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ACRONYMS AND ABBREVIATIONS

AAI	-	Water Collection Amoreira I
AFB	-	Afriland First Bank
AGER	-	General Regulatory Authority
AM	-	Resident Association
BISTP	-	International Bank of S.Tomé e Príncipe
CD/GR	-	District Council and Local Government
CIAT	-	Centre for Agricultural Research and Technology
CIPD	-	International Conference on Population and Development
CN	-	National Communiction
CNE	-	National Centre for Diseases
CO_2	-	Carbon Dioxide
COBSTP	-	Commercial Bank of S.Tomé e Príncipe
NCDPR	-	National Committee for Disaster Preparedness and Responses
COP	-	Conference of Parties
CP	-	Port Authority
CPLP	-	Community of Portuguese Language Countries
UNFCCC	-	United Nations Framework Conventionon Climate Change
CS	-	Social Communication
DF	-	Forestry Department
DGA	-	Directorate General for Environment
DGAg	-	Directorate General for Agriculture
DI	-	Directorate of Industry
DJF	-	December, January and February
DP	-	Directorate of Fisheries
DPCB	-	Directorate of Civil Protection and Fire
DPO	-	Directorate of Public Works
DRNE	-	Department of Natural Resources and Energy
DSGC	-	Department of Geographic and Survey Services
DT	-	Department of Treasury
EB1	-	Basic Education Level 1
E-CO_2	-	Carbon Dioxide Equivalent
EE	-	Energy Efficiency
EMAE	-	Water and Electricity Company
ENRP	-	National Strategy for Poverty Reduction
USA	-	United States of America
FA	-	Armed Forces
FAO	-	United Nations Food and Agriculture Fund
FONG	-	Federation of NGOs in Sao Tome and Principe
GCM	-	Global Circulation Model
GHG	-	Greenhouse Gases
GEF	-	Global Environmental Facility
GHG	-	Greenhouse Gases
HAM	-	Ayres de Menezes Hospital
ICN	-	First National Communication
IDH	-	Human Development Index
IEC	-	Information, Education and Communication
IGEE	-	Inventory of Greenhouse Gas Emissions
IMAP	-	Marítime and Port Authority

INE	-	National Institute of Statistics
INM	-	National Institute of Meteorology
HBS	-	Household Budgetary Suvey
IPCC	-	Intergovernmental Panel on Climate Change
IRD	-	Institute Research Development
ISP	-	Higher Polytechnic Institute
IST/SIDA	-	Sexually Transmitted Infections
IUCAI	-	Graduate Institute of Accounting, Administration and Information
JJA	-	June, July and August
MAM	-	March, April and May
MARAPA	-	Sea, Environment and Fishing Craft
MC	-	Climate Change
MDL	-	Clean Development Mechanism
MEC	-	Ministry of Education and Culture
MECF	-	Ministry of Education, Culture and Training
MFC	-	Ministry of Finance and Cooperation
MOPRN	-	Ministry of Public Works and Natural Resources
MPD	-	Ministry of Planning and Development
MS	-	Ministry of Health
NAPA	-	National Adaptation Program of Action
NE	-	North East
OGE	-	State Budget
OMD	-	Millenium Development Goals
NGO	-	Non Governmental Organisations
PADRHU	-	Human Development Resources Support Project
WFP	-	World Food Programme
PASS	-	Social Sector Support Project
PDSA	-	Decentralised Social Security Project
PIB	-	Gross Domestic Product
PNADD	-	National Programme on Environment for Sustainable Development
PNS	-	National Health Policy
UNDP	-	United Nations Development Programme
RBM	-	Roll Back Malaria
RNSTP	-	National Radio of Sao Tome and Principe
SEFSTP	-	Emmigration and Boarder Service of Sao Tome and Principe
SCN	-	Second National Communication
SON	-	September, October and November
SR	-	Reproductive Health
SRES	-	Scenarios of Rising Sea Waters
STD	-	Sao Tome Dobras
STP	-	Sao Tome and Principe
TAR	-	Technical Analysis Report
TNT	-	Trinitroglicerine (1,2,3 propano triol)
TVS	-	Santomean Television
UNICEF	-	United Nations International Children's Emergency Fund
USD	-	American Dollars
V & A	-	Vulnerability and Adaptation
VC – VCC	-	Volume of commercial timber-producing species with commercial values
VIH/SIDA	-	Human Immunodeficiency Virus
ZC	-	Coastal Zone

JDZ - Joint Development Zone
EEZ - Exclusive Economic Zone

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The preparation of the Second National Communication had the support of the GEF (Global Environment Facility, UNDP and the Ministry of Public Works and Natural Resources, coordinated by the Directorate General for Environment.

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PREFACE

Climate change is interpreted as a global phenomenon on a global scale, although the member countries of the United Nations Framework Convention on Climate Change (UNFCCC) have a common but differentiated responsibility for each according to their levels of pollution through which are classified as "Annex I", i.e. the Developed Countries and the "non-Annex I" Developing Countries, such as Sao Tome and Principe.

