Bijagós archipelago is considered as a humid zone of international importance because it shelters more than one (1) % of the world population of birds. Estimates point to the existence in Guinea-Bissau of 11 species of primates, 21 species of carnivorous, 19 species of ungulates, 8 species of rodents, 10 species of chiropters, 85 species of reptiles and 31 species of amphibious animals.

Estuaries, large mangrove surfaces, low-depth areas and adequate temperatures are the main features of Guinea-Bissau's coastal area, which shelters important fishing and non-fishing fauna resources of economic interest.

The existing flora and fauna diversity is currently threatened, being even on a downward trend in coastal areas. In fact, the vegetation cover represents not only a resource but also a biotope that shelters various animal organisms (from large- to small-sized fauna, to micro-organisms that take part in nature's food chain and in bio-geo-chemical processes that occur in forest ecosystems) and that are at the heart of complex ecological processes. The degradation of forest ecosystems is a present problem in Guinea-Bissau, for it represents not only a loss of biomass but also the fragmentation of habitats, thus interfering negatively in the wild fauna's migratory process.

3. 6. COASTAL EROSION

The low altitude that predominates in Guinea-Bissau, particularly in coastal areas where coasts are much lower than the average sea level, makes the country quite vulnerable to sea erosion. Damage from coastal erosion is particularly visible on the north-western coast, namely Varela beach where a tourist undertaking made in the 1980s became flooded in 2000. Equally, according to estimations, between 60% and 80% of soils with high iron con-

tent as well as hydromorphic ones are exposed to: (i) erosion and compacting, with a rapid loss of fertility and decrease of the replenishment rate of shallow aquifers "; (ii) salinity due to existing conditions on the territory's waterways and decreases in rainfall. Effects are particularly devastating in sandy littorals, whose sedimentary cover is little consolidated causes an intensive felling of palm trees and other forest species lined up along the coast; important quantities of sand on the beach and dunes are affected every year thus laying fossil layers bare and exposed to the phenomenon.

Figure n.º 6:Coast erosion in Guinea-Bissau northwest (Varela beach)



Photo by Alexandre Cabral, 2006

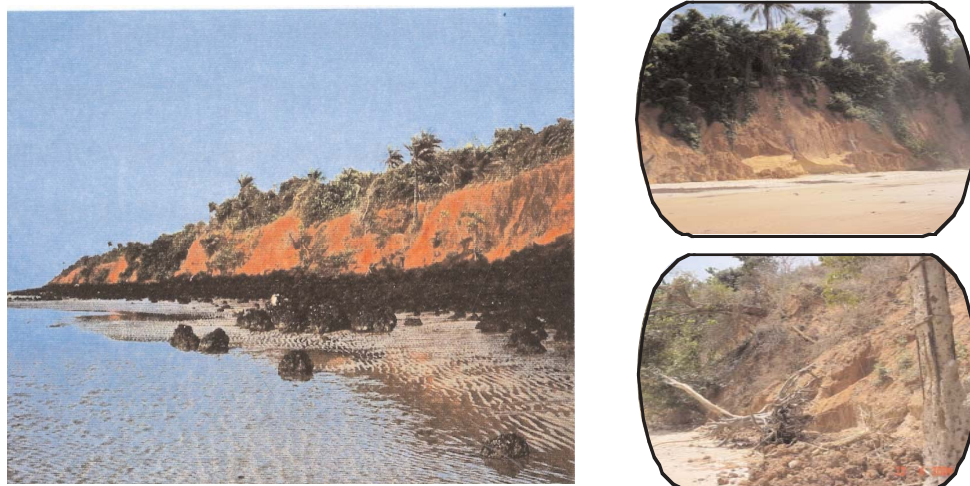


Figure n.º 7: Coast with mangrove

The littoral is made up of mangrove and is a stable zone as compared to the sandy and sloped littoral. It is highly penetrated by tides and possesses recent deposits from the quaternary age. This coast is constantly under the influence of tides and is subject to pressure from artisan fishermen, settled in illegal encampments, who fell the mangrove for fish smoking and thus facilitate seawaters' erosive action.

Rocky littoral with escarpment, this type of coast is not predominant in Guinea-Bissau due to the country's geological and geomorphologic characteristics. The highest altitude does not exceed 300 metres. Average altitude in the coastal area does not go beyond 20-25 metres. Meanwhile, we can find rocky coast with escarpment in well-defined segments in Varela and the islands of Bubaque, João Vieira, Melo, Carache and Unhocomo. The coast is subject to coast and rain erosion. The erosion phenomenon is obvious in almost all these places and localities.

Figure n.º 8 : Rocky coast with steep slope. Carache island (in G. Pennober, 1999)



... Bubaque island

3.7. EXCEPTIONAL EVENTS

3.7.1. CATASTROPHES

Natural catastrophes are rare. Coastal area floods caused by high tides or torrential rains, (likes the ones in 2003, 2004 and 2005) are rather the norm. The Directorate General of Water Services reported in those years that various localities in the country's eastern regions (Bafatá and Gabú) were affected by foods that damaged infrastructure (bridges and makeshift housing), and caused a loss of 63 ha of food production and troubles to hundreds of people forced to leave their villages on a temporary or definitive basis. Those floods were originated at Geba River's streams and shared streams of Koliba River (Guinea-Conakry) and Corubal River (Guinea-Bissau).

Five communities from the Bedanda/Cubucaré lost their paddy rice fields in 2005 due to salt-water invasion in the wake of high tides in September, which destroyed protective dams. Rural engineering services calculated that around 3,015 ha became non productive for rice-growing and were pointed out as a direct source for the widespread hunger that hit populations.

3.8 ANTHROPIC PRESSURES ON NATURAL RESOURCES

3.8.1 AGRARIAN SECTOR

According to estimates over half of the national territory, i.e., about 2.5 million hectares, have vocation for agriculture, forestry or grazing uses (SCET, 1978). Sources from GAPLA/MADR (Agriculture Yearbook, 1997), state that ninety thousand (90,000) family-owned agricultural units are responsible for the production of 90% of overall agricultural production in the country. This production comes mostly from the so-called itin-erant agriculture, characterised by forest felling and slash-and-burn practices, utilization of traditional methods and tools. The remaining 10% are produced by the commercial farming

sector and has some level of mechanisation, which is practised by 1,200 *ponteiros* (modern farmers) who occupy 27% of available agricultural land and 9% of the country's overall surface. The average land surface per *ponteiro* is 136 hectares. Production in each of the country's three agro-ecologic regions (East, North and South), is based on natural resources that exist in the ecosystems we describe below:

UPLAND ECOSYSTEM

Among all ecosystems, the upland ecosystem is the one that suffers the heaviest anthropic pressure, particularly from itinerant agriculture and bad agricultural practices that facilitate the onset of litterate and soil erosion. Intensive soil use and exploitation of this ecosystem's resources have increased in parallel with the rise in population density and the deterioration of some weather factors (rains), reflected in the drastic reduction of the fallow period of those soils lately: from 5 to 15 years in the 1950s and 1970s, it changed nowadays to 2 to 3 years; the vegetative regeneration of fallow land has been retarded in some of the country's regions (northern and eastern ones) due to the combined action of weather factors and a diminution of the fallow period. The non utilization of fertilizers and more productive agricultural techniques does not favour the maintenance, after the second year of production, of soil natural fertility in those fields thus leading to the abandonment of those lands and the utilization of new ones. Estimates point to 10,000 hectares being felled and burnt out every year for agricultural purposes in uplands, mostly for cereals (millet, rice and sorghum), leguminous plants (groundnuts and beans) and tubercles (cassava and yam). Upland rice (*pampam*) occupies 33.000 ha of the planted area and contributes with 15,000 tonnes/year, i.e., 10.7% towards overall national production of this cereal. (Source: report on rice production, PSRDP/WB, 2004)

Besides, the increment of cashew growing (134,000 hectares) and commercial fruit growing (... hectares), constitute nowadays another factor behind the acceleration of the clearing of the country's humid and sub-humid forests.

MANGROVE ECOSYSTEM

In this ecosystem, communities of rice growers cut mangroves and leave soils exposed to rains, which makes those lands lose their salt content. They then build dykes and anti-salt dams to impede salt-water invasion and afterward cultivate exclusively rice on those soils. Current estimations are that there exist 106,000 ha of mangrove soils with vocation for rice growing all over the country that were obtained, obviously, at the cost of losing an equal area covered by mangrove and the destruction of an important natural habitat for crustaceans and fish. It should be stressed that out of the 106,000 ha of those soils with rice-growing vocation only 50,000 ha (47,1%) are utilised for agricultural purposes by a total of 18,661 agricultural farms, accounting for an annual production of 115,000 tonnes of rice, i.e., 80% of 140,000 tonnes of the country's overall production. (Source: Rui N. Djata et al, Report on rice production /PSRDP/WB, 2004)

SMALL-VALLEY ECOSYSTEM

This ecosystem supports essentially production of rice and varied horticultural species. It is made up of lands made out of flood depressions commonly denominated as small valleys or bas-fonds. They are continental hydromorphic soils, temporarily subject to flooding and sedimentation caused by rainwater. Current estimates point to the existence of 100,000 ha with agricultural vocation for the production of rice and horticultural produce in lowlands and perennial plants in slopes. They are located essentially in the eastern (Bafatá and Gabu) and central (Oio) regions of the country. Women are the main users of this ecosystem; they are estimated to have enhanced around half (50 mil hectares) of the overall area available. (Source: Anibal Pereira et al, Report on Study of Agrarian Sector /NAPA, 2005)

Rice culture in this ecosystem occupies 29.369 ha distributed by 58.190 family-owned agricultural units that produce an overall quantity of 10,000 tonnes/year, i.e., 7% of total rice production. The overall area utilised for horticultural production is calculated at x thousand ha, per y thousand women/year.

3.8.2 FORESTS

According to Atlanta Consult (1985), forests covered 64 % of the country's overall surface. A preceding study by SCET International in 1978 pointed to a forest-covered area of approximately 74%. This presupposes that the country's forest area decreased by around 315,000 ha, i.e., an average of 45,000 ha/year between 1978 and 1985, due essentially to anthropic pressure, as shown in the table below.

Table n.º 1- Evolution of forest resources for the 1978-1985 time span

| Types of forests | SCET- International Survey 1978 (ha) | Atlanta Consult Survey 1985 (ha) | Difference (ha) |
|--------------------------|---|---|------------------------|
| Sub-humid forests | 178,800 | 135,431 | 43,369 |
| Dry forest | 848,300 | 844,959 | 3,341 |
| Gallery Forest | 79,950 | 52,909 | 27,041 |
| Savannah | 1,237,900 | 996,985 | 240,915 |
| Total | 2,344,950 | 2,030,284 | 314,666 |

Source: Elements d' un Plan Directeur d' Aménagement et de Gestion de Ressources Naturelles, 1992.

With an annual growth rate estimated at 1,500,000 m³/year, forest degradation is estimated at approximately 600,000 m³/year, excluding surfaces lost to the felling of trees in villages and farms and by slash-and-burn practises, evaluated at 30,000-60,000 ha/year (Study for support to the forest sector in Guinea-Bissau, 1997). One can notice that according to the 1985 forest survey, forests covered 2.1 million hectares and the wood reserve was 48,300,000 m³. Besides, the Agrarian Development Letter (1997) states that the devastation of forests is translated into the degradation of (i) 30% of surfaces of sub-humid forests in the Tombali region, south of the country, (ii) 57% of surfaces of savannahs in the Bafatá and Gabú regions (east), Oio (Centre) and northwest and (iii) 19% of surfaces of mangrove forests (Silva e Vaz, 2001).

Nacional Programme of Action of Adaptation to Climate Changes

The overall forest area is thought to be suffering a current drastic reduction of 60,000 ha/year.

National consumption of wood in 1992 was estimated at 1.2 million m³ corresponding to an increase of 8.3 % per year, equivalent to 81 % of firewood energy, 6 % of sawn wood and 8 % of construction wood as per PAFT data in 1992. This corresponds to an annual cutting of approximately of 132,000 ha of wood, i.e., 9 times more than the surface surveyed by DGFC in 1987. This consumption is in strong contrast with the average forest growth rate, which stands at around 0.3m³/ha/year. Yearly exploitation was estimated at 2,100,000 m³/year in 1992 and national wood consumption was estimated at 4.000-5.000 m³/year and the sawn wood production estimate was 3,000-20,000 m³/ano.

The wood industry registered in 1992 an overall number of ten saw-mills that had an obsolete technological equipment capable of processing a maximum of 40,000 m³ of round wood into 20,000 m³/ano of sawn wood. This industry focus mainly on the exploitation of Pau de sangue (*Pterocarpus einaceous*), Pau de Conta (*Azelia africana*) and Bissilão (*Khaya senegalensis*). Indicators of the annual impact of wood production are shown in the table below.

Table n.º 2

| Formation | A.a.a. (m³/ha /year) | Area (ha) | Overall annual wood production (m³/year) |
|--------------------------|--|----------------------|--|
| Dry dense forest | | | |
| Dense forest | 0.994 | 90,400 | 89,858 |
| Degraded forest | 0.404 | 62,400 | 22,210 |
| Transition forest | (0.404) | 20,000 | 8,080 |
| Open forest | | | |
| Dense forest | 0.474 | 189,600 | 89,870 |
| Degraded forest | 0.288 | 747,200 | 170,362 |
| Savannah | 0.245 | 926,000 | 226,870 |
| Palm tree forest | - | 80,000 | pm |
| Mangrove | - | 248,400 | not exploited |
| “Ripícola” Forest | (0.474) | 93,200 | 44,177 |
| TOTAL | | 2,457,200 | 654,427 |

Source: FDFN, 1992; A.a.a. = Annual average accrual

The current pressure exerted by the wood industry tends to be felt increasingly on southern forests, which are of capital importance for the maintenance of national ecological balance because they are areas where large species, capable of regulating the country's rainfall and hydrological pattern are still plentiful (PNGA- May 2000).

As regards mangrove forests, data collected in 1953-1959 and 1976-1990, indicated that between the two periods of time, the forest-felling level rose 2.000 ha/year to 3,830 ha/year (CIRAD/PAPT/DGFC, 1992).

The pressure of forest resources is in an upward trend due to market demand and, on the other hand, it reflects survival needs of an extremely deprived population. Thus, the rising demand for wood products and charcoal (for domestic use as a source of energy), cibes (wood for the construction of housing units) and wood (furniture industry) in the urban and semi-urban market, has pushed an increasing number of Guineans into an unbridled exploitation of those resources for commercial purposes, hence causing irreparable damage to forests and the biodiversity. On the other hand, forests are still utilised permanently by populations as a source of various types of wild fruit, medicinal plants, hunting, honey and wax, fibres for varied handicraft, etc. There are studies that shed enough light on the quantities and values that all these elements represent for the economy at household, community and national levels.

3.8.3 LIVESTOCK

Livestock activity encompasses all production systems. The table that follows illustrates the overall number estimated by Veterinary services in 2000:

Table n.º 3 – Overall national livestock

| Ruminants | Other species |
|------------------|----------------------|
| Cattle 524,891 | Pigs 33,046 |
| Lambs 311,521 | Poultry 478,476 |
| Goats 267,456 | |

Source: Veterinary services

According to Veterinary services, the eastern zone has a cattle potential estimated at 74%, against 85% of lambs and 58% of goats. The northern zone, on its turn, has 49% of pigs, and the southern zone just 19% of this overall number. Poultry are evenly distributed throughout the national territory.

Meanwhile the impact of livestock’s utilization of natural resources is still negligible due to the relatively low number of animals nationwide.