Some subsidies related to the process of negotiating new measures to be taken by governments, taken from the 4th Assessment Report (AR4) of IPCC published in 2007 provide guidance to Parties accordingly.

S. Tome and Principe, a "non ANNEX I" country, has no obligation to comply with specific emission quotas, but also undertakes to make every effort to ensure that reduction targets are achieved, namely to reduce current emission levels similar to 1995, or keep them at current levels.

This check is done through the National Communications (NC) that comply with specific rules in accordance with decision 17/CP.8 of the Conference of Parties Article 4, paragraph 1 and Article 12, paragraph 1, of the United Nations Framework Convention on Climate Change (UNFCCC), which gives the obligations to each party in order to report to the Conference of Parties (COP) information about its emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol (IGEE).

Indeed, the SCN aims to ensure the publication and dissemination of a report containing synthesized information on climate change at the national level as a result of consultations and studies undertaken during the period from 1988 to 2005, year of reference for the ICN and the SCN, respectively.

With this in mind, there was a greater effort of the national authorities in the sense that the emission results, as well as mitigation and adaptation presented in this SCN, correspond to the recommendations of the IPCC and the COP.

Indeed, in this SCN are included in the inventory of emissions of greenhouse gases methods recommended in AR4 (4th IPCC assessment report) through the spreadsheets reviewed in 1996. This information is prepared taking into account aspects such as the same consistency, transparency and comparability.

On the other hand, a report was elaborated on the proposed mitigation, taking into account the adverse effects of climate change already being felt, assisted with the effects of anthropogenic actions on the environment in Sao Tome and Principe.

This will allow greater objectivity in identifying the subject target of vulnerability assessment and develop strategies and measures to strengthen the capacity of Sao Tome and Principe, with respect to issues related to climate change through its gradual integration in sustainable development, particularly in National Strategy for Poverty Reduction (ENRP), Food Security, among others.

The Minister of Public Works and Natural Resources

Carlos Vila Nova

EXECUTIVE SUMMARY

National Circumstances

The Democratic Republic of S. Tome and Principe is an archipelago of volcanic origin, located in the Gulf of Guinea and covers an area of 1001 km^2. It consists of two islands and several islets and is characterized by a very rugged topography. The highest points are the Peak of Sao Tome (2024m), in Sao Tome and the Peak of Principe (948m), in Principe.

It lies 300 km off the coast of Africa between parallels 1° 45 'N and 0º 25' South and longitude 6° 26 'East and 7 ° 30' West.

The political regime in the Democratic Republic of Sao Tome and Principe is a semi-presidential system in which political power is exercised through the organs of sovereignty, including President of the Republic, National Assembly, Government and the Courts.

The climate is tropical humid with rain throughout most of the year and rainfall is around 800-900 mm per year. There are two stations of which one of them is recorded rainfall during the corresponding nine months period from September to May and the other dry, called "Gravana" for a period of three months from June to August.

Temperatures registered in Sao Tome and Principe, both, the minimum, the maximum and the mean, did not change significantly during the period 1951 to 1977, moving the average, 21.3 ° C, 29.3 and 25.3 ° C º C, respectively.

However, there is an intermediate station called "Gravanito" that occurs transiently during the months of December and January, during which there is displacement of the mass of dry air, laden with suspended dust from the Sahara Desert toward the inter-tropical convergence zone. It is characterized by a decrease in precipitation and an increase in average air temperature. At this time of the year, the winds blow South – Southwest (SSW) and West-Southwest (WSW).

The Coastal Zone of Sao Tome and Principe and Principe extends from the boundary of the Exclusive Economic Zone (EEZ) that starts at 200 nautical miles to 100m altitude, from the coastline.

There, you can find various ecosystems, including the marine, terrestrial and those of the immediate zone, where a varied fauna and flora exist.

The coastal temperatures are higher (26 ° C) from March to May but are relatively lower in July and August (23 ° C to 23.5 ° C).

Most of the rocky coastline is very rugged with relief, but there are numerous sandy bays that make up a whole system of beaches along the coast.

Sao Tome and Principe has forests with abundant vegetation whose characteristics vary depending on several factors including the topography, altitude and thus microclimatic characteristics of each region.

The difficult economic situation of the populations has led to indiscriminate felling of trees for charcoal production, firewood and lumber all over the country, except in protected areas.

The decomposition of wood chips on one side and burning due to high temperatures resulting from the modification of the vegetation make the island's forests a source and also a consumer of CO2. The phenomenon of forest fires is a threat to the balanced management of forests and soils, because it pollutes the atmosphere, causes the loss of biodiversity and soil degradation.

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According to studies conducted by ORSTOM / SGTE (April to October 1982) and campaigns by the Soviet Navy Oceanographic vessel (March 1983 and February-March 1986), the fishery potential comprises the area for artisanal fishing, which is about 8500 t / year for coastal pelagic species (1500 t being in Sao Tome and Principe in 7000 t) and 3500 t / year (being 1500 t Sao Tome and Principe in 2000 t) for demersal species.