3.8.4. WATER SECTOR

The country has important water resources that are grouped into (1) rain water resources, (2) surface-water resources and (3) underground-water resources. The renewal of these resources depends to a large extent on the intensity and regularity of the rainfall patterns, whose parameters have been decreasing. Overall, albeit on an indicative basis due to lack of more updated and reliable data, water resources are estimated at 14 billion m³/year (DGRH Master Scheme, 1997), of which renewable resources from deep aquifers are assessed at 8-29 billion m³/and those of surface aquifers are estimated at hundreds of billion m³/year. Exploitation of surface waters of Geba and Corubal rivers in 1991 was estimated at 1.5 million m³.

Most of Guinea-Bissau populations live close to springs, water points or perennial and non/perennial rivers to ensure their access to this vital resource that they utilise for (i) their own consumption, (ii) consumption of productive animals (animal-production activity), (iii) agricultural production, etc. It should be stressed that potable-water access rate is only 45.3% for populations residing in rural regions against 78.9% for city dwellers in Bissau, the capital (Source: Azinhaga et al, Water Sector Report /NAPA, 2005; 1^a CNSMC, 2004)

The agricultural and services sectors are the main users of water resources. Rain waters are vital for agriculture and they depend totally on the rainfall. Surface-water resources are utilised for the supply of populations, grazing and irrigation whilst underground waters are rather utilised as a source of potable-water supply to populations (urban, semi-urban and rural ones), in agriculture, cattle consumption and the irrigation of horticultural and fruticultural products.

Updated data on the utilization of the country's water resources are unavailable, and a large number of water points were constructed lately, especially in the main urban centres as a result of the increase in the number of inhabitants in some towns (Bissau and regional capitals). Both government and populations ordered the mentioned constructions. Boreholes, modern wells, traditional wells and spring-tapping are utilised to exploit underground waters. There are over 2,500 boreholes and modern wells currently in use in rural hydraulics whilst deep boreholes utilised for varied aims (urban supply, irrigation, etc.) hover around 150, according to DGRH data produced in 1997.

The construction of water points without a prior technical study taking into account the country's hydro-geological complexity faced some problems namely silting, the utilization of materials that were ill adapted to water corrosion, wells exhaustion, salt-water invasion, pollution of ground water due to lack of isolation, and water quality not acceptable to populations.

Efforts made both by government and private entities from 1975 to date, if we take as a reference the numerous water points (boreholes, fountains and improved wells) that were built, are indicators of the intense exploitation of the county's underground water resources. Private investment in the construction of traditional and improved wells, without the required preparatory work by the relevant technical services, has been growing since it is the kind of solution seen as the most affordable by the overwhelming majority of Guineans: each household has, at least, a traditional or improved well whose water quality is of a questionable quality.

Water use for consumption and other purposes presupposes the need for renewal of quantities utilised in order to ensure the durability of this vital good. Despite the non-existence of data to measure the impact on underground water resources, there are fears that the concentration of the construction of water points in coastal areas may alter the flowing pattern of underground waters thus facilitating invasion by brackish oceanic water. Besides, common sense supports the assumption that the increasing use of underground water resources implies the preservation of aquifers' natural ability to renew themselves or herwise they will run dry at some stage. Well, as we saw earlier on, that renewal capacity in

Guinea-Bissau is greatly dependent on rainfall patterns and a rational use of water, plus the fact that a large part of rain waters being wasted into the sea, eroding soils on their journey whilst at the same silting the beds of rivers and lakes.

3.8.5. FISHING RESOURCES

The country possesses a broad coast, calculated at 22 235 KmÇ, which covers 61% of national territory and shelters 80% of the country's population. Fishing is carried out against the backdrop of an important production potential favoured by the existence of a significant shallow continental platform, the breadth of the maritime front and the existence of a sea delta represented by the Bijagós archipelago. Fishing is focused on certain species related to the type of fishing: artisan or industrial fishing. These species represent a biomass that hovers around 1 300 000 tonnes, whose exploitable share stands at about 40%. This catch potential encompasses 200 000 tonnes of shallow and deep water species of high commercial value and about 100 000 tonnes of "baliste" type species (species with low economic value and which are object of very little exploitation). Out of this total, about 34 000 tonnes of high value shallow-water species and 110 000 tonnes of deep-sea species are accessible to artisan fishing (Barros, I., Artisan Fishing, Bissau, 2001).

The same authors state that artisan fishing is dominated by the existence of non-mechanised pirogues. This type of fishing rose about 300% in 1989-1995, both in terms of the number of pirogues and the number of fishermen. As a result, catch levels have also increased, to a level of 400 %, i.e., 10 000 tonnes in 1989 against 52 000 tonnes in 1995. Fishing authorities estimate that catch levels have risen significantly in the wake of the cropping up of illegal encampments of fishermen originating from the sub-region (12 were detected in the Bolama/Bijagós Biosphere, in 2005, by IBAP) and illegal fishing in the artisan-fishing zone (within 12 miles). Additionally, fishermen from illegal encampments devastate mangroves for fish smoking or for use as construction material, thus stripping the coast and exposing it to sea erosion, coupled with perturbations on the natural habitat various sea species.

Effects of deforestation on upland soils is felt through the silting phenomenon and the non navigability of rivers and lakes, a reduction of fishing resources caused by sediments dragged away by rain erosion from high lands to low lands.

Foreign fishing fleets carry out industrial fishing outside 12 nautical miles upon licenses granted to them by the authorities. Available data (1st CNSMC, p. 34) indicate 115 kg/h as the average catch per fishing unit in 1990-1996. Top catch levels occurred in fish-catching fleets (370 kg/h) compared with only 71 kg/h for mollusc-catching fleets and about 14 kg/h for shrimp-fishing units.

The levels of illegal fishing observed within Guinea-Bissau Exclusive Economic Zone (ZEE) lead us to think that unrecorded catch levels are far superior to those seen in 1990-1996.

In 2006 the Fishing Surveillance Services (FISCAP) arrested forty industrial-fishing boats and 147 pirogues. This shows that illegal fishing levels may be extremely high and the pressure thus exerted on fishing stocks may endanger the existence of some fish species in

the long run. It should be stressed that shallow-water fishing, involving fish, molluscs and crustaceans (shrimp) constitutes the bulk of industrial fishing, representing 80% of stated catch (Barros, I., 2001).

To sum up, pressure on Guinea-Bissau's fishing resources tends to rise not only as a result of a growth of local population but also due to public treasury imperatives, whereby the issuance of licenses or multiyear fishing agreements are seen as an important source of revenues. According to data supplied by FISCAP, fines levies in 2006 amount to US\$ 6,520,000 USD, a risible sum if compared to the ecological damage caused by the practise of forbidden fishing techniques.

4. SOCIO-ECONOMIC SITUATION:

Guinea-Bissau has a territory of 36,125km² and a population estimated at slightly over 1,300,000 inhabitants distributed over 9 regions. Its population density is approximately 34 people/km² and the average growth rate as per the latest population census (1991) is 2.2%. About 70 % of local population live in the rural world and have as their main socio-economic activities the exploitation of renewable natural resources (agriculture, fisheries, forests, livestock and extraction). The country's coast zone shelters 80% of the country's overall population and, compared to the countryside or continental zone, it is rich in biodiversity, being there that the country's five Protected Areas are to be found.

According to data published in the Human Development Report, 2002, many important social indicators in Guinea-Bissau are below the average in the African region. For instance, life expectancy in Guinea-Bissau was 45 years at the start of the millennium whilst the average figure for Africa was 48.9; child mortality was 145/1,000 and the African average was 105/1,000; maternal mortality was 1,310/100,000 and the African average was 700/100,000. The situation in the education sector was as follows in the mentioned time span: basic education expenses/overall budget, 3.5% for Guinea-Bissau and 15.7% for African in general; the illiteracy rate was 63.2% and the African average was 41.5%. As for the health sector, available data point to a sharp deterioration of the health personnel/population ratio; the relation health personnel and the number of inhabitants changed from 1/7,157 in 1991 to 1/11,371 in 2000.

The poverty rate is currently very high: 64.7 % of the population are classified as being poor and around 20.8 % as extremely poor (people that live with less than US\$ 1 dollar per day), according to PRSP data extracted from the Light Inquiry on Poverty Evaluation, ILAP), 2003.

In 2004, Guinea-Bissau's active population was estimated at little over 46% of the country's overall population. Women have a share of about 52% and children below 15 represent 46%, thus revealing a mostly young population overall.

Existing information on domestic migratory movements is scarce but available data point to a strong rural exodus. Bissau, the capital, has only 3% of territory but it shelters a quarter of the country's population.

According to the 2006 Human Development Report, published by UNDP, Guinea-Bissau is part of the group of countries with the lowest human development indices in the world. Its HDI in 2006 was 0.349 (173rd spot out of a total of 177 countries).

The paralysis that hit the country from May 1998 to June 1999 due to the civil war has contributed in a particular way for an additional deterioration of the already precarious social situation. Thus, lack of control and the malfunctioning of fiscal management structures worsened and this state of affairs greatly penalised social sectors. These factors contributed significantly to an increase of local populations' degree, particularly in the rural world, vis-à-vis climate changes.

Guinea-Bissau began the new millennium with a negative economic growth rate, standing at an average rate of -0.4% for the 2001-2005 timeframe.

As regards standards of living, the real GDP per inhabitant suffered a decrease in each year between 2001 and 2004, but it nevertheless rose slightly by 1% in 2005.

The agricultural sector, dominated by cashew, is the most important sector of the country's economy, contributing with 62.6% for the GDP compared to 12.2% for industry and 25.2% for the services sector.

The current fiscal situation is critical thus preventing the government from meeting its obligations namely paying the wage bill, which has exceeded tax receipts since 2003 (111.9%, 155.0% and 108.9% in 2003, 2004 and 2005 respectively), when, in fact it should not be over 35% according to WAEMU convergence criteria. This reveals that Guinea-Bissau is incapable of financing with its own resources projects meant to adapt its most vulnerable segments to climate changes.

5. INFLUENCE OF CLIMATE CHANGES AND WEATHER PATTERN VARIABILITY ON BIO-PHYSICAL PROCESSES AND KEY SECTORS

5.1 HISTORIC FINDINGS

During the survey we often heard statements that confirm the change of parameters related to rainfall, temperature, relative humidity, the sea level and water resources. Populations have noticed (i) a late start of the rainy season (mid June) as compared to the usual time (early May), (ii) a less regular distribution of rainfall compared to the past, (iii) a shortening of the time period with cooler temperatures, the so called "cold season", from three months (December to February) to two months only (December and January), (iv) a hotter and drier environment, (v) frequent dust winds, (vi) higher frequency of high tides, which destroy dykes and rice fields, (vii) deterioration of water quality caused by salt-water invasion and infestation of water resources by waterborne plants, (viii) decrease in humid areas' surfaces due to drought.

Figure n.º 9: Bed of Bidigor river, east of the country



Photo by Alexandre Cabral, 2006

5.1.1 INFLUENCE OF CLIMATE CHANGES AND VARIABILITY IN WEATHER PATTERN ON BIO-PHYSICAL PROCESSES

Reflexes at various levels may be quoted in this regard: a) the vegetation cover of Guinea-Bissau, especially in the western and northernmost areas, has also suffered degradation because of the advancing Sahel zone, a process that has contributed to the change of temperature and rainfall parameters. As a result, forests are receding and savannahs are advancing, accidental bush fires are much more frequent, rivers and lakes become narrower and have weaker streams, natural habitats are destroyed or highly disturbed, biological diversity is threatened, agriculture and the rearing of animals become harder or impossible, large quantities of biomass are lost, and forced migration of wild fauna takes place, etc.

High temperatures in abnormal periods of the year, associated to dust winds from the Sahel that hit the country every year, have damaged the blossoming and ripping of many fruit species.

Locust plagues, helped by rises in temperature, have been frequent in the last five years, causing enormous damage to fruit- and vegetable-growing activities and the consequent abortive effect on plants and fall in production levels. It is known that when temperature levels are above cultures' tolerance levels in a given area, they may lead to changes in the overall framework of species grown in that area. This has happened in some areas of the country where sorghum and cassava are no longer grown due to the prolonged dry period and the irregular rainfall patterns, and have been replaced by cultures that are less sensitive to water shortage and are more tolerant to high temperatures.

Climate change developments have caused changes in habitats, fauna and flora, and affected the fauna and flora diversity of an important number of species nationwide. The decrease in vegetation cover is due in part to a reduction in rainfall and its influence on the hydrological cycle and the regeneration ability of various plant species. This is notorious in many locations in the country with lower rainfall indices and more prolonged dry season (eastern and north-westernmost areas).

Vegetation degradation due to the increasing sahelization of our climate reflects directly on complex ecological processes because it is a biotope that shelters various animal organisms (from large-sized to small-sized fauna, to micro-organisms that participate in nature's food chain and in bio-geo-chemical processes that occur in forest ecosystems).

5.2 IMPACTS ON KEY SECTORS

5.2.1 AGRICULTURE

Empirical data for the latest thirty years reveal that the volume of rainfall has been decreasing in Guinea-Bissau and the rainy season is now limited to only five months (June-October), in contrast to before. Production of rice and other cereals in small valleys and uplands in the north and east of the country are affected by water shortage. The fact that rain now is frequently accompanied by strong winds causes a considerable loss of production in –grain species in months when it rains heavily (August/September). Damage from flooding is significant in agricultural fields located in low lands (small valleys) and rice fields in mangrove hydromorphic soils.

Production in the south, centre and islands, where species are more demanding in terms of water supply, (rice, millet), is also affected by the concentration of rainfall and its bad time distribution.

In the so-called mangrove soils and in small valleys, rain insufficiency and bad distribution have contributed to a rise in salinity and acidity levels, which in turn have rendered non-viable the practice of rice growing. This has led to a rise in the number of deteriorated rice fields and a rise in the number of deteriorated mangrove rice fields, forcing peasants to abandon them; this happened in five villages in Cubucaré, south of the country, whose inhabitants were impeded from working 3,015 ha of bolanhas (rice fields) due to the destruction of their dykes and the resulting loss of rice fields caused by the invasion of salt water. Populations were thus forced to seek new lands, which they clear through the use of slash-and-burning before they transform them into rice fields. Or, as it happens in the southern littoral, farmers migrate to the north of the neighbouring Republic of Guinea; also in the east, northwest and some locations in the south of country – regions more affected by rainfall deterioration. Migratory movements were also registered from uplands to lowlands (small valleys) or vice-versa.

5.2.2. FORESTS

The increasing advance of the savannah-type vegetation is a visible impact, particularly in longer dry periods, namely in northern, eastern and north-western areas where higher temperatures and drought and changes or deterioration of the vegetation cover led to mutations in the composition of a large part of forest species or even to the extinction of some of those species, and migration of animals.

Figure n.º 10: Upland Agriculture- South of the Country (Photo: A. Cabral, 2006)



5.2.3 LIVESTOCK

According to the Thematic Report on Climate Changes/Agrarian Sector, 2006, animals subject to extensive raising, consume 30-40 litres of water per day; if temperatures reach the top daily levels of 45-50 °C, and in the air's hygrometric degree is very low, coupled with very strong evaporation/transpiration and very low water content in their fodder, animals' water needs may reach 50 litres or more. The decrease in the number of months with rainfall or an increase in the dry season, associated to a rise in temperature affect negatively the availability of grazing surfaces and natural water points, as well as animal activities and animal productivity. To face these circumstances, some Guinean animal raisers abdicated from the raising of some types of ruminants and now practice transhumance in dry months (January-June). They were forced to move to other villages and bear the losses suffered with the dying of their animals along the journey.