According to the results of the second "National Forest Inventory" in 1999, there exists for the whole archipelago of Sao Tome and Principe a total volume of standing timber under bark of 12.8 million m3, considering all species and 2.7 million m3 of commercial timber-producing species of useable timber in joinery, carpentry and construction. There are about 6.8 million m3 of wood with commercial dimensions (VDC-VC), but lower quality and less likely to use.

The Savannah area has an estimated area of 4,140 hectare, according to A. Castanheira Dinis and G. Cardoso de Matos, 2001. It covers the entire northern and northeastern part of S. Tome and northeast of the island of Principe. The predominant vegetation is characteristic

of semi-arid microclimate (500-700mm of rainfall and average temperature of 26 ° C), characterized by the presence of scattered trees and shrubs and a large grassy carpet.

With a gross domestic product per capita of 1,231 U.S. Dollars in 2009 (Nationl Statistics Institute – INE, 2011), the Democratic Republic of Sao Tome and Principe is a poor country. The study onn the poverty profile in 2001 indicates that 54% of the population lives below the poverty lime and 15% are classified as extremely poor. Poverty remains a predominantly rural phenomenon, with 65% of the rural population living below the poverty line and 22% living in extreme poverty.

The Democratic Republic of Sao Tome and Principe is a country whose agricultural economy based on cocoa exports in 2001 represented 30% of all agricultural production and 86% of exports. INE estimates indicate that in the period from 2001-2007, the economy grew 50% in cumulative terms, equivalent to an average annual growth of 7%.

According to the same UNDP report, in the same period, the performance of the economy of Sao Tome and Principe was evident with highlight to the tertiary sector, driven by the health services, accommodation and catering, and transport services and communications that the cumulative grew 91.7%, 88.3% and 61.1% respectively.

For the secondary sector which represents 20% of GDP, its contribution was 42% in the same period. According to estimates of national accounts of INE's participation in the tertiary sector in GDP rose from 54% in 2001 to over 60% in 2007, driven by increased trade and transport services primarily in the informal sector.

According to the GDP of approximately U.S. $ 181 million in 2008, the main contributions of sectors of economic activity are: i) Trade (23%), ii) Transport and Communications (13%), iii) Agriculture, Livestock (12%) and iv) Financial (10%) (INE, 2008).

Despite the relatively small continental shelf due to its volcanic origin, fishing is an important sector for the national economy with abundant potential in fish stocks, but with a contribution of 6% to GDP (INE).

The industrial base is weak, producing only 7% of GDP and 6.5% of employment. The high energy costs reduce productivity of the business sector by reducing its liquidity.

The seaport is also a potential, especially in relation to the possibilities of building a deep water port and the benefits which could result, given our geostrategic position.

Mineral resources, particularly oil, could be a cornerstone in the development of Sao Tome and Principe, should the dividends earned from its exploration, expected with a few years, are used in sectors such as agriculture, fisheries, energy, services, education, scientific research and, in short, in all sectors of national life.

According to the report on the Unified Survey of Basic Indicators and Welfare (QUIBB) carried out by INE in 2005, the estimated population is 152,742 inhabitants.

In terms of means of residence, it was found that 37.1% of the population lives in the district of Agua Grande, where is situated the capital, 16.7% live in other urban areas and 46.2% live in rural areas. This fact indicates that more than half of the population (53.8%) lives in urban areas, which confirms the trend of urban population of Sao Tome.

Concerning the structure of the population by major age groups, the same report reveals that the population of Sao Tome is still young with 44.2% of individuals under 15 years. The age group from 15 to 64 years and more than 65 years represent 51.4% and 4.4% respectively.

According to the Demographic and Health Survey, conducted by the INE and the Ministry of Health in 2008-2009, access to life insurance is practically absent in Sao Tome and Principe. With efforts made in recent years, a clear improvement of the main status of the population could be noted. Two indicators show this positive development: decresed mortality, thus increasing life ecpetancy from 59.4 years in 1970 to 63.9 years in 2001. It is worth noting that life ecpectancy of women of 64.4 years is superior to that of men which is 62.5 years (Ministry of Health).

According to the national human development report presented by the UNDP (2008), life expectancy increased from 63.9 years in 2001 to 66.4 in 2007. The education index evolved 15.4%, i.e. the gross enrollment rate combined primary, secondary and higher education rose from 57.7% in 2001/02 to 88.2% in 2006/07.

The Center for Agricultural Research and Technology (CIAT) and the National Institute for Meteorology (INM) are institutions of scientific research of tradition and with some human capability to research and develop durable agricultural technologies, run diagnostics on the state of soil, weather, early warning on climate and drought in Sao Tome and Principe.

The Millennium Development Goals (MDGs), taking into account Climate Change, is an approach that should be done cautiously, in ongoing efforts to achieve these goals at the national level by 2015.

Provide better operational institutions aimed at climate change, in terms of equipment, technical training and implementation of the existing legal framework, are part of a package of measures to be implemented, taking into account the country's commitments to its partners as a member of the UNFCCC.

Inventory of Greenhouse Gases Emissions.

By emission levels observed in the second inventory of greenhouse gases (IGEE), like the first, it was proved that Sao Tome and Principe is not an emitter country of greenhouse gases (GHGs), but a sink of carbon, that is, STP is lesser emitter of CO_2.

Despite this finding, there are visible effects that show the possibility of a certain degradation of this condition in the future if mitigation and adaptation measures are not performed accurately.

That is the nefarious action of the Saotomean population on the surrounding environment (aggregate extraction on beaches and abusive cutting of trees) on the one hand and the effects of global warming, on the other side.

Emissions of greenhouse gases for the areas identified in the Second National Communication (SCN) are summarized in Table 0.1, which follows:

Table 0.1-Summary of GHG Emissions by Sector (Gg)

Table 0.1- Summary of GHG Emissions by Sector (Gg)

Sectors	Gases						
	Emissions CO_2	Removal CO_2	CH_4	N_2O	NO_x	CO	NMVOC
Energy	66,29	-	0,22	0,03	0,50	5,48	0,67
Forestry and Land Use Change	97,2	727,57	0,05	-	0,01	0,41	-
Agriculture and Livestock	-	-	0,68	0,001	0,26	11,28	-
Industrial Processes and Waste	-	-	0,17	0,01	-	-	2,32
Total Emisions	**163,49**	**727,57**	**1,12**	**0,041**	**0,77**	**17,17**	**2,99**

From analysis on contribution of emission inventories of diferent sectors, it could be noted that energy is the major emitted of CO_2 in the country. (66.29 Gg).

After all, the absorption of CO_2 from the changes in forests and other woody biomass stocks (-689.14 Gg) and the abandonment of managed lands (-38.43 Gg), see Table 19 (Chapter II.4.3.1) is greater than the emissions from the energy sector (66.29 Gg CO2)-see Table 0.1 shown above - Conversion of forests and fields (37.58 Gg CO2) and changes in soil carbon (59 , 62 Gg CO2) - see Table 19 - (Chapter II.4.3.1). This explains the results obtained in the calculations of GHG emissions that link to the assertion of our capacity for sequestration.

The emission of greenhouse gases (GHG) emissions from the burning of savannas and agricultural residues is relatively insignificant. Only carbon monoxide (CO) amounted to 11.28 Gg in the burning of savanna, Agriculture and Livestock sector, Table 0.1, shown above.

Chart – 1 shows levels of GHG emissions by sector in percentage for the year 2005.

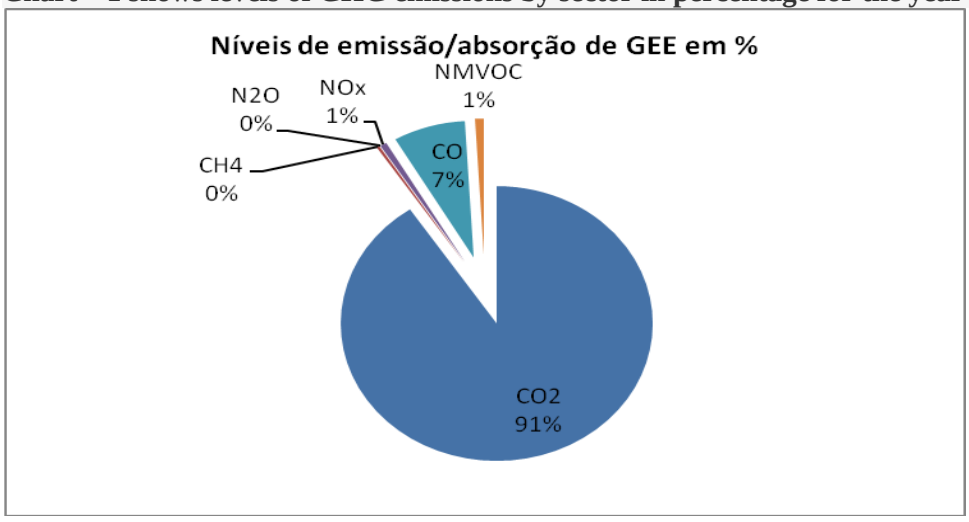


Chart 1- Summary of GHG emissions by sector -2005

Table 0.2, below shows variation in emissions between 1998 (ICN) and 2005 (SCN), in CO2-E.

Table 0.2 – Summary of Emissions (1998-2005)

Sectors	1998 (Gg CO_2-E)	2005 (Gg CO_2 -E)
Energy	79,077	101,4763
Industrial Processes and Wastes	34,085	13,96
Forestry and other Land uses (excluding removal)	73,775	73,775
Agriculture and Livestock	43,152	7,425
Total emissions	**230,089**	**196,63**
Estimation of CO_2 removal		
Agriculture, Forestry & other land uses	-704,55	-727,57

The empirical perception generalized within the team of national experts, that the sequestration capacity of STP forests would deteriorate in the period between Greenhouse Gases Inventories (GHGI) from 1998 and 2005, due to the intensification of unlawful and arbitrary exploitation of timber in recent years, cannot be verified by reviewing the calculations made using new knowledge implmented in IGEE of 2005, through the IPCC method of 1996 magazine.

Indeed, the summary of GHG emissions for 1998 and 2005, Table 0.2, shown above, reveals an increased sequestration of carbon dioxide (CO2), in the order of 0.3%.