Figure n.º 11: Transhumance from the east to the south of the country. Photo: Alexandre Cabral, 2006

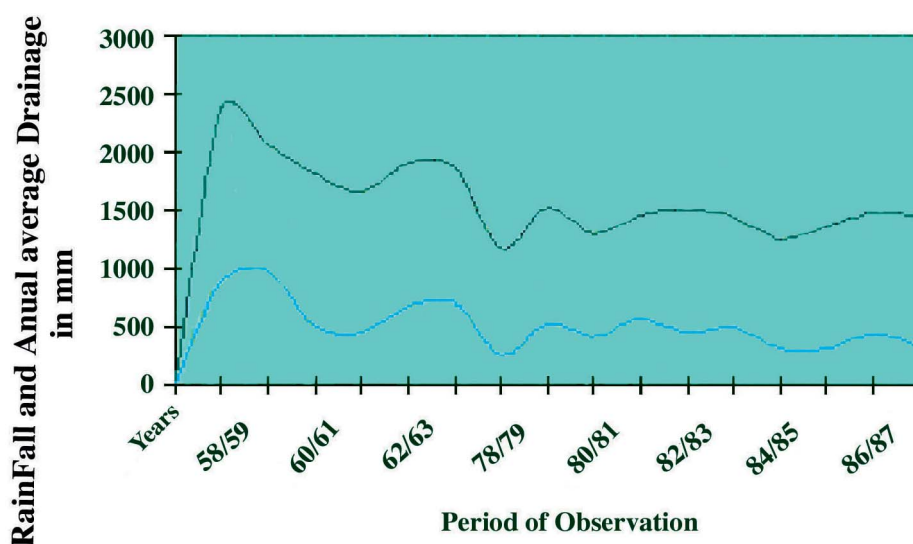


5.2.4 FISHERIES

The impact of changes in climate parameters, rainfall (downward trend) and temperature (upward trend) on fishing activities is still unknown. However, actors active in the sector have revealed that the fishing of some species in lakes and in some rivers has been affected and the catching of some species has turned more difficult; this situation may be related to over fishing of those species. On the other hand, one supposes that these changes have caused the migration of various species that were abundant in the past. One knows that the decrease in rainfall is contributing to a rise in water salinity levels, which thus upset fish life in estuarine, aquatic maritime and continental ecosystems, adding to the effect of floods that silt the sea bed. Reports indicate that intense rainfall in August-September influence fish lives, their concentration or dispersion, when they deposit sediments and nutrients dragged away from uplands into rivers, lakes and the sea.

5.2.5 WATER RESOURCES

According to 1st CNSMC, 2004 rainfall is the climate parameter that most affects the sector if we take into account that there was a decrease of 10 % in the coastal area and 15 % on average in the countryside for the 1941-1969 timeframe and from 1970 onwards. This decrease affected negatively the refilling of surface aquifers, on the one hand and river debits on the other hand, thus favouring salt-water progression. It should be stressed that a study carried out on Corubal River's basin demonstrated that there is a direct relation between rainfall and the flowing of rain water: if the former decreases the latter follows suit, as can be seen in data collected during 16 years of observation, in 1957/58 - 1986/87, excluding the 1963/64 - 1976/77 time period.



5.2.6 HEALTH

Temperature and rainfall, associated to serious sanitation, are two parameters that have had influence on the recrudescence of various diseases in the country, of which malaria (60% of appointments in hospital emergency cases), hepatitis, cholera, etc. In times of greater rain concentration and high temperatures, the number of Guineans with malaria problems rises whilst diseases like measles and meningitis increase at times of less rain and strong winds, e.g., meningitis in the eastern zone or bronchitis and other respiratory ailments observe in dry periods, namely January (Source: 1st CNSMC, 2004).

6. FRAMEWORK OF ADAPTATION PROGRAMME

6.1 VARIABILITY IN WEATHER PATTERNS AND CLIMATE CHANGES OBSERVED

Empirical observation of rainfall developments in the latest 30 years (1961-1990) or even in the latest 45 years (1954-2000) show a downward trend: in the south, 2,440 to 1,800 mm; in the centre, 2,200 to 1,600 mm and in the north, 1,600 to 1,200 mm (Silva, C. quoted by Da Silva, A. O., 2001). For the 1953-1983 timeframe, a study shows that whilst in the north, at the border with Senegal, average rainfall over a period of just 70 days was 1,300 mm, average rainfall in the country's southernmost area was over 3,000 mm during a period of over 120 days of rain. For 1961-1990 (Imbali, F. & Da Silva, A. 1997), the average number of rainy days recorded was 162. In fact, we see an annual decrease in rainfall and its concentration in just five months (June-October) contrary to what happened before (May-November). Nowadays rains are frequently accompanied by strong winds that cause damage to plantations and cultures. Reflexes of other climate parameters (temperature) can be seen in floods caused by semi-daily tides, whose amplitude are among the highest in West Africa, namely in Porto-Gole and Buba, where it reaches 6.42 m during high tide. Other examples of amplitude known in the country are 1.97 m for Farim, 4,24 m for Bubaque, 3,61m for Pecixe, 5,10 m for Bissau, 4,90 m for Bolama and 2.32 m for Varela (J. P. Barousseau et al. in rivières du sud, quoted by Da Silva, A. O., 2001). With almost two thirds of its territory in the coastal zone, at below 50 metres of altitude, Guinea-Bissau is a country that is prey of high tides and coast erosion, whose impact has been increasing in a demolishing way on the coast, agricultural land and coast ecosystems, presumably aided by climate changes (longer dry season, higher sea temperature). Indeed, it is thought that erosion effects may diminish the country's overall surface from the current 36,125 km² to 28.000 km² (Source: 1st CNSMC, 2004).

6.2 VARIABILITY OF WEATHER PATTERNS AND PROJECTED CLIMATE CHANGES

Forecasts contained in the 1st CNSMC 2004, developed according to the Magic Schengen model, predict that until 2100 temperature will rise 2%, rainfall will diminish by 11.7%, the probability of cloud formation will rise by 3.3%, and the average sea level will rise 50cm.

7. POTENTIAL IMPACTS OF CLIMATE CHANGES

7.1 POTENTIAL IMPACTS

Thematic reports on climate changes and the 1st CNSMC stress essentially the following: a rise in temperature and rainfall that surpasses the cultures' tolerance limits will cause significant changes in blossoming, yield, smell, taste, plague- and disease incidence, etc., depending species and varieties. Based on current figures for maximum and minimum, varying between 32 °and 39 °C (March - May) and 20 ° to 24 °C, (December - February), a rise of 2 °C in the 2100 time horizon would lead to a rise of 34 °to 41 °C in hotter months and 22 ° to 26 ° in cooler ones.

In the above circumstances both cashew blossoming and harvest, which occur between March and May, as well as the production of horticultural species would be affected.

Torrential rain, concentrated in August and September, would worsen existing drainage problems and complicate the growing, transplant and adaptability of varieties that currently utilised. Broadly speaking, the danger for the agricultural sector stems essentially from the irregular rain pattern.

Other than the risks arising from pressure on forest resources, climate changes would affect the vegetation cover, thus degrading and leading human settlements to move successively from one vegetation formation to another. The sahelisation and desertification process would thus be reinforced.

Concerning water resources, the decrease in rainfall may lead to a continuous diminution of water resources and main rivers' stream, an accentuation of water deficit in dry months, a decrease in rainwater to hydrographical networks, currently estimated at 45 billions of cubic meters.

As regards livestock, taking aside the eastern regions, where the extension of the dry season and the consequent reduced availability of grazing areas and water wells, coupled with the practise of transhumance tend to be more accentuated, no major losses are expected. The fisheries sector also is not greatly threatened in the 2100 horizon. Nevertheless, a rise in average sea level by 50 cm may endanger the reproduction of some species of sea mammals, e.g., turtles, due to the submersion of fish-spawning beaches. In fact, the rise in sea levels constitutes a latent and permanent risk if we take into account the predominance of a low altitude and important coast prairies: even if we consider a rise in sea level below 50 cm (stronger scenario until 2100), Guinea-Bissau would not be in condition to protect its coastal area. Phenomena like erosion, salt intrusion, gales and floods may be reinforced in the future in coastal areas. And if by then (2100) this fact is not duly taken into account, physical processes (wave energy, tides and streams, transportation of sediments, etc.), causing considerable impacts, not only in coast ecosystems and its multiple types of production, functional regulations but also concerning biodiversity resources (fish, crustaceans, molluscs, forest essences etc.) and the type of use (tourism and sea transportation).

7.2. POTENTIAL IMPACTS THAT WILL AFFECT POPULATIONS THE MOST

Table n.º 4 below seeks to synthesize these impacts as follows:

| | Nature of Impacts |
|--------------------|--|
| Agriculture | <p>Loss of soils suitable for agriculture (continental and maritime hydromorphous soils) due to salinity and acidification (rain shortage) and invasion of salt water (rise in sea levels);</p> <p>20-30% fall in yield of agricultural species affecting especially horticultural products, cereals (rice and millet), groundnuts and cashew, due to drought, high temperatures, bad distribution of rains and/or flooding of low lands for prolonged time periods; a third (33%) of populations are submerged by food insecurity.</p> <p>Worsening of cereal deficit, especially rice, which will rise to 75,000 tonnes/year, and heavier country food dependence vis-à-vis imported rice.</p> <p>Deterioration of populations' living conditions, rural ones in particular.</p> |
| Livestock | <p>Worsening of (i) shortage of grazing and water points for animals, due to extension of dry months, (ii) conflicts between animal raisers and farmers concerning the delimitation of natural grazing corridors and water points.</p> <p>Marked loss of annual revenues and productivity due to nutrition deficiencies, water imbalance and physical efforts during transhumance.</p> |
| Forests | <p>Increment of uncontrolled slash-and-burn practices thus jeopardising populations and wild fauna</p> <p>Increased difficulty to collect/extract products from the forest for current consumption for multiple purposes (food, health, ornamentation, handicraft, traditional ceremonies, etc.) due to accelerated degradation of vegetation cover (from dense forest to open forest and from open forest to savannah, resulting from the accentuation of the <i>sahelization</i> and desertification processes).</p> <p>Impossibility of hunting some wild species because they become rare (due to migration) or extinct (the modified habitat is hostile to them)</p> |

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Please see the below matrix, from the 1st CNSMC, containing an identification exercise for adaptation measures and their linkage with national policies and plans.

Table n.º 5 – ESSENTIAL ADAPTATION NEEDS AND THEIR LINKAGE WITH NATIONAL POLICIES AND PLANS

| Primary sector (agrarian) | Adaptation strategies and measures | Linkages with national policies and plans |
|------------------------------|--|--|
| Agriculture | <ul style="list-style-type: none"> i) Extension of short-cycle seeds, ii) Greater dissemination of varieties less demanding in water and resistant to prolonged drought periods; iii) Increase in hydraulic works, iv) Construction of micro dams and small dykes for water retention, v) Promotion of low-cost irrigation systems; vi) Production diversification | <ul style="list-style-type: none"> - The Letter of Agrarian Development states as its objectives the ensuring of food security and the diversification of production; its plan of action contains measures that encompass these strategies. - PRSP takes the agricultural sector's strategies into account in its fight against poverty. |
| Forests | <ul style="list-style-type: none"> Launching of nationwide survey on forests; - Setting-up of conservation units, especially in important and fragile ecosystems; - Promotion of local initiatives focusing on conservation and development; - Supply of financial and technical means to technical services; - Introduction of community-based management of forests and their extension to the north and south of the country; - Selection of rapid-growth species plants for energy purposes. - Reforesting of zones degraded and their restoring through the use in each agro-ecological zone of local species; sustainable management of those species thus allowing their future natural regeneration | <ul style="list-style-type: none"> - The Forest Master Plan and the Forest Law foresee actions that contribute towards the implementation of adaptation measures; - Measures foreseen in the PRSP plan of action and in the PAFI. |

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| | | |
|-------------------------|---|--|
| Livestock | <ul style="list-style-type: none"> - Utilization of agricultural sub-products namely sugar cane, rice straw coated with urea and sugar-cane syrup, and, if possible, the use of cassava and other residue; <li style="padding-left: 20px;">- Improving of grazing fields through the introduction of plants with high nutritional quality and greater production potential, especially leguminous species that contribute towards an improvement of animals' diet and simultaneously on soil-enriching with nitrogen; - Promotion and strengthening of production of short-cycle animals (goats and sheep); residues; | <ul style="list-style-type: none"> - CPDA and its Plan of Plano de Action analysed and foresaw measures that fit well with the strategies in the livestock domain; - Measures foreseen in the DENARP plan of action encompass these measures. |
| Fisheries | <ol style="list-style-type: none"> 1. Preparation of an Integrated Management Programme of Coastal Resources (PGIRC), and its respective Plan of Action on the Coast (PAC). 2. Acquisition of knowledge on internal dynamics of populations of sea resources in the area; <ul style="list-style-type: none"> - Integrated management of those resources and respective zone; - Appropriate legislation to ensure protection of resources, particularly regarding their access and assessment of local hydro-meteorological risks | Strategies and measures envisaged are reflected in the Fisheries Master Plan and PRSP |
| Secondary sector | | |
| Water | <ol style="list-style-type: none"> a) Rehabilitation, renewal and extension of needed infrastructure for a quantitative and qualitative improvement of water and sanitation resources; b) Rehabilitation and implementation of infrastructure for the evacuation of rain water and the evacuation of residual water in critical locations in large urban centres; c) Organization and sensitisation of populations for a change in mental attitudes (setting up of water-consumer associations); better knowledge on water resources (hydro-geology and hydrology) and their functioning (Training); d) Effective protection of those resources and their tapping for supply purposes; <ul style="list-style-type: none"> e) Effective and integrated management of different ways to utilise water. f) Institutional organization, reactivation of CTA, CIMA and CNA; g) Legislation updating. | <ul style="list-style-type: none"> - The Water Master Scheme encompasses these strategies. - Measures under the DENARP plan of action encompass these measures. - The Water Code, also approved by Government in 1992 sets out the general framework for water – resource management, utilisation and conservation, and determines their institutional framework; - The linkage is equally done regarding the integrated management of hydrographical basins and water resources, namely with OMVG and the AGIR project but the terms of reference should be extended to encompass a greater sub-regional synergy. |
| Coastal Zone | <ul style="list-style-type: none"> - A requirement to guide traditional and modern techniques in research, experimenting and base studies for the exploitation of sea resources with a view to ensuring the sustainable use of stocks of commercial importance thus reducing pressure on those resources - In order to minimise its sea fauna vulnerability to climate changes, the country needs to define an efficient management of its living sea resources aiming at: <ul style="list-style-type: none"> Making use of actors' good sense when faced with shortage of scientific information; An immediate implementation of conservation measures before obtaining reliable data and reaching scientific consensus (which requires a long timeframe) on the status of sea resources; <p>To promote experimental aquaculture in coastal areas</p> | The Tourism Master Plan, when establishing the link between tourism development and biodiversity conservation and its risks for the sector, takes into account the proposed strategies, especially when it envisages the updating of this plan and its adaptation to climate changes in the future. |