This finding requires the creation of internal conditions for the preparation of NC at the national level that permits a continuous follow-up and monitoring for the reduction of uncertainties in subsequent inventories.

What is certain is that, the GHGI relative to the sector and the Use of Soils and Forests in Sao Tome and Principe can only be more reliable if they are known more accurately as possible, the surface of the different forest types and quantity of wood that is extracted from them.

Status of Base and Climate Scenarios

The series of data collected from the airport weather station of S. Tome, though singular, has proven to be representative of the climate of Sao Tome and Principe, in the period selected, because corroborate the conclusions of the regional climate analysis carried out by researchers University of Cape Town.

In preparing the study on Vulnerability and Adaptation in Sao Tome and Principe, this team of national consultants made climate projections about the behavior of temperature and precipitation on the islands at the horizon 2040-2060.

These projections were made, as mentioned above, with reference to a study by the Analysis Group of the Climate System of the University of Cape Town - South Africa on the climate of

the geographic region where it operates Sao Tome and Principe, using the Global Circulation Models (GCM).

The data used for modeling the GCM are coming from collections obtained by satellite for several decades, through which we analyzed the variations in that period in aspects of the regional circulation of certain climatic parameters, namely, wind, pressure, geopotential height, surface temperatures, the sea and rain.

The verification of consistent changes in this regional circulation was made through an analysis of the results obtained by mean and reanalysis data sets collected during the period between 1979-1988, 1989-1998 and 1999-2008, which is estimated to be approximately corresponding to the years 1980, 1990 and 2000 respectively, using an analysis system called (NCEP / DOE AMIP-II (NCEP-II).

The construction of these data series is obtained using a system of global data assimilation which includes a variety of sources, such as probes radio, satellite, aviation, merchant ships and meteorological observation stations.

The trend analysis of the actual data of temperature and precipitation of Sao Tome and Principe shows that from 1976, the average annual temperature values have an increasing trend, reaching above 25°C.

With regard to temperature, the simulations of the Global Circulation Models for the emission scenarios B_1 and $A_{2,}$ project an average temperature increase by 2050, between 1 and 2^{o}C. For the A_2 scenario, the largest increase is expected to take place in June, July and August (JJA) and September, October and November (SON).

The trend of precipitation in relation to the actual data observed is a decrease from 1951 to 2010.

Relatively to rainfall projections between the years 2040 and 2060, the referred team came to the conclusion, through the GCM scenarios that in the B_1 scenario analysi, the decrease in precipitation may be from 8 to 10mm of rainfall per year and in scenario A_2, from 12 to 14mm respectively.

Vulnerability and Adaptation to Climate Change

The results from vulnerability and adaptation studies within the ambit of the SCN came to confirm the major vulnerability of the country relatively to Climate Change, referenced in the ICN and provide evidence that urgent mitigation and adaptation masures should be taken by the National Authorities to prevent possible threats and mitigate the potential effects that are already being felt.

The objectives of the analysis of vulnerability and adaptation of the key sectors of the study relate to the need to identify the impacts and to evaluate the sensitivities of the same, due to climate change and promote actions aimed at awakening the international community to the following points:

The current weather condition and future evolution of the climate of Sao Tome and Principe, in the context of the United Nations and its worldwide position as a party.

It also allows one to make known to others involved, the degree of exposure of the country to the adverse effects of climate change in its status as an island.

I this condition, manifest the national authorities the extent of effort that should be made, so that, together with development partners, could move towards a self-reliance development.

It brings out the points to be included in the National Development Plan, in the various sectors whose vulnerabilities were identified.

Given the climate impacts identified, including increased temperature and decreased precipitation, we highlight the following adverse effects / sensitivities, as follows:

Agriculture and Livrestock

- Production Decrease: Areas of existing crops may be reduced due to changing soil and climatic conditions; An increase in the incidence of pest is expected which wil reduce crop yield and effective reduction of animals, deaths due to excess of animal parasites resulting from pasture (ticks).

- Physico-chemical changes of the soil: Negative changes are expected in the dynamics of soils organic matter, less efficiency in the mobilization of chemical elements in the soil; loss of nutrients at the upper layer.

- Reduction of income in rural areas for farmers and cattle rearers: Low production and consequently, reduction in farmers income; effective reduction of animals; death due to aneamia and low comsumption of pastures.

Forest and Soil

- Reduction of forest area in the event of prolonged drought, forest shade adapted to the rainfall ranging between 1200 and 2500 mm; Secondary forest adapted to the rainfall ranging between 2000 and 3500 mm.

- Increase of the length of the Savannah area in the NE of the island of S. Tome: Practice of indiscriminate felling of trees and shrubs and manufacture of coal in the vicinity and within the Savannas.

- Proliferation of insect predators in forest ecosystems: Existence of outbreaks of rubrocinthus..

- Flooding of forest areas of flat terrain: forest shade Zones located in the plains.

- Loss of forest cover by landslides: About 90% of forest areas located in rugged areas.

- Reducing the water content of soil: black and brown clay soils of the Savannah, already subject to water scarcity.

- Progressive erosion of soil: STP very hilly island country.

- The emergence of the phenomenon of "hydromorfism" flood-prone lowlands.

Water, Energy & Fisheries

- Reduction in Groundwater: reserves of water resources, springs for irrigation of agricultural crops and extinction of some watercourses with lower flow
- Reduced flows: low production and distribution of the population, with higher incidence in the soil for agricultural production and livestock farming.
- Increased mortality and migration of species (Fauna and Flora).
- High rainfall, increased flow, flood, natural disaster.
- Decrease Water Quality: increase of microorganisms in surface waters.
- High cost of water treatment.
- Reduced hydropower production.
- Reduction of the consumption of residential energy.
- Reduction of energy consumption in small industries.
- Decreased productivity of small industries.
- Degradation of biodiversity due to diversion of water currents.
- Reduction to 50% of the production of artisanal fisheries.
- Reduction of discharges of the Niger River in the Atlantic Ocean.
- Fishing activity (reduction of fishing effort).
- Displacement of the houses of fishermen in their respective communities due to invasion of the sea.
- Increase of 0.55m of the sea level.

Costal Zone

- Economic Loss: A rise of 0.13m to 0.43 m (SRES B1) could affect about 15% to 20% of homes of Praia Melão (Melon Beach), affect hotel infrastructure and homes and restaurants located on the coast, in the same proportion and about 35% to 45% of the facilities from the main port of S. Tome.
- Loss of habitats: A rise of 0.13m to 0.43 m (SRES B1) may cause the destruction of about 40% to 50% of reefs in the area of Lagoa Azul (blue marine lagoon), 25% to 30% of endemic species that live in mangroves, and 25% to 35% of wetlands and migration of 30% to 45% of sea turtles.
- Flooding of coastal villages: Elevation of water level of the sea at 0.13m to 0.43 m (SRES B1) will reach 30% of homes in the coastal town of Malanza, 35% of Santa Catarina and 40% of houses of Ribeira Afonso, Agua Izé and the Bay of Santo Antonio.

- Coastal erosion: Raising the water level of the sea at 0.13m to 0.43m (SRES B1) can cover about 30% of Diogo Nunes Beach, 20% of Praia Pomba (Pomba Beach), 10% of the roads in the coastal villages (Praia Lagarto, Neves, Ribeira Afonso, Santa Catarina, etc..) and 15% of the houses of Praia Lochinga.

- Flooding of river banks due to flooding and flood, abnormal rise in water level of rivers (Ribeira Afonso, Papagaio) between 0.25 to 0.40m, about 25% to 40% of homes are completely flooded and assets lost / drawn.

Population, Health & Education

- Poverty: Incidence-poverty - 53.8%; Incidence of extreme poverty - 15.1%; intensity of extreme poverty - 14% Depth of poverty - 4.81%; GINI Index - 0.49%.

- Migration: - More than 60% of the population is concentrated in only two of the seven administrative areas of the country, representing only 13.8% of the country: are the districts of Água Grande and Mé-Zóchi.

- Change of Eating Habits: Decrease consumption of bananas, cocoyam, cassava, and other local products.

- Malnutrition: Decrease intake of animal protein and plant by the population.

- Respiratory, epidermal and vision diseases: Increased incidence of respiratory-borne diseases or acute respiratory infection that mainly affects children in the Autonomous Region of Principe and the District of Lembá.

- Increase in cases of diseases like malaria, cholera and other diarrheal diseases.

- School failure: Decrease in net enrollment rate in primary education, increased dropout rate, increasing the repetition rate in primary education, reduction of length of stay in primary school.

- The degradation of school infrastructure: Increase of the number of schools at risk, increasing the number of classrooms at risk.

- Low level of information and training: Existence of a significant percentage of education professionals without adequate training, lack of guidance manuals or guides for teachers.

- The time horizons used in the projections took into account the scenarios made based on the Global Circulation Models (GCM). It retained the horizon 2040-2060.

- Relatively to the reference year, the year 2005 was chosen, by being the year in which data are available for different sectors provide a thorough analysis of the same vulnerabilities.

- Adaptation measures (see Annexes, Table No. 1, No. 2, No. 3, No. 4, No. 5 and No. 6) and the bodies responsible for forecasting, monitoring and resilience were also identified in the Board of Experts.

Mitigation

The inclusion of a chapter on mitigation in SCN is a novelty for ICN and represents an effort by the authorities and the team of national experts so as to improve each national communication submitted to the parties, taking into account aspects related to data quality , regarding the accuracy, control and transparency (QA / QC).

Indeed, the ability to sequestration of Sao Tome and Principe increased between the ICN and the SCN.

The engagement of the country as a "non-Annex I" comes from the relatively well awareness of the fact that climate change has an effect that manifests itself on a global scale.