| | | |
|---|--|--|
| <p>1. Fishing resources and maritime, estuarine and aquatic continental biotopes</p> | <p>Vulnerable or very vulnerable to sedimentological dynamics and issues and the coastal dynamics generally resulting from anthropic actions and climate hazards</p> <ul style="list-style-type: none"> - Identification through studies and research of zones most vulnerable to changes of sedimentological nature and that constitute a bottleneck in upstream ecological processes. - Identification through studies and research of zones most vulnerable to sea and coastal erosion phenomena and integrate these issues into a broader search for solutions (Sub-regional and international level). - Support and enhancement of the Mangrove Observatory project, so as to include the follow up of sedimentological dynamics, namely relating to the contribution of the Corubal-Geba water system and the physic-chemical composition of biotopes. - To ensure a natural transportation of sediments along waterways and carry out, on a joint basis with the Ministry, the dredging of rivers in critical points, or works meant to deal with natural effects. <p>Very vulnerable to rising salinity and episodic flooding, increases in NMM, and reduction of rivers' debits and stream.</p> <ul style="list-style-type: none"> - Guinea-Bissau joining of major international and sub-regional programmes on climate change as main factors behind this vulnerability (tides dynamics, "bombement" of continental platform, decrease in rainfall and rise in average sea level) needs global measures that surpass by far a State's borders. - A better utilisation of rain water and, if needed, the carrying out of dredging works on hydrographical basins so as to increase the quantity of sweet water leading to a decrease in the level of salinity of surface water streams and aquifers, and soil salinity and acidification and consequently ensure, on a direct basis, a propitious biotope for mangrove and other coastal types of vegetation, and water and sea fauna and, indirectly, for users of fishing resources. | <p>The National Office on Coast Planning, as a forerunner of measures directed at conservation and sustainable development of the coastal area in all its mentioned aspects, namely ecosystems, biodiversity, coastal erosion and its causes, ecologic monitoring, demonstrates the existing strong linkage between proposed strategies and national policies. The latter were recently consolidated through the approval of PNGA and EPAN-DB, in addition to the Framework Law for Protected Areas and prospects relative to IBAP, INA e AIA.</p> |
| <p>2. Coast Line, Mangrove and Coast Vegetation</p> | <ul style="list-style-type: none"> - Promotion of scientific research with | |

| | | |
|--|---|--|
| | <p>The intervention of scientists and scholars on climate changes' issues linked to the coastal zone and coastal ecosystems,</p> <ul style="list-style-type: none"> - Mangrove protection bearing in mind that protection of the littoral against coast erosion is one of that ecosystem's attributes; - Setting up of a Mangrove Observatory, based on the project already existing at the Coast Planning Programme. - Based on agronomic research and experiment and base studies, to guide traditional techniques of land exploitation towards recovering and enhancing land for rice-growing purposes, particularly in "bolanhas" (salt and sweet water), aiming at increasing yield of cultivated areas. <p>Rise of sea level</p> <ul style="list-style-type: none"> - Research, intervention by scientists and scholars of climate change linked to the coastal zone and coast ecosystems, which, if adequately equipped for their work, may end up proposing alternative techniques to traditional ones, regarding the unbridled exploitation of mangrove for fish smoking; - Carrying out of base studies, research, experimenting, extension and technical assistance that may enable Guinea-Bissau to monitor risks related to the sea level; - Adoption of settlement and infrastructure strategies that minimize potential risks, avoiding their placing close to the coast line; - Setting up of tide-monitoring stations and their geographical distribution; - Guinea-Bissau has a considerable coast zone and large swaths of low lands; scientific research focusing on coast protection thus constitutes an urgent need. - Recovery and enhancement of land for agriculture, rice growing in <i>bolanhas</i> (salt- and sweet water), aiming at increasing the yield of cultivated areas and hence relieve pressure on mangrove forests; - Setting up of national and natural parks; | |
| <p>3. Hydrographical soils and basins</p> | <ul style="list-style-type: none"> - Sensitisation of population on the utilization of precocious fires; - Preparation of legislation on land slash-and-burning; - Use of efficient agricultural techniques that are capable of preventing or decreasing the loss of surface layer | |

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| Sanitation | <ul style="list-style-type: none"> - Updating and implementation of code of behaviour of town councils and Master Town Planning framework, which foresee the building of toilets for each house and type of ditch to be adopted; - To stimulate the building of latrines following some technological measures for protection of ground waters, especially in urban centres; - Setting up of rubbish depots and their respective treatment; - Preparation of a national strategy for management of urban residues; - Strengthening of programmes for public-education and sensitisation; | Linkage concerns are broadly expressed in PRSP |
|-------------------|---|--|

| | | |
|---------------|---|--|
| Health | <ul style="list-style-type: none"> - Building of disease-research centres; strengthening of measures to fight and prevent the on-setting of diseases among populations. - Designing of a broader vision on the issues of climate-sensitive diseases. - Promotion of capacity building in research. - Strengthening of health-information system aiming at obtaining global and complete data about the epidemiological situation. | Besides the PRSP, strategies here presented in the field are part of a broader and more complete range of measures and strategies included in the PRSP, and updated in 2002. |
|---------------|---|--|

| | | |
|----------------------|---|--|
| Food security | <ul style="list-style-type: none"> - Setting up of national security stock; - Setting up of cereal banks (silos) by peasants to guarantee a food reserve in all regions; - Setting up of an Early Warning System against risks; - Strengthening of sensitisation campaign about the importance of diversifying eating habits. | Both CPDA, in its objectives translated into the Plan of action and DENARP are in line with the strategies hereby defined. |
|----------------------|---|--|

8. SYNTHESIS OF POTENTIAL RISKS AND IMPACTS



A survey of present and future climate risks was carried out on the basis of a participatory evaluation, facilitated by national experts. The survey allowed (i) an assessment of resources, sectors, geographical zones and more vulnerable human groups, (ii) the identification and setting out of vulnerable modes of existence. The matrix below illustrates the respective outcomes.

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Table no. 6: Survey of Potential Risks and Impacts:

| RISKS | VULNERABILITY | | | | | | | |
|--------------------------------|-----------------|---------------------|----------------|----------|---------------|-----------|-------|------------|
| | Economic Impact | Loss of human lives | Mortality rate | Duration | Area Involved | Frequency | Trend | Total or % |
| | Scale (1-5) | | | | | | | |
| Seasonal Drought | 2 | 1 | 1 | 2 | 2 | 3 | ↘ | 37% |
| | | | | | | | | |
| Acute Drought | 5 | 4 | 2 | 4 | 4 | 1 | ↘ | 67% |
| | | | | | | | | |
| | | | | | | | | |
| Rise in Ocean Temperature | 3 | 2 | 1 | 2 | 4 | 1 | ↘ | 43% |
| | | | | | | | | |
| Rise in atmosphere temperature | 3 | 3 | 2 | 4 | 4 | 3 | ↘ | 63% |

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|----------------------------|---|---|---|---|---|---|---|--|-----|
| Cyclones (Strong winds) | <ul style="list-style-type: none"> - Health problems, losses of human lives Coastal erosion - Loss of arable land; salt invasion, economic and biodiversity losses; - Loss of beaches, appearance and disappearance of some islands Reduction of fishing activities | 4 | 3 | 2 | 1 | 4 | 1 |  | 50% |
| A.S.L. Average sea level | <ul style="list-style-type: none"> - destruction of infrastructure in coastal areas, salt-invasion phenomenon, deterioration of sweet waters' quality, coastal erosion, disappearance of beaches, loss of land decrease of fishing activities on the coast loss of income and displacement of populations from one place to another; | 5 | 3 | 1 | 2 | 4 | 1 |  | 53% |

9. SENSITIVITY ANALYSIS ON MORE VULNERABLE RESOURCES, SECTORS, ZONES AND HUMAN GROUPS

The table below, developed through a participatory approach, shows the results of a sensitivity analysis on climate risks facing vulnerable environment goods and services, activity sectors and groups of actors.

Table no. 7: Hypothetical Sensitivity Matrix

| Environmental Goods and Services | CLIMATE RISKS | | | | | | | Exposition Indicator in (%) |
|----------------------------------|------------------|---------------|---------------|-------------------------------|------------------------------------|-------------------------|------------------------|-----------------------------|
| | Seasonal Drought | Acute Drought | Intense Rains | Increase in Ocean Temperature | Increase in Atmosphere Temperature | Cyclones (Strong Winds) | ASL. Average Sea Level | |
| Scale (1 to 5) | | | | | | | | |
| Soil Fertility | 1 | 4 | 4 | 1 | 3 | 1 | 3 | 48% |
| Water Resources | 3 | 5 | 5 | 3 | 4 | 1 | 4 | 60% |
| Biodiversity | 2 | 5 | 2 | 3 | 3 | 3 | 5 | 66% |
| Arable land exposition to risks | 2 | 5 | 4 | 1 | 3 | 3 | 4 | 63% |
| Sectors | | | | | | | | |
| Agriculture | 2 | 5 | 4 | 1 | 3 | 3 | 2 | 57% |
| Livestock | 3 | 5 | 3 | 1 | 4 | 2 | 1 | 54% |
| Fisheries | 2 | 4 | 1 | 4 | 2 | 1 | 4 | 51% |
| Infrastructure | 1 | 2 | 3 | 1 | 1 | 4 | 4 | 46% |
| Health | 1 | 2 | 3 | 1 | 5 | 3 | 4 | 54% |

10. TYPOLOGY OF PARTICULARLY VULNERABLE GROUPS

Vulnerability levels of different social groups were assessed on the basis of available socio-economic indicators, especially those supplied by the Light Inquiry on Poverty Evaluation (ILAP) and indications of impact of climate changes on activity sectors identified sector studies carried out under NAPA preparation. Thus, small subsistence constitute the 1st group (54%), cattle raisers the 2nd group (49%), resident paid workers living in main town centres, the 3rd group (46%) and fishermen the 4th group (34%).

Table no. 8: POPULATIONS' MORE VULNERABLE GROUPS

| | | | | | | | | |
|------------------|-----|-----|-----|-----|-----|-----|-----|------------|
| Small farmers | 3 | 5 | 4 | 1 | 2 | 2 | 2 | 60% 54% |
| Urban Workers | 1 | 2 | 2 | 1 | 3 | 2 | 5 | 51% 46% |
| Cattle raisers | | | | | | | | 51% 49% |
| Fishermen | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 37% 34% |
| Impact Indicator | 38% | 78% | 54% | 32% | 37% | 46% | 48% | |

11. NAPA IMPLEMENTATION STRATEGY

The implementation will follow the envisaged strategy under sector policy letters in force and the PRSP so as to ensure necessary linkages for a larger synergy and impact of planned activities. A participatory and complementary approach will take centre stage and will entail a full involvement of populations and different actors regarding the implementation of measures adopted. The table denominated "Strategies and Adaptation Measures and their Articulation with National Policies and Plans ", in Annex ... provides details of this strategy and its degree of articulation with NAPA.

12. COORDINATION AND INSTITUTIONAL ARRANGEMENTS FOR ADAPTATION

12. 1 COMMITTEE COMPOSITION

The Environment Directorate General, upon proposal by the project National Coordinator, launched the process following the decree that set up the NAPA National Committee (NC). NAPA NC is composed of 15 institutes representing the public sector (9) and civil society (6). The choice fell on public technical institutions and civil society entities (non-governmental

organizations) that operate in activity sectors deemed by the government as the most vulnerable ones and are thus seen as priority ones under the preparatory process of NAPA in Guinea-Bissau.

12. 2 COMMUNICATION STRATEGY FOR ADAPTATION

Throughout this programme's implementation stage, Regional Committees and the National Committee will play an important role concerning the dissemination of NAPA-related information and targeted NGOs will prepare radio programmes to be broadcast in community radios since rural communities, among which small farmers and cattle raisers, constitute the most vulnerable segment of the population.

12. 2.1 SURVEY OF ADAPTATION OPTIONS

13. CRITERIA FOR SELECTION OF ADAPTATION OPTIONS

The criteria adopted for the selection and sorting of options are as follows: (1) the level of seriousness of impacts, which estimates the degree of the sector's vulnerability to climate changes; (2) contribution to poverty relief, which estimates the level of impact of probable effects of the adaptation option on improving populations' living conditions; (3) synergy with AMA, which assesses the degree of linkage and complementariness of adaptation options with Agreements and International Protocols on environment; (4) costs, which classifies adaptation options under a cost/benefit perspective; (5) gender, which assesses implications for the most vulnerable segments, with emphasis on women and children; (6) the number of beneficiaries, which assesses the numerical and geographical comprehensiveness of the adaptation option.

The evaluation scale on the importance of each criterion relative to each option goes from 1 to 5.

SCALE: 1 to 5

1. Significance level of impacts:

1 = Very weak; 2 = Weak; 3 = Average; 4 = Strong; 5 = Very strong

2. Poverty relief

| | | | | |
|------|-----------|-----------|-----------|------|
| 1 | 2 | 3 | 4 | 5 |
| ≤ 3% | ≥3 % ≤ 6% | >6 % ≤ 9% | > 9%≤ 12% | ≥12% |

3. Synergy with AMA

1. Very weak 2 Weak 3 Average 4 Strong 5 Very strong

4. Costs (US\$)

| | | | | |
|-----------|---------------------|--------------------|--------------------|-----------|
| 1 | 2 | 3 | 4 | 5 |
| > 500.000 | > 400.000 ≤ 500.000 | >300.000 ≤ 400.000 | >200.000 ≤ 300.000 | < 200.000 |

5. Gender

1 Very weak implication 2 – Weak implication 3- Average implication 4-Strong implication
5 – Very strong implication

6. Beneficiaries

| 1 | 2 | 3 | 4 | 5 |
|----------|-------------------|------------------|--------------------|----------|
| < 20.000 | > 20.000 ≤ 60.000 | >60.000 ≤ 80.000 | > 80.000 < 100.000 | >100.000 |

14. PRIORITIZATION OF ADAPTATION OPTIONS

A group of representatives from different public agencies and civil society assembled in a workshop identified particularly vulnerable sectors and population groups under the National Strategy on Poverty Reduction and taking into consideration findings of sector studies on vulnerability and adaptation to effects of climate changes. Furthermore, a second workshop, based on the matrix below for analysis of multiple criteria arrived at the following order of priority:

Estimates point to a degradation rate of forest capital of approximately 600,000 m³/year against a backdrop of an annual growth rate of 1,500,000 m³/year, excluding losses of surface provoked by forest clearing in villages and farms by slash-and-burning, assessed in 30,000-60,000 ha/year (Study for assistance to forest sector in Guinea-Bissau, 1997). It should be noted that according to the forest survey carried out in 1985 forests covered 2.1 million hectares and the wood reserve was 48,300,000 m³. Furthermore, in accordance with the Letter on Agrarian Development Policy (1997), forest felling translates into the degradation of (i) 30% of sub-humid forests in the Tombali region, south of the country, (ii) 57% of savannah surfaces in Bafatá and Gabú regions (east), Oio (Centre) and northeast (iii) 19% of mangrove areas (Silva & Vaz, 2001).

Overall forest surface is currently estimated to be decreasing at a rate of 60,000 ha/year.

National consumption of wood in 1992 was estimated at 1.2 million m³, corresponding to an increase of 8.3 % per annum, which is equivalent to 81 % of firewood, 6 % of sawn wood and 8 % of service wood (construction) according to PAFT data in 1992. This corresponds to an annual cutting down of approximately 132,000 ha of wood, i.e., a nine-fold increase as compared to the forest surface surveyed by DGFC in 1987. This consumption is in stark contrast with the average forest growth level, now estimated at around 0.3m³/ha/year. The annual exploration rate was estimated at 2,100,000 m³/year in 1992, national consumption of wood at 4,000-5,000 m³/year and sawn wood production at 3,000-20,000 m³/year.