The mitigation measures that stand out are:

- Construction of hydro Plants,
- Construction of solar and wind Park
- Operating efficiently, through appropriate management techniques, potential agro-forest lands;
- Reforestation, through the application of agro-forestry techniques, forest areas, belching;
- Introduction of kilns for making charcoal and improved stoves, and monitoring the consumption of wood-fuel;
- Operating efficiently, through appropriate techniques for managing agricultural land;
- Application of compost instead of burning of agricultural wastes;
- Promotion of sustainable agricultural and livestock practices in land use;
- Preparation of a Master Plan for Urbanisation.
- Construction of the landfill with gas recovery (if any amount of garbage that justifies the issuance of gas and then be transformed into electrical energy)
- Composting (home, community) of organic waste accompanied by training and awareness.
- Raising awareness and public information on recycling and reuse of waste.

Other additional information deemed relevant to the implementation of the Convention

Reasearch and Systematic Observation

INM is the institution responsible for systematic observation in the issue of Climate in Sao Tome and Principe and provides the bulk of the observations and research in this field.

The Directorate General for Natural Resources and Energy, responsible for the national hydrological network and CIAT, responsible for agricultural research also contribute to the process of research and systematic observation in the context of climate change.

Climáte Modeling

The models used by INM STP are based on the Climate Information System project (SICLIMAD - STP). Thanks to it, it was possible to use the Brazilian version of the American Regional Model BRAMS for modeling and forecasting in STP. For modeling and forecasting sea state, the SWAN model appealed to the INM, which is fed by the outputs of the BRAMS.

Considering the small size of the islands of Sao Tome and Principe, it is desirable that the INM could have other models to allow comparison of results and improve its weather forecasting and climate modeling. For this, the acquisition of weather radar would be extremely useful to the INM.

In preparing the study on Vulnerability and Adaptation in Sao Tome and Principe, climate projections for the horizon 2040-2060 were made using the Group Climate System Analysis at the University of Cape Town - South Africa, using the data local weather station of the airport in Sao Tome in GCM global model, presented a projection on the behavior of temperature and precipitation on the islands for the period.

Education, Training, Information & Public Awareness.

The Convention (UNFCCC) by providing information, training and public awareness, arouse the interest of stakeholders, especially vulnerable to climate change, to the increasing importance of these phenomena for the development of the country and sustains the negative consequences that may arise even if the resulting measures are not taken to protect the environment and change of mind through knowledge of the phenomena inherent to it.

In this context, Sao Tome and Principe benefited from the Project of Self Assessment of Capacity Building Needs on Environment (NCSA), funded by GEF and implemented by UNDP that identified the country's needs in training in the areas of the Rio Conventions and on Persistent Organic Pollutants, and the synergy between them.

Several training sessions on different topics related to climate change were organized: Climate change and health procedures for the preparation of national action plan for adaptation to climate change, the methodology for establishing the inventory of greenhouse gases (IGEE), Vulnerability and Adaptation, Mitigation, Integration Issues of climate change on national development plan and the clean development mechanism (CDM).

National & Regional Institutional Capacity Building

The Designated National Authority (DNA) of Sao Tome and Principe, inserted in the Directorate General of Environment is tasked to monitor the issues contributing to the implementation of projects in this field in the country, including small hydropower (SHP) and landfill.

Several training initiatives have taken place internally, with regard to:

- Training on the methodology for the inventory of emissions of greenhouse gases, in the preparation of second national communications
- Training for capacity building of national staff in the identification of mitigation measures in the preparation of the second national communications.
- Training for capacity building of national staff in identifying the country's vulnerabilities to the impacts of climate change and adaptation measures to the possible effects of these changes, as well as the needs of technology transfer for mitigation and adaptation, in the preparation of the second National Communication.

Information & Education Network

The institutions responsible for climate change in the Portuguese-speaking countries decided to establish an institution for the coordination of these issues, taking into account their interaction.

This coordinating institution was named CRIA Agency (Climate and its Related Environmental Issues) and integrated as well as research institutions, all meteorological services of the Portuguese-speaking countries. The Agency operates in a regular way funding projects and some training until mid-2003 due to lack of funds.

In this context, members of the CPLP though all not from the Meteorological Services, decided by the creation of a broader process that would bring together representatives of the CPLP in the area of climate change. This process culminated in 2005 with the creation of Lusophone Network of Experts on Climate Change (RELATIONS), which aims to promote cooperation in the area of climate change among its members.

Technology Transfer

The assessment of technology needs allows the identification of the technologies and procedures best suited for the different sectors of national life. Under the Second National Communication, were identified a number of technologies in the range of internationally available, with potential national use, particularly for Agriculture, Forestry, Health, Education, Fisheries, Energy, Water, Coastal Zone, Industry, Transportation and Buildings, whose implementation would be beneficial to reduce the country's vulnerability to the adverse effects of climate change.

This initiative falls within the guidelines for the preparation of National Communications on Climate Change. In light of its social and economic status, countries are encouraged to provide information on activities relating to the transfer and access to technology and know-

how environmentally sound development and improvement of skills, technologies and endogenous know-how and measures for improving the environment.

INTRODUCTION

Sao Tome and Principe joined and ratified the United Nations Framework Convention on Climate Change on May 30, 1998, hereinafter "the Convention", thus becoming a full member of the Conference of Parties. In this context, implicitly assumed the commitment to develop, periodically update, publish and make available to the Conference of Parties, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, as well as, provide an overview of measures aimed at mitigating climate change and propose measures to facilitate adequate adaptation to this change. The document containing such information is called the National Communication on Climate Change.