The wood industry was made up until 1992 of ten saw-mills that had an obsolete technological park with capacity to process up to 40,000 m³ of round wood into 20,000 m³/year of sawn wood. This industry is based mainly on the exploitation of Pau de sangue (*Pterocarpus einaceous*), Pau de Conta (*Afzelia africana*) and Bissilão (*Khaya senegalensis*). Indicators of the annual impact of wood production are presented in the table below. It is suitable to analyse annual production data as per type of forest:

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Table n.º 9 – Options resulting from the analysis of multiple criteria: 1 level of seriousness of impacts; 2 poverty reduction; 3 synergy with AMA; 4 costs; 5 gender; 6 beneficiaries

| PROJECTS | 1 | 2 | 3 | 4 | 5 | 6 | TOTAL |
|---|---|---|---|---|---|---|-----------|
| Coastal Zone | | | | | | | |
| 1 (Protection, conservation and enhancement of fishing and coastal resources) | 3 | 2 | 3 | 3 | 4 | 3 | 18 |
| 2 (Mangrove Observatory) | 5 | 3 | 3 | 3 | 4 | 4 | 22 |
| 3 (Prevention of natural catastrophes) | 4 | 2 | 2 | 3 | 2 | 5 | 18 |
| 4 (Nat. Res. com..) | 5 | 4 | 3 | 2 | 4 | 4 | 22 |
| Water Resources | | | | | | | |
| 5 (Rural waters) | 4 | 5 | 2 | 1 | 5 | 5 | 22 |
| 6 (DGGH Institutional support) | 4 | 3 | 2 | 2 | 2 | 4 | 17 |
| Agriculture | | | | | | | |
| 7 (Integrated system of information on food security) | 4 | 4 | 2 | 3 | 2 | 5 | 20 |
| 8 (Production Diversification). | 5 | 5 | 3 | 2 | 5 | 5 | 25 |
| 9 (Alternative Energies) | 4 | 3 | 4 | 4 | 4 | 4 | 23 |
| 10 (Promotion of small irrigation schemes on Geba and Corubal banks) | 4 | 4 | 3 | 1 | 5 | 3 | 20 |
| 11 (Reforestation of degraded zones) | 3 | 3 | 3 | 3 | 2 | 1 | 15 |
| 12 (Rehabilitation of small perimeters of mangrove soils for rice growing) | 4 | 4 | 2 | 2 | 3 | 3 | 18 |
| 13 (Production of short-cycle animals) | 2 | 4 | 2 | 2 | 3 | 3 | 16 |

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Table n.º 10 – The following sorting of projects, with their location and costs, resulted from the exercise carried out

| Order of priorities | Project denomination | Geographical Zone | Intervention | Cost Estimates |
|---------------------|---|---|--------------|-----------------------|
| 1º | Support to Diversification of Production and Food Diet Project | Southern Province (Quinara and Tombali) | | US\$ 600,000 |
| 2º | Improvement of Water Supply in Rural Zones Project | Southern Province (Quinara and Tombali regions) Eastern Province (Bafatá and Gabú regions) | | US\$ 1.000,000 |
| 3º | Capacity building in Prevention and Protection of Mangrove <i>Bolanhas</i> against High-Tide Invasion Project | Southern Province (Quinara and Tombali regions) Northern Province (Cacheu region) | | US\$ 600,000 |
| 4º | Observatory for Mangrove Monitoring and Evaluation Project | Northern Province (Cacheu region) Southern Province (Bolama/Bijagós region) | | US\$ 800,000 |
| 5º | Monitoring of Coastal Area Erosion | Northern Province (Cacheu region) Southern Province (Bolama/Bijagós region) | | US\$ 400,000 |
| 6º | Assessment of Impact of Climate Changes in Producers' Sectors Project | Nationwide | | US\$ 350,000 |
| 7º | Promotion of Small-scale Irrigation in Geba and Corubal rivers Project | Eastern Province (Bafatá and Gabú regions) Northern Province (Oio region) | | US\$ 800,000 |
| 8º | Prevention of Natural Catastrophes Project | Nationwide | | US\$ 300,000 |
| 9º | Protection, Conservation and Enhancement of Fishing and Coastal Resources Project | Coastal Area (Northern and Southern Provinces) | | US\$ 450,000 |
| 10º | Integrated System of Information on Food Security Project (SISA) | Nationwide | | US\$ 300,000 |
| 11º | Environmental Education and Communication in Coastal Areas Project | Coastal Zone (Northern and Southern Provinces) | | US\$ 200,000 |
| 12º | Rehabilitation of Small Perimeters of Mangrove Soils for Rice Growing in Tombali, Quinara, Bafatá and Oio Project | Eastern Province (Bafatá region) Northern Province (Oio region) Southern Province (Quinara and Tombali regions) | | US\$ 500,000 |
| 13º | Support to Production of Short-Cycle Animals Project | Eastern Province (Bafatá region) Northern Province (Oio region) Southern Province (Quinara and Tombali regions) | | US\$ 400,000 |
| 14º | Reforestation of Degraded Areas Project | Eastern Province (Bafatá region) | | US\$ 500,000 |
| TOTAL | | | | US\$ 6,300,000 |

These priorities aim essentially at augmenting rural populations' food security levels with a view to strengthening their adaptation capabilities, reducing pressure on forest and sea resources and improving access to potable water for human and animal consumption, taking into consideration the negative influence climate changes have on water resources' quality and quantity due to reductions in rainfall. The conservation and enhancement of fishing and coastal resources, as well as the optimisation of the enormous agrarian potential available are also concerns of no lesser importance.

It has to be recalled that, according to the Letter of Agrarian Development Policy (CPDA), the country cannot ensure its food security without a diversifying of its food production, including short-cycle animal production. The country is very dependent on rice. As internal rice production is not enough to cover the self-reliance cycle, most households in Guinea-Bissau use the income arising from cashew nuts' sale, the main export product, essentially to cover the cereal deficit.

Other than the destruction of thousands hectares of mangrove rice fields through floods caused by high tides during last year's harvest, cashew nuts' price decreased substantially in the international market, thus reflecting negatively on producers' price, which decreased from CFAF 250 in 2005 to an average of CFAF 100 in 2006. This fall in producers' price has greatly constrained the financial capacity of a large majority of rural populations in the country, a fact that has had consequences at various levels and increased the vulnerability of households to hunger and/or malnutrition. Accounts by peasants from various regions in the country confirmed this situation, including anecdotic evidence that religious ceremonies to honour the dead had to be postponed because relatives could not afford them (In Rádio Sol Mansi, rebroadcast by Rádio FM/Bombolom).

This choice goes in tandem with the need to keep synergies between this programme and other international conventions, and Guinea-Bissau's plans and internal policies.

15. METODOLOGICAL PROCESS FOR THE PREPARATION OF THE NATIONAL ADAPTATION PLAN - NAPA

It should be stressed that the criteria for the choice of sectors to be targeted under sector study-diagnosis were set out taking as a reference CNI base lines.

According to the Letter on Agrarian Development Policy (CPDA), the country cannot ensure its food security without a diversification of its food production, including short-cycle animal production. The country is very dependent on rice. Since domestic production is not enough to cover local needs, most households in Guinea-Bissau utilize income from the sale of cashew nuts, the country's main export, essentially to cover the grain shortfall.

Other than the destruction of thousands of hectares of mangrove rice fields through floods caused by high tides during the preceding harvest season, the international price of cashew nuts fell substantially and thus reflected negatively on producer prices, from CFA 250 in 2005 to an average of CFA 100 in 2006. This fall in producer price has greatly constrained the financial capacity of the overwhelming majority of rural populations in the country, a fact that has had grave consequences at various levels and increased households vulnerability to hunger and/or malnutrition. Accounts from farmers coming from various regions in the country have confirmed this situation. Even religious mourning ceremonies had to be postponed because relatives lacked the required purchasing power (In Rádio Sol Mansi, rebroadcast by Rádio FM/Bombolom).

This choice is in line with the need to keep synergies between this programme and other international conventions, plans and internal policies of Guinea-Bissau.

16. METHODOLOGICAL PROCESS FOR NAPA PREPARATION

It need to be said that the choice of sectors to be covered by the sector study-diagnosis was done using as reference the CNI baselines. The communication included, among other aspects, an exhaustive analysis of the country's development priorities relating to climate changes and the institutional framework, with incidence on key sectors deemed as potentially vulnerable to climate changes, namely: the agrarian sector (agriculture, forests and livestock), fisheries, water resources, health and education.

NAPA CR supervised, fitted and facilitated at the local level the whole process entailing the carrying out of sector studies and the sounding out of actors and local populations. In all the country's administrative regions, both at regions' capitals and in a significant number of villages, workshops were held to allow the discussion and validation of sector reports prepared by experienced national consultants, focusing on the analysis of both national problems and problems specific to each region. Experts from NGOs specialised on rural animation were called upon to assist the consultants' team to run those sessions as facilitators of the whole process.

Following the validation of studies at three different levels (national, regional and community), the NAPA document for Guinea-Bissau, itself also a subject of analysis and validation by representatives from Government, Parliament, civil society organisations and populations, was prepared.

**17. NAPA'S RELATIONS WITH DEVELOPMENT PROGRAMMES
AND MULTILATERAL AGREEMENTS ON THE ENVIRONMENT**

Table n.º 11: List of projects relating to NAPA

| Denomination | Funding entity | Time period | Funding | Execution Entity | Relation with PD |
|--|-----------------------------|-------------|--|------------------|--|
| AGRARIAN SECTOR | | | | | |
| 1. Chinese Technical Agricultural Mission (for the development of small valleys) | People's Republic of China | 2006-2008 | | MADR | CPDA PRSP |
| 2. Structural Reduction of Food Insecurity in Guinea-Bissau Project | EU LVIA Beneficiaries | 2006-2008 | Euro 500,000 Euro 35,000 Euro 28,000 | LVIA | CPDA PRSP |
| 3. Strengthening of Agricultural Production Systems in Oio and Quinara Regions Project | EU LVIA Beneficiaries | 2006-2008 | | LVIA | CPDA PRSP |
| 4. Rehabilitation of Agrarian and Rural Sector Project (PRESAR) | AfDB GOGB | 2006-2010 | US\$ 8,526 US\$ 1,1025 | MADR | CPDA PRSP |
| 5. Quebo/Coli Horticultural-Fruticultural Project | EU Portugal | 2006-2010 | | MADR | CPDA PRSP |
| 6. Support to Development of Services of Agricultural Information, Documentation and Dissemination Project | CTA | 2006-2008 | Euro 42,583 | MADR | CPDA PRSP PAN-LCD PRSP |
| 7. Food Security Information Project | EU | 2006-2008 | Euro 2,000,000 | MADR | CPDA PRSP |
| 8. National Capacity Building for the Fight against Locusts Project | EU | 2006-2008 | Euro 1,150,000 | MADR/S PV | CPDA PAC/UEM OA PAN-LCD PRSP |
| 9. National Rice-Development Project (PNDA) | Kuwait | 2007-2011 | US\$ 4,300,000 | | CPDA PRSP |
| 10. Rural Rehabilitation and Community Development Project (PRRDC) | IFAD | 2007-2010 | US\$ 8,554,000 | MADR | CPDA PAC/UEM OA PRSP |
| FISHERIES SECTOR | | | | | |
| 11. Support to Fisheries Sector Project (PASP) | AfDB | 2006-2008 | US\$ 7,673,400 | MPER | |

The advance of the desert, particularly in the country's eastern and northern regions, constitutes a current reason for concern to CILLS member countries. The Guinea-Bissau government validated in December 2006 its National Plan of Action to Fight against Desertification (PAN-LC), which proposes to invest US\$ 27 million in the next 5 years in projects to mitigate the effects of desertification on populations, particularly as regards soil degradation, loss of vegetation cover, decrease of humid areas and agrarian productivity.

18. OBSTACLES TO IMPLEMENTATION

Obstacles to implementation can be summarised as follows:

1. Key actors' institutional weaknesses
2. Low level of knowledge on the part of populations and key actors on climate changes.
3. Unpredictability of effects of climate changes.
4. Possibilities to obtain sufficient resources for execution.
5. Expected difficulties regarding change in populations' attitudes and practices.

19. MEASURES IMPLEMENTED TO DEAL WITH CLIMATE CHANGES

The country pondered in the various development programmes it has implemented actions that had some bearing on mitigation efforts to climate change effects. The following actions may be summarised per each sector:

AGRARIAN SECTOR:

1. Agrarian Zone 1 Integrated Rural Development Programme, 1983-1994, (Northern Zone). This programme executed a broad set of rural extension and research activities that involved the collaboration of technical staff and producers and contributed to (i) setting up of a system of agricultural, grazing and forest production, (ii) construction of anti-salt dykes and/or recuperation of mangrove soils' productive capacity, (iii) construction of rural wells, (v) intensifying of horticulture, (vi) adoption of precocious-fire techniques in contrast to uncontrolled slash-and-burn practices, (vii) introduction of rapid-growth exotic forest essences as sources of firewood, and improved cookers, as a strategy to reduce firewood consumption, and (viii) granting of agricultural micro-credit (small agricultural tools, purchase of seeds and fertilizers).

2. Eastern Agrarian Zone's Integrated Rural Development Programme (PDRL-2), 1983-1993, (Eastern Zone). This programme performed actions involving its technical staff and farmers that helped to: (i) fight desertification through an extension of the agricultural, grazing and forest system, (ii) the fostering of horticulture, (iii) the use of large swaths of bas fonds for rice growing and horticulture, (iv) forest resettlement of some degraded areas, (vii) the building of community fountains, (vi) purchase of diverse agricultural material and equipment.

3. Programme of Support to Boé Integrated Development (PADIB), implemented in 1990-1998. This programme provided farmers in the country's easternmost area considerable support to their production efforts in the agricultural, fruticultural and horticultural fields and forest resources as well.

4. The agricultural, grazing and forest Project (PASP), whose execution involved a large participation of cattle raisers and farmers in the eastern region, contributed towards (i) the installation of agricultural, grazing and forest fields, (ii) the setting up of natural grazing areas in the dry season, (iii) the resolution of conflicts between cattle raisers and farmers concerning access to grazing areas and water, (iv) greater availability of food for animals during the dry season (production of hay), (v) reduction of forest fires, and (vi) extension of annual tree-planting by communities.

5. Tombali Rice-growing and Fruit-growing Project (PDOT), 1996-1998, a project that helped local communities to recover various hectares of mangrove soil for rice growing and to diversify their cultures, through the fostering of fruticulture, allowing them access to various agricultural materials and equipment and to carry out income-generating activities.

6. Komo-Caiar Rice-growing Development Project, implemented in 1985-1990, this project contributed towards the rehabilitation of mangrove soil for rice growing, dissemination of rice huskers and reinforcement of food security.

7. Agrarian Sector Rehabilitation and Development Programme, in 2006-2008. It will benefit populations in the Cacheu, Bafatá and Biombo regions and will focus on (i) food security through the rehabilitation/protection of rice fields destroyed by salt-water invasion, agricultural funding and institutional capacity building.

Environmental Sector

1. The Guinea-Bissau Biodiversity and Coast Management Project (PGBZCGB), being implemented in 2004-2010, aims at building national capacity in terms of nature conservation and biodiversity preservation through (i) the strengthening of management of the network of protected areas through IBAP, (ii) the development of regulating tools that integrate environmental costs in development decision-making, such as environmental-impact studies and (iii) reduction of impacts of human activity on species and habitats, through the financing of grassroots initiatives that contribute to a sustainable and rational use of natural resources.

2. Regional Programme of Support to the Integrated Management of Natural Resources (AGIR), whose phase I lasted from 2000 to 2006. This project, encompassing the country's eastern (Bafatá and Gabú) and southern (Tombali) regions, centred on the definition and protection of safe cross-border corridors of wild fauna (eastern and southern zone) as well as on the introduction of knowledge about the sustainable exploitation and utilization of natural resources.

Structural reforms

1. The Trade and Investment Promotion Support Project (TIPS), executed in 1994-1998, contributed towards the promotion of a market economy and the production, processing, and domestic and international commercialisation of six products deemed as strategic ones for Guinea-Bissau: rice, cashew, fisheries, non-wood forest products, fruit and vegetables. Legal and regulatory reforms, sustainable-management plans of fishing resources as well as the formulation of pro-market public policies were developed and adopted by the

authorities; numerous private-sector associations were assisted to emerge and consolidate their organisation and institutional-management capabilities.

2. Private Sector Development Project, 2000-2007, which assisted in the preparation of reform for the economic sector and in capacity building to the benefit of both private sector organisations and those of the public sector in the area of legal reform and the creation of an enabling environment to business.

3. National Good Governance Programme, implemented in 2002-2004 with the aim of strengthening governance capacity at different levels. For instance, it assisted in the formulation of the Environmental Management National Plan (PNGA).

Actions undertaken by NGOs

1. Other than these public programmes/projects, whose 90% of resources come from external assistance (grants or credit), NGOs settled in the country (local and foreign ones), have also implemented various activities in the fields of community development, micro-credit, capacity building and the environment (nature conservation and biodiversity preservation).

ANNEXES

PROJECT FILE N.º 1

Project Title: Support to the Diversification of Production and Food Diet Project.

Location: Quinara and Tombali regions

Justification:

Rice is the country's main food crop. It is produced both in the mangrove production system and in small valleys and uplands.

Despite being the country's main food crop local production can only meet 50%-55 % of national needs. The difference between supply and demand is covered by importations. The mangrove rice's production system (the country's main type) has been steeply degrading lately due to structural and occasional problems. The downward trend seen on rainfall patterns coupled with a rise in river waters' levels, thus leading to penetration of rice fields by salt water and their consequent destruction, tends to worsen. The 2005/2006 harvest may be quoted as an example to illustrate this point. Production in the south of the country was almost totally lost. This is was a very critical situation indeed but it also helped to awaken mangrove-rice growers (one-crop farmers) for the need to diversify production. The food shortage that set in led farmers to seek for alternatives themselves and we can see them currently growing cassava, sweet potato and yam. Despite being at a very reduced scale due to the insufficiency of vegetation material, it is already an initiative that may be utilised to launch a broad programme to diversify production as an alternative for cases of insufficient rain bearing in mind that the initiative and interest came from the farmers themselves. The project thus appears as a relief to the food insecurity problem caused by lack of rain or water penetration of mangrove-rice fields.

Project actions (production, processing and commercialisation) will be designed in such a way that beneficiaries will be responsible for their execution, and actions will have continuity after the project's completion.

Global objective:

Increase in food security

Specific objectives:

To foster the diversifying of production and consumption of foodstuff in the Quinara and Tombali regions.

Components:

- Production, processing and commercialisation of cereals;
- Production, processing and commercialisation of fruit and vegetables;
- Food and nutrition.

Expected results:

- A diversified consumption of local produce Production of vegetables in adequate quantity and quality.
- Populations become accustomed to consume a diversified mix of local produce with higher nutritional value.

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- Lower risk of food insecurity malnutrition.
- Increase in households' incomes through the commercialisation of surplus production

Beneficiaries:

Rural communities.

Institutional Implementation Framework:

Ministry of Agriculture and Rural Development, DGA, DSER, Directorate of Producers' Service Support, Ministry of Public Health.

Monitoring and Evaluation:

To be ensured by DGA, GAPLA, Directorate General of Environment and CAIA.

Risks and Barriers:

There are no risks and barriers that may jeopardise the project's implementation.

Project duration: 3 years.

Budget: US\$ 600,000

PROJECT FILE N.º 2

Project Title: Rural Zones Sanitation and Water-Supply Improvement Project

Location: Southern Province (Bolama, Quinará and Tombali regions) Eastern Province (Bafatá and Gabú regions)

Justification:

Potable water supply and sanitation are domains that affect populations' quality of life and public health. There is a need to increase the supply of potable water and sanitation services in villages in order to decrease the risk of waterborne diseases that are, in general, much frequent in the rural world. It should be recalled that the latest cholera epidemic, in 2005, registered about 25,000 cases and 400 fatalities (National Human Development Report, UNDP), due to bad sanitation conditions.

Global objective:

To improve access to quality water and reduce the risk of contraction of waterborne- and infectious diseases.

Specific objectives:

- To improve rates of access to quality water;
- To eliminate conditions that contribute to the appearance of cholera outbreaks and other diseases.

Components:

- Sensitisation;
- Construction of latrines and environmental sanitation;
- Construction of improved wells and boreholes.

Expected results:

- 60 % of population have access to potable water;
- Non-appearance of cholera epidemics and other diseases related to water consumption and sanitation conditions.

Beneficiaries:

Communities and schools

Institutional Implementation Framework:

The Directorate General of Water Resources will implement the "Construction of wells" component and components concerning sensitisation and the construction of latrines will be placed under the Ministry of Public Health, which will benefit from support of some NGOs.

Monitoring and Evaluation:

Components' supervising agencies and the donor, to whom the project management will be accountable and will submit reports for appraisal and approval, will ensure the monitoring of this project's activities.

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Risks and Barriers:

The main risk factors may arise from political instability and the mental attitude on the part of populations. Therefore, special attention ought to be paid to populations' sensitisation.

Duration: 2 years

Budget: US\$ 1.000,000

PROJECT FILE N.º 3

Project Title: Capacity Building in Prevention and Protection of Salt-Water Rice against High-Tide Invasion Project

Location: Country's Coastal Zone (Mangrove rice fields)

Justification

Salt-water invasion, driven by high tides into mangrove rice fields, remains the main cause of decrease in rice production in the mentioned ecosystem. On the other hand, protection of those rice fields remains the main obstacle against those fields' enhancement. In the last few years climate changes, especially man-made ones have accentuated worldwide resulting in global warming and a rise in average sea level. This latter aspect embodies concerns by littoral populations regarding physical protection of their ecosystems and biodiversity. Mangrove rice fields are part of this ecosystem and require pressing solutions for its rehabilitation and protection.

Almost every year high tides cause enormous damage to dykes and other infrastructure built for the control and protection of rice fields against salt-water invasion. This phenomenon occurs usually at the end of the rainy season, in September-October, after the finalisation of rice sowing and rice transplant. For that reason, any invasion of rice fields by salt in that time of the year may kill the rice plant since the decrease in rainfall makes it difficult to find enough additional water to wash off the salt thus introduced.

Global objective:

Improvement of the country's food security

Specific objectives:

To improve rice production in mangrove rice fields thanks to the implementation of preventive and protective measures against high-tide invasion.

Components:

- Rehabilitation of the country's main meteorological stations;
- Installation of PRESLOG automatic tide-level recording devices in different ports in the country;
- Training national technical staff in processing of meteorology, hydrology and hydro-metrics data;
- Systematic dissemination of information on rainfall, temperature and high tides in coastal areas;
- Technical studies (hydraulic and hydrologic) and designing of infrastructure for protection against, and control of, high tides;
- Execution of hydraulic works;

Expected results:

1. Hydrologic and hygrometric information is collected and disseminated so as to allow farmers to prepare each September and October (day and time) for the arrival of high tides.

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2. Rice fields are protected from the invasion of high tides through the building of enhanced dykes and the learning of new water control and management techniques.

3. Food insecurity associated to rupture in households' rice stocks is reduced thanks to an increase in mangrove-rice production levels (from 500-700kg/ha to 2500kg/ha).

Beneficiaries:

Rural communities and Directorate General of Meteorology

Institutional Implementation Framework:

A unit will be set up whose role will be to deal with the execution of project activities in strict collaboration with rural engineering services, INPA, regional offices of the Ministry of Agriculture and Rural Development and NGOs.

Monitoring and Evaluation:

Monitoring and evaluation will fall under the Ministries of Agriculture and Rural Development, and Transportation and Communications as well as on donors.

Risks and Barriers:

Project duration: 2 years

Budget: US\$ 600,000

PROJECT FILE N.º 4

Project Title: Observatory for Mangrove Monitoring and Evaluation Project

Location: Costal Areas

JUSTIFICATION:

Mangrove is a vegetation formation that is under tides' influence. It is found in coastal areas and is characterised by different species, of which: *Rhizophora*, tall mangrove, with an average height of 10 m, seen in littoral rims and riverbanks totally submerged by tides - it covers a riverbed of approximately 20-100 m in riverbanks; *Avicennia*, low mangrove, whose main difference from *Rhizophora* is its average height of approximately 5 m. This mangrove species is frequently felled and the respective soil is then utilised for rice growing ("Salt-water rice field "). *Lagunculária racemosa* and *Conocarpus erectus* (south of the country) are other mangroves-associated species that exist in the country.

This type of vegetation covered an overall surface of 287.000 ha in 1978, i.e., 10% of overall national territory, according to SCET. That area decreased to 250,761.1 (7% of the national territory) in 1993, according to GEOSYSTEMES). The functioning of this ecosystem is determined by tides, the water regime (rains in particular), deposit of sediments and temperature.

Other than its physical function (anti-erosion, protection against storms, etc.) mangrove has an ecological function of extreme importance for Guinea-Bissau's economy. It is considered as a zone for the reproduction and raising of maritime and terrestrial fauna, as well as sea birds (fish-spawning, feeding, growth, rest and refuge, etc.). A large part of molluscs and crustacean there produced constitute the main source of protein for many coastal ethnic groups. As an example, oysters glue themselves to its aerial roots, which normally are submerged at high tide, and many sea herbivorous animals seek its leaves to feed themselves. Its role in shrimps' reproductive cycle should be stressed, bearing in mind that most industrial fishing licences focus on shrimps and they have an important repercussion in the state budget.

However, despite the existence of preliminary information on the diminution or degradation of this vegetation formation, stemming especially from the clearing of mangrove for rice- growing purposes, fish smoking and the construction of roads, and their consequences in terms of rainfall decrease in the north of the country and increase in salinity, additional information and studies are need to document and quantify eventual changes in mangroves in the last decades. Thus a study of the dynamics behind those changes and a monitoring of changes that have occurred become pertinent.

Global objective:

- Setting up of a tool for mangrove's monitoring on ecologic and economic grounds;
- To provide a propitious framework for evaluation of projects and actions that have a direct or indirect impact on mangrove, thus setting out a reference framework on the functioning and ways to utilise this ecosystem in Guinea-Bissau's coastal areas.

Specific objectives:

This project aims specifically at:

- Improving scientific knowledge on mangrove's ecosystem and determining monitoring modalities;
- Protecting habitats and ecological processes and stabilising the littoral;
- Contributing towards mangrove organisation through an enhancement of its products;
- Making available technical-scientific bases for evaluation of projects and actions with direct and indirect impact on mangrove and proposing recovery measures for heavily degraded zones.

Expected results:

- Stations and Observatory office set up, equipped and endowed with qualified technical staff;
- Monitoring and research programmes are adopted on the basis of a strong institutional and technical cum scientific partnership;
- A manual on mangrove's protection and management measures, ecologic processes and littoral stabilisation is prepared and disseminated;
- Specific legislation and data bank exist;
- Different actors and modus operandi in the production field are identified;
- A manual on techniques and micro-projects aimed at the enhancement of mangrove products is prepared;
- The data bank contains sufficient information for studies on environmental impact (EIA);
- Proposals for the recovery of degraded areas are prepared and presented to decision-making entities.

Beneficiaries:

The main beneficiaries of this project are the State, universities, research institutions, entity in charge of coast planning, local government and local population.

Institutional Implementation Framework:

The National Mangrove Observatory (ONM) will operate with the structures shown in the organisation chart below.

ONM will be placed under the direct supervision of the Coast Planning Office. Its management will have a director, a coordinator for research programmes and monitoring, an administration and financial officer and a secretary. Its executive function will be to ensure the observatory's daily operations and management in its administrative, financial, personnel and programme area, as well as its relations with other peer institutions.

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The Inter-institutional Scientific Council is made up of different institutions that develop activities linked to the mangrove ecosystem. Its role consists in taking major decisions on scientific matters (appraisal and approval of research and monitoring programmes, evaluation of scientific performance) and advising management as regards procedures leading to decision taking by public authorities.

The following stations will be set up:

- Cacheu, for the country's northern and central areas
- Iemberem, for the south
- Orango, for the Bijagós archipelago

Each station will be run by a station head with research background and will have a technical staff member, who will report to the ONM director and the programme coordinator.

MONITORING AND EVALUATION:

Monitoring of ONM activities will be carried out by: (i) the supervising entity and donors, to whom the observatory will report through regular reports (ii) the scientific council, which, as earlier indicated, will be in charge of, inter alia, the validation of programmes, i.e., proposed actions and outcomes, and (iii) national institutional partners and the population at large, at regular restitution meetings, whose periodicity will be set out by the observatory's management.

RISKS AND BARRIERS:

The observatory's heavy dependence on external funding for the financing of activities, scientific research in particular. The second potential risk could be a conflict in project execution between institutions that work with mangroves, either directly or indirectly.

DURATION: 2 years

BUDGET: US\$ 800,000

PROJECT FILE N.º 5

Project Title: Coastal-Areas Erosion Monitoring Project

Location: Coastal Areas

JUSTIFICATION:

Guinea-Bissau has a coastal zone of approximately 270Km. That zone is characterised by an intense dynamics marked by accumulation and erosion spots along the coast and in some islands of the Bijagós archipelago. Some palpable examples may be quoted to illustrate this point. There is intense coast erosion in Varela beach, in the northwest, caused in part by direct wave action on the coast and, on the other hand, by rainwater falling out a cliff facing the coast. This phenomenon tends to worsen because of the increasing pressure of urbanization towards the coast. A plantation of ornamentation trees and some infrastructure that exist on the coast have been disappearing gradually.

Another zone with a visible erosion phenomenon is located in the islands of Bubaque and João Vieira, in the Bijagós archipelago. Erosion in Bubaque is linked above all to direct sea action (waves) on the coast and a stream of rainwater and water originating at Hotel Bubaque. This zone has an active escarpment whose erosion tendency is likely to last for many years. It is pertinent to underscore that part of the surrounding vegetation had already disappeared due to this phenomenon. Erosion in João Vieira is linked especially to the impact of waves on the coast and part of the natural vegetation has already disappeared.

There is little systematised information and in-depth studies that explain the causes and consequences of coastal erosion in Guinea-Bissau.

It is in such a perspective that a project for the monitoring (research-action) of coastal erosion should be seen, endeavouring to deepen knowledge about this phenomenon and its negative impact on the littoral in particular, and the environment in general, on Guinea-Bissau's coastal zone.

Global objective:

Production of a synthesis of multidisciplinary knowledge on coastal erosion and the workings of the coastal environment with a view to finding a tool meant to help in decision-making.

Specific objectives:

- Follow up with the aid of modern methods of remote detection and fieldwork of the status of erosion in critical sites on the above-mentioned coastal zone;
- Dissemination of information and knowledge about coast erosion;
- Proposals to minimise the coast-erosion phenomenon in specific critical zones.

Expected results:

- An easily accessible and usable data bank for involved local and international partners is set up;

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- An institution in charge of coast erosion monitoring and study is set up at a national level, in consensus with other institutions;
- Small-scale works to provide protection against coast erosion are carried out in critical locations;

Beneficiaries:

State, universities, research institutions, entity responsible for coast planning, local government and local population;

Institutional Implementation Framework:

The Ministry of Agriculture and Rural Development will be in charge of this project's supervision and the Coast Planning Office will ensure its technical execution, in partnership with universities and research centres from countries in the North, the Directorate of Geology and Mines and the Ministry of Public Works. In his context, universities, making use of students in training schemes or working on their thesis, will be in charge of the scientific monitoring of coast erosion developments in predefined critical sites.

The Directorate of Geology and Mines and the Ministry of Public Works will provide technical assistance, particularly as regards the proposal for the execution of small works that minimize the negative impact of erosion on the coast.

Monitoring and evaluation:

The project will be subject to regular multidisciplinary and inter-ministerial evaluation in accordance with policies and procedures set out by donors for the project's supervision and execution. Different reports will be prepared as per requirements set out by donors and the execution agency.

External auditing will be done regularly.

Risks and barriers:

The project's reliance on external funding constitutes the main risk facing the project. Another risk relates to national universities; none of the two universities has hitherto curricula and courses on natural sciences and the environment. Such a fact may affect the scientific monitoring of activities and the setting up of a data bank as well as a knowledge base on erosion and coast dynamics.

Duration: 3 years

Budget: US\$ 400,000 USD

PROJECT File N.º 6

Project Title: Evaluation of Impact of Climate Changes in Productive Sectors' Project

Location: Nationwide (Guinea-Bissau)

Justification:

Guinea-Bissau is a country whose coastal area corresponds to 61% of the national territory. Ecosystems in this zone are sensitive and vulnerable to nefarious effects of climate changes.

Negative effects from anthropic actions constitute one of the main factors that accelerate climate changes and, as result, increase natural resources' degradation and deterioration. Factors behind climate changes are visible through the extinction of various species and various problems related to human health are evident.

After independence several programmes, projects and sector development plans were implemented without taking into account environmental and social aspects. As a result, significant infrastructure is at risk and various species, habitats and ecosystems are endangered and degraded.

The country has a serious prospect of finding and eventually exploiting important deposits of minerals (Bauxite, Phosphate and Oil), which justifies the setting up of an early alert system for the prevention and evaluation of risks and the negative effects these activities may imply regarding the acceleration of climate changes.

Prevention is considered as the best way to protect, preserve and guarantee ecosystems' structural and functional equilibrium and related dynamics.

In this context, and aiming at reaching Millennium Development Goals and ensuring a sustainable development as per commitments made both locally and at the international level, the government set up in late 2004 a unit for the Evaluation of Environmental Impact (CAIA).

Through the creation of this unit the government aims at foreseeing, correcting, preventing, identifying and/or mitigating through environmental evaluation (environmental audits for projects being implemented and socio-environmental impact studies for projects being designed, evaluation of risks and natural and anthropic catastrophes) negative effects that anthropic actions (projects, programmes, plans and policies) cause and/or may cause on the environmental system.

This challenge requires awareness at all levels, an enormous availability of qualified technical and scientific capabilities, legal framework and norms and procedures as well as clear and well defined institutional aspects, material means and equipment.

This project fits into overall efforts to ensure technical, legal and institutional capacity at the national level in terms of environmental evaluation, particularly as regards the impact of climate changes in productive sectors.

Global objective:

- To ensure national capacity building in the field of environmental and social evaluation of negative effects of climate changes on development sectors and projects, programmes, plans and sector development policies;

Specific objectives:

- Strengthening of technical capacity (sensitisation, training, empowerment and specialization) of national technical staff in environmental evaluation;
- Strengthening of a legal and institutional framework that is appropriate, acceptable, credible and stable;
- Setting up of an adequate mechanism for an environmental evaluation and monitoring of negative effects of changes before, during and after the implementation of projects, programmes, plans and policies.

Expected results:

- Guinea-Bissau provided with a credible institution in terms of studies of assessment of social and environmental impact;
- Sector guides, Guidelines and Manual of Procedures on environmental evaluation prepared, published and disseminated in all local mass media;
- Permanent mechanism for the monitoring and evaluation of negative effects of climate changes and anthropic actions set up;
- Legal framework set up, published and disseminated in all local mass media;
- Data bank set up and available for users.

Beneficiaries:

National cadres and staff, the government, Guinean population, investors, local communities and the international community will be the main beneficiaries

Institutional Implementation Framework:

The body responsible for the implementation of this project is the unit for Evaluation of Environmental Impact, in joint collaboration with development partners.

Monitoring and evaluation:

The project will be subject to a regular evaluation in accordance with the policy and procedures set by donors and the government for the project's supervision and execution. The project head will submit each year a half yearly report and an annual synthesis. He will submit also a final report at the end of the project. The different reports will be sent to the government, donors and the agency.

Risks and Barriers:

The main risk relates to the State's dependence on projects financed from abroad.

DURATION: 2 years

BUDGET: US\$ 350. 000

PROJECT FILE N.º 7

Project Title: Project Promotion of Small-scale Irrigation Schemes in Geba and Corubal rivers' Project

Location: Bafatá, Gabú and Tombali regions.

Justification:

Guinean agriculture remains predominantly dependent on rainfall, which does not allow high yields in agricultural production. This situation is compounded by the influence of climate factors namely in years where there are long time intervals without rain. In the Gabu region, Pitche and Pirada suffer from seed losses and populations are forced to sow again their seeds; production shortages losses and sudden rain stoppages do not allow cultures to complete their vegetative growing cycle.

Yet, there are considerable potentialities and actual water resources, particularly in Corubal River. This opportunity is far from being tapped. The use of water resources and the optimisation of the use of lands in Geba and Corubal riverbanks for irrigation would be an alternative in the search for solutions to diminish the risk of effects of low rainfall and water shortage for agriculture. Irrigated agriculture allows the employment of modern control and management techniques, leading to high production yields.

Global objective:

Increase in food security.

Specific objectives:

To increase agricultural production through the employment of efficient techniques for water control and management.

Components:

- Technical studies
- Hydro-agricultural execution
- Beneficiaries' training and fitting.

Expected results:

- Potential sites for agricultural development identified and surveyed.
- Summarised ante-project files prepared in search for funding to enable projects' expansion.
- Hydro-agricultural and development works in a perimeter of approximately 100 hectares per year.

Beneficiaries:

Farmers' associations, rural communities, private sector.

Institutional Implementation Framework:

Ministry of Agriculture and Rural Development, DGA, DSER.

Monitoring and Evaluation:

Supervising entity (MDRA), Directorate General of Environment, CAIA, NGOs, farmers' organisations and partners.

Risks and Barriers:

Conflicts may arise on land tenure, cattle transhumance and other aspects that the project needs to clarify. Steps will have to be taken at the outset to overcome existing risks.

Duration: 3 years

Budget: US\$ 800,000

PROJECT FILE N.º 8

Project Title: Natural-catastrophe Prevention Project

Location: Nationwide

Justification:

Guinea-Bissau has a surface of 36 125 km². Its overall population is 1 200 000 inhabitants. The country is frequently hit by drought, floods and erosion like in other West African countries. Drought and the danger of accelerated desertification threaten a weak economy and lead to a population exodus towards the countryside.

The government, aware of the situation, has formulated a number of guidelines, of which one relating to the prevention of catastrophes thanks to meteorological information. Unfortunately, meteorology and hydrology services are currently unable to provide an effective contribution into a natural-catastrophe prevention system due to the existing insufficiency in terms of specialised personnel for the application of new technologies and methodology in this field.

On the other hand, lack of equipment and weak management means, coupled with the absence of a national plan for situations of natural catastrophes, need to be taken into consideration under this project. A coherent training and specialisation programme is of capital importance and urgency.

Global objective:

The project's global objective is to contribute towards an improvement in populations' living conditions and the protection of the environment and production against effects of natural catastrophes, particularly those related to meteorological and hydrological phenomena through the setting up of an appropriate system of meteorological and hydrological prevention and the dissemination of warnings and advice to users in particular and the population in general.

Specific objectives:

- To establish a national centre for meteorological and hydraulic prevention supplied with equipment and qualified personnel capable to ensure the operation of the mentioned centre;
- To educate and sensitise populations on meteorological and hydrological phenomena likely to provoke natural catastrophes;
- To provide meteorological and hydrological information and forecasts through the national committee whilst improving at the same time aeronautical, maritime and fluvial forecasts.

Expected results:

- Population sensitised and educated on meteorological and hydrological phenomena likely to cause natural catastrophes;

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- A group of meteorologists and hydrologists at the national meteorology centre, personnel from other services, including provincial officers involved in the fight against natural catastrophes, trained;
- Grade IV meteorology and hydrology personnel trained.

Beneficiaries:

- National decision makers for the prevention, planning and the fight against natural catastrophes caused by meteorological and hydrological phenomena;
- Transporters (aeronautical, maritime and fluvial) and fishermen;
- Farmers.

Institutional Implementation Framework:

The Directorate General of National Meteorology National (DGMN), Ministry of Transportation. Taking into consideration contributions of activities relative to natural-catastrophe prevention, all technical services from the Ministries of Natural Resources, Interior, Defence, Rural Development, Information and Communication will be associated to the project's implementation. A national project-monitoring project committee may be set up with the participation of the Ministries of Planning and Public Health.

Monitoring and evaluation:

The project will be subject to regular evaluation in accordance with the policy and procedures set out by donors for the project's supervision and execution. The project head will submit a half-yearly report and a yearly synthesis report each year. He will also present a final report at the end of the project. The different reports will be sent to the government, finding agencies and execution agency.

An overall evaluation of project outcomes will take place in the first and third years of its execution, according to procedures set out by financing agencies. Donors will organise evaluation missions in collaboration with the execution agency and the respective outcomes will be communicated to governmental entities.

Risks and Barriers:

The project's main risk lies in the State dependence towards projects funded from abroad. Those projects may arrive to and end without assurances of continuity to actions started. Another risk relates to the creation of a budget line needed to ensure the employment of trained cadres and effective outcomes on numbers and quality with a view to retaining those cadres after the project's completion. To deal with the risk, donors' financial contribution will be important throughout project implementation in order to allow a gradual transfer of project to national structures.

DURATION: 3 years

BUDGET: US\$ 300,000

PROJECT FILE N.º 9

Project Title: Protection, Conservation and Enhancement of Fishing and Coastal Resources Project

Location: Nationwide

JUSTIFICATION:

Guinea-Bissau has one of the broader continental platforms in West Africa, with an approximate surface of 53 000 Km². Its maritime part, including the Bijagós archipelago is characterised by the existence of sand banks and shallow canals that may go 20 metres deep, thus making difficult navigation by large vessels. This zone is considered as one of reproduction, growth and feeding to various sea species. This is justified by the quantity and diversity of fishing and coastal resources found in the Guinean coast, without forgetting the contribution of the resurgence phenomenon that brings with it a large quantity of nutrients to feed sea fauna.

This richness in fishing resources attracts fishermen from sub-region countries namely: Senegal, Guinea-Conakry, Sierra Leone and Ghana, who set themselves up in illegal fishing camps in the islands or along the coast where they freely carry out their fishing activities. Fishing arts and types practised in many of these camps are inappropriate: they range from the use of forbidden nets to the cutting of sharks' fins to the clearing of mangrove for fish smoking.

This situation goes on at a time when Guinea-Bissau authorities lack means under a coherent surveillance policy for the artisan fishing carried out by foreign fishermen. Various conflicts have taken place between local populations and foreign fishermen.

This project is part of the aim to ensure a participatory management of fishing resources to the benefit of Guinea-Bissau coastal communities through the appropriation of their water space and resources.

Special attention will be paid to local development initiatives, placing emphasis on a rational exploitation of coastal fishing resources, the processing of fishing resources and their commercialisation with economic advantages for the local population.

Global objective:

The project's overall objective is to ensure the sustainable co-management and exploitation of fishing resources in coastal areas to the benefit of local populations.

Specific objectives:

- To seek viable solutions, in collaboration with all stakeholders in this production field, for a responsible management of sea and coastal resources and environment;
- To foster the sector's sustainable development through catch enhancement, mangrove and sea products, thus contributing to the fight against poverty affecting involved communities;
- Setting up of a durable institutional mechanism aiming at mediating conflicts around the utilisation of coastal fishing resources between users;

Expected results:

- Fishing resources are well managed and a monitoring system makes available data discussed with partners (fishermen, managers and economic interest groups) to manage and regulate annual exploitation of resources;
- Living conditions of fishing communities and other stakeholders are improved through fish processing, conservation, and commercialisation activities;
- An effective fishing-surveillance system is set, implemented and appropriated by fishermen residing in pilot villages;

Beneficiaries:

Local communities living in the coastal area, and those population segments that depend directly on fishing for their living are the main beneficiaries.

Institutional Implementation Framework:

The Ministry of Fishing and Sea Economy is the supervising agency and technical execution will be placed under the Directorate General of Artisan Fishing in partnership with local NGOs and grassroots associations;

MONITORING AND EVALUATION:

The project will be subject to regular evaluation in accordance with the policy and procedures set out by donors and the government for the project's supervision and execution. The project head will submit a half-yearly report and a yearly synthesis report each year. He will also present a final report at the end of the project. The different reports will be sent to the government, funding agencies and execution agency.

Risks and Barriers:

The project's main risk lies in the State dependence towards projects funded from abroad. The lack of commitment by local population towards the project may constitute an important risk since Guineans are not traditional fishermen but rather farmers. Benefits may go towards foreign fishermen.

DURATION: 2 years

BUDGET: US\$ 450,000

PROJECT FILE N.º 10

Project Title: Integrated Food-Security Information System Project (SISA)

Location: Nationwide

Justification:

Great disturbances have affected agricultural production lately as a result of the late start of the rainy season and bad rainfall distribution across time. This situation has led to an insufficient supply of agricultural products to populations, rural ones in particular. Services charged with the monitoring of food production through the provision of information on rainfall, cultivated areas, expected income and production levels, animals' and cultures' phytosanitary situation, foodstuff availability in markets, namely agricultural statistics, vegetation protection services, livestock and meteorology services are not operating well due to lack of necessary and adequate means. Hence, it has not been possible to follow up on vulnerability and food security and the consequences translate into considerable delays and even in the non-mobilization of necessary assistance for populations facing food shortage. The situation becomes more serious when the nutritional status of children, pregnant women and elders is affected. This is due to lack of information to allow a rapid reaction based on real data. This is the reason behind the SISA project, which aims at building the capacity of units dealing with the gathering, processing, analysis and dissemination of information about the climate and availability, access and stability of food items, as well as information about the market for those produce.

Global objective:

Increase in food security

Specific objectives:

To ensure the availability of credible data about the different vulnerability, production and food security parameters.

Components

The early warning system (SAP EWS) and the market monitoring system (SIM MMS) are the components of this project.

Expected results:

- Yearbooks on food production and bulletins on food and meteorology situation published.
- Market bulletins published.
- Information available on a timely manner.

Beneficiaries:

GAPLA, Vegetation Protection Services, Agricultural Statistics, Livestock Services, Meteorology and Food Security Office and populations.

Institutional Implementation Framework:

GAPLA on behalf of the Ministry of Agriculture and Rural Development.

Monitoring and Evaluation:

GAPLA/DSSP

Risks and Barriers:

Non-allocation of funds in state budget for services involved in SISA

Duration: 2 years.

Budget: US\$ 300,000

PROJECT FILE N.º 11

Project Title: Environmental Education and Communication in Coastal Areas Project

Location: All coastal areas in Guinea-Bissau

JUSTIFICATION:

Climate changes are pointed as one of the main threats against our country's sustainable development. Pressure man has been exerting on natural resources to ensure his daily subsistence; the existence of production systems directly associated to widespread poverty situations, which provoke land degradation, coast erosion, an indiscriminate cutting down of large trees for commercial purposes, shortage of potable water, an increasing reduction in underground water, drought in the east and floods on rice fields in the south due to rises in sea level show that Guinea-is very vulnerable to climate changes.

The present project is proposed bearing in mind the low level of awareness about the existing risks and consequences arising from the above-mentioned environmentally-negative practises and the degree of the country's vulnerability to climate changes.

Global objective:

To contribute towards raising environmental awareness among Guinean populations, particularly as regards impacts of climate changes on main sectors for the development of economic activity.

Specific objectives:

- Strengthening of technical capacities and competences of target groups in adaptation to climate changes through natural resources' management and biodiversity conservation;
- To raise populations' awareness through specific programmes on private and community radio stations focusing on climate changes through a rational management of natural resources and biodiversity.

COMPONENTS:

Environmental education and communication on climate changes through a rational management of natural resources and biodiversity under the fight against poverty.

Expected results:

- Training and upgrading sessions held to the benefit of teachers and journalists from private and community radio stations concerning climate changes through a rational management of natural resources and biodiversity;
- Workshops and studies organised aiming at the dissemination of the Convention on Climate Changes and Biodiversity and national communication on NAPA;
- Lectures organised in high schools, universities, training schools on climate changes on a rational management of natural resources and biodiversity;
- Radio debates organised at Environment and Culture Houses and among grassroots communities about climate changes on a rational management of natural resources and biodiversity;

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- Debates organised in private radio stations focusing on climate change on a rational management of natural resources and biodiversity;
- Programmes produced in private, public and community radio stations and national TV on climate changes and a rational management of natural resources and biodiversity;
- Advertisement spots and information magazines produced on climate changes and a rational management of natural resources and biodiversity at Rádio Pindjiguiti;
- Photo exhibitions organised about the effects of climate changes on priority national development sectors at cultural centres, Environment Houses and in schools;

Beneficiaries:

Populations living in areas most vulnerable to climate changes

Institutional Implementation Framework:

ONG GAEC PALMEIRINHA

Monitoring and evaluation:

The PALMEIRINHA NGO, in close collaboration with the National Environment Institute, will carry out project monitoring and evaluation.

Risks and barriers:

Political instability during the project's implementation and late disbursing of funds after the project's approval.

DURATION: 3 (three) years

BUDGET: US\$ 200.000

PROJECT FILE N.º 12

Project Title: Rehabilitation of Small Perimeters of Mangrove Soils for growing of rice

Location: Quinara, Tombali, Bafatá e Oio

Justification:

Potable water supply is a domain that affects populations' life quality and public health. The aim is thus an increase in the supply of drinking water in order to decrease the risks of contracting waterborne diseases, which are frequent in the rural world. It should be recalled that the latest cholera epidemic, in 2005, registered about 25,000 cases and 400 fatalities (National Human Development Report, UNDP), due to bad sanitation conditions.

Global objective:

To improve access to quality water and reduce the risk of contraction of water- and infectious diseases.

Specific objectives:

- To improve rates of access to quality water;
- To eliminate conditions that contribute to the appearance of cholera outbreaks and other diseases;

Components:

- Reforestation;
- Conservation and protection.

Expected Results: To increase vegetation cover with drought-resistant species. Improved soil constitution. Integrated management of land in villages by communities is strengthened.

Beneficiaries: Local populations, sector administrative services

Institutional Implementation Framework:

The Directorate General of Water Resources will implement the "Wells building" component and components that relate to sensitisation and construction of latrines will be placed under the Ministry of Public Health, with support from NGOs.

Monitoring and Evaluation:

Supervising entities and the donor will monitor project activities and project management will be accountable and submit reports for their appraisal and approval.

Risks and Barriers:

Main risk factors may relate to political stability and lack of change in populations' mental attitudes. Therefore special attention sought to be paid to sensitisation issues.

Duration: 2 years

Budget: US\$ 500,000

PROJECT FILE N.º 13

Project Title: Support to Production of Short-Cycle Animals Project

Location: Nationwide

Justification:

The short-cycle-animals' raising project should be seen as a food security strategy designed for rural and semi-urban communities. Climate changes lead to uncertainty in the production of vegetal foodstuffs and that calls for the seeking of other alternative sources of food, e.g., animal protein to feed our population. Guinea-Bissau has an enormous potential in grazing land plus a population well experimented in raising animals, assets that need to be optimised. Short-cycle livestock is a quick source of income, especially for women that may draw great benefits from it and hence improve their families' living conditions, thus contributing to poverty relief in the rural world. This project aims at augmenting production of meat and animal proteins, and enhancing fishing and agricultural sub-products for animal feeding culminating in an improvement in rural populations' living conditions.

Global objective:

To increase food security.

Specific objectives:

To increase production and consumption of animal food items (meat, milk, eggs, etc.).

Components:

- Production modernization;
- Animal health;
- Institutional support;
- Training and fitting;

Expected results:

- 10 pilot units for training and demonstration nationwide are set up;
- Consumption of meat, milk, eggs and other produce from animal sources increases nationwide;
- Higher household incomes;

Beneficiaries:

Animal raisers, NGOs, population and farmers' organisations;

Institutional Implementation Framework:

Ministry of Agriculture and Rural Development (MADR) and Directorate General of Livestock (DGP).

Monitoring and Evaluation:

Monitoring and evaluation will be placed under DGP, GAPLA, Directorate General of Environment, Environmental Impact Evaluation Unit.

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Risks and Barriers:

- ~ Lack of a master plan for livestock development
- ~ Non-approval by parliament of regulations governing the implementation of the Land Law.

DURATION: 2 years.

BUDGET: US\$ 400.000 (Two hundred thousand dollars)

PROJECT FILE N.º 14

Project Title: Reforestation of Degraded Zones Project

Location: Cambaju, Contuboel Sector (Bafatá region); Pitche, Sonaco (Gabú region)

Justification:

The marked disappearance of vegetation cover in areas in Cambaju due not only to negative growing practises and the predominant growing of cotton and groundnuts added to an itinerant agriculture, associated to animal grazing and the intense exploitation of resources by local populations, make easier not only the erosion and sedimentation of small valleys usable for agriculture but also the area's desertification.

The degradation progresses and extends already further into the Contuboel sector. This means that if it the situation is not addressed quickly through reforesting actions it may become soon an ecological disaster for the whole Gabú region, an area already arid and under strong influence from the Sahel.

Global objective:

Rational utilization of agricultural, grazing and forest resources;

Specific objectives:

To recover soils and increase forest cover in degraded areas;

Components:

- Reforesting;
- Conservation and protection;

Expected results:

- Larger area of vegetation cover, consisting of species that are adaptable to drought;
- Improved soil constitution;
- Better-integrated management of village lands by communities;

Beneficiaries:

Local population, regional and sector administrative services;

Institutional Implementation Framework:

Ministry of Agriculture and Rural Development through the Directorate General of Forests and Fauna;

Monitoring and Evaluation:

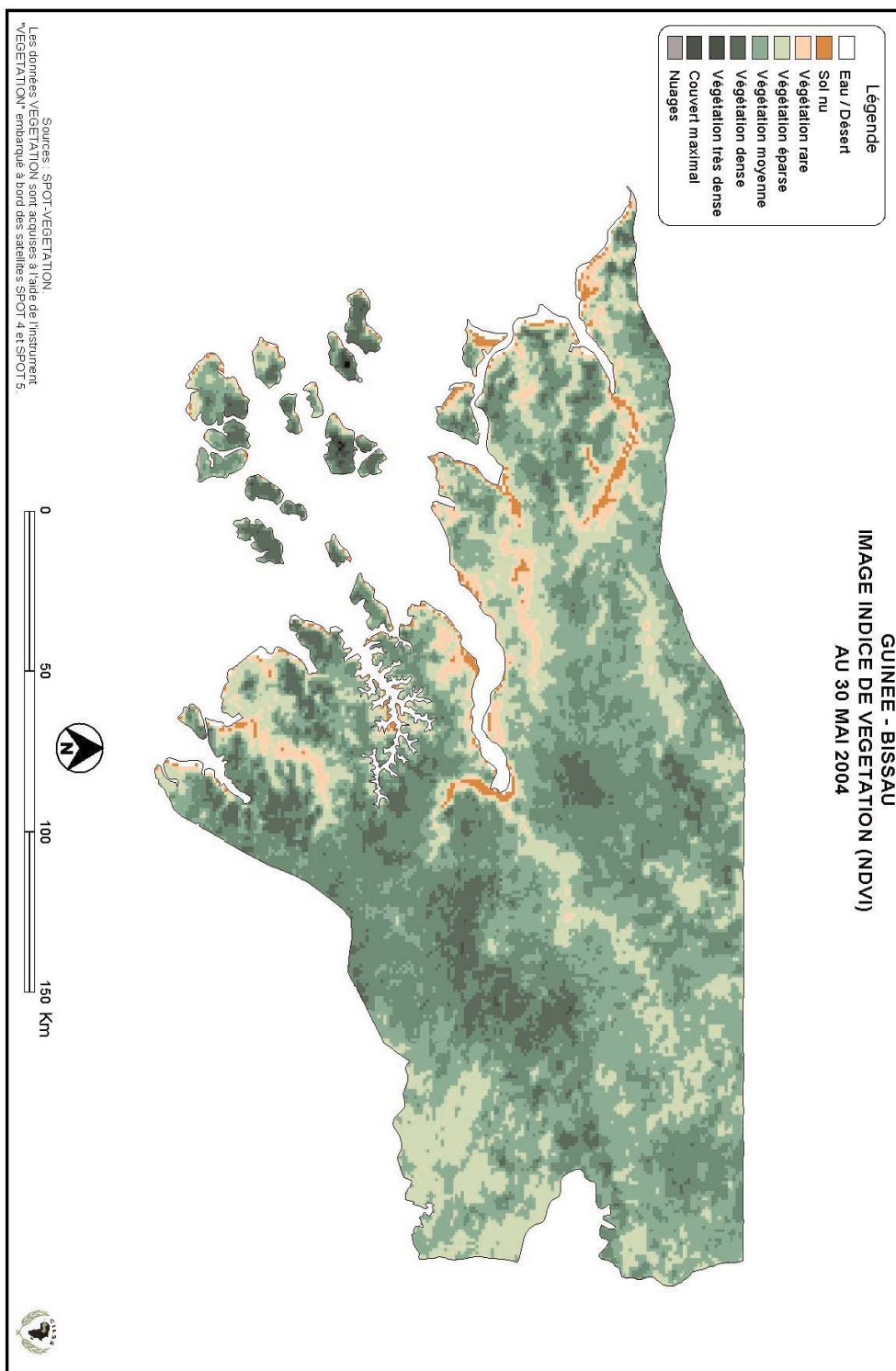
Directorate General of Forests and Fauna, GPPLA and IBAP;

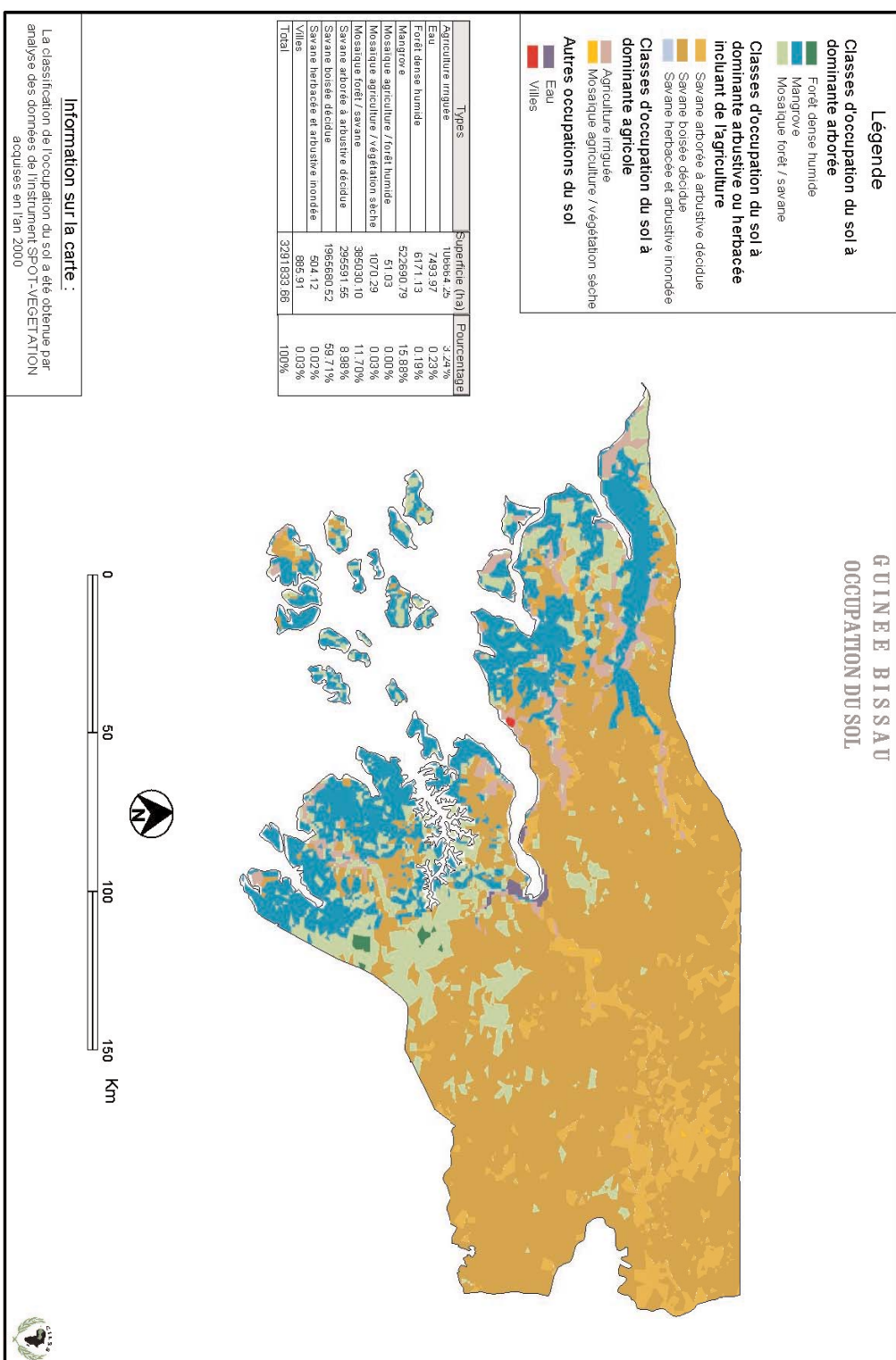
Risks and Barriers:

Lack of rigour in the application of forest laws;

Duration: 2 years.

Budget: US\$ 500,000







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- **CIPA Plan of Action (see section on agriculture, forests and livestock)**
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Title: National Programme of Action on Adaptation to Climate Changes - NAPA

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Pages: INACEP

Pictures: Eng.º Alexandre Cabral

Printing and editing: INACEP/2007

REPUBLIC OF GUINEA-BISSAU

***National Programme of Action of
Adaptation to Climate Changes***

Ministry of Natural Resources and Environment
Government of Guinea-Bissau

December 2006