The Second National Communication of Sao Tome and Principe (SCN) is due to compliance with paragraph 1 of Article 4 of the United Nations Framework Convention on Climate Change and follows the guidelines for preparation of National Communications from Parties non-Annex I to the Convention, adopted at the Second 10th Session of the Conference of Parties (10/CP.2).

In this context, we present the Second Communication of Sao Tome and Principe, consisting mainly of four parts, divided into six chapters.

The first part integrates chapter I and refers to national circumstances in which it presents an overview of the country in view of evaluating aspects of the sectors identified, vulnerable to climate change or influence on the emission of greenhouse gases, not losing sight of the priorities of the country.

The second part comprises of Chapter II and refers to the inventory of greenhouse gases, i.e. the update of the first inventory of greenhouse gas emissions, completed in 2004.

The third part includes chapters III based on the climate system, the IV on the analysis of vulnerabilities and measures implemented or proposed in the context of the objectives of the Convention on the V and mitigation.

The fourth, the last part of this communication, comprising Chapter VI are presented in which measures to facilitate a better adaptation to climate change and Chapter VII of the constraints, gaps and institutional capacity building. The conclusions and recommendations are also part of this chapter.

The Second National Communication, like the First, is therefore an important message that the panel of national experts that assessed the vulnerability / adaptation to climate change in the country heads to the authorities and policy makers.

Sao Tome and Principe in 2004 completed its First National Communication on Climate Change, a document that was reinforced by the drafting of the document "National Strategy for Implementation of the United Nations Framework Convention on Climate Change" and "National Action Plan for Adaptation to Climate Change".

In the first National Communication, it was evident that, on the one hand, Sao Tome & Pkrincipe, a small insular country with coastal settlement, opened to the world of perpetual changing, won't in any way be left out from the economic, cutlutral, social and environmental transformations which will cause a global climate change and on the other hand, it is directly threatened by a global warming thus running the risk of losing more than half of its socio-economiuc infrastructure.

The first diagnosis of vulnerability / adaptation to climate change in the country also allowed to highlight its high level of risk from climate change and suggested the need to include, since that time, the dimension "Climate Change" in the economic and social development plans.

Within the SCN, in the chapter for the analysis of vulnerabilities and adaptation in the face of possible effects of climate change identified, the risks that are highlighted are warning that urgent action continues to be taken by the competent authorities, both in the prevention as attenuation.

The methodology involves the compilation of the various constituent parts of the report of the national communication, previously developed in a phased manner.

According to the IPCC guidelines, the compilation of these various parts presupposes the identification of a common axis centered in the main vulnerabilities, impacts, adverse factors and sensitivities without neglecting the adaptation and mitigation, taking into account the self-efficiency development priorities of the country.

The impacts identified, i.e. increased temperature and decreased precipitation, are the reflection of the basic climate presented, as well as future scenarios, projected through the Global Circulation Model (GCM) based on observed climate trends.

PART - I

CHAPTER - I – NATIONAL CIRCUMSTANCES

I.1 – INTRODUCTION TO THE COUNTRY

I.1.1- Geographical Characteristics

The Democratic Republic of Sao Tome and Principe, located in the Gulf of Guinea, and crossed by the Equator, is a State consisting of two small islands and several islets. Its Exclusive Economic Zone covers 170,000 km². It is one of the smallest state in the world and second in Africa. From volcanic origin, the archipelago characterized by very rugged topography, high rainfall (800mm.900mm of rain per year) and soils of average fertility in which the highest points are: Peak of Sao Tome (2024m) and the Peak of Principe (948m).

It is 300km from the African coast between the parallels 45 ° 1 'N and 0 º 25' South and longitude 6 ° 26 'east and 7 ° 30' West. Its total surface area is 1001km^2, and the island of S. Tome and its adjacent islets surface 859km^2 and the island of Principe and also including its adjacent islets 142 km^2 (Figure 1).

Illustration 1- Map of S.Tome & Principe

I.2 - Climate

In Sao Tome and Principe, could be noted rain during the corresponding nine months period from September to May, with a slight slowdown in the period of about two months called "Gravanito" that oscillates between December and January. The three-month period, referred to as "Gravana," June to

August, corresponding to Northern Hemisphere summer, is that in which no precipitation records or logs into very low precipitation.

According to the meteorological data collected by the INM, the average rainfall recorded between 1951 and 1976 was about 913 mm. From 1977 until 2000 there was on average 816 mm per year.

The temperatures in both the minimal, maximal, as well as the means did not change significantly during the period 1951 to 1977, moving average, respectively at 21.3°C, 29.3ºC and 25.3°C.

In recent years, there has been an increase of the average maximum temperature at a rate of 0.032°C per year against an average of 0.021°C minimum temperature, according to data from the meteorological station of the Airport of Sao Tome

I.3 – Soil

According to the classification of Cardoso, J. C. and Garcia, J. S. (2001), all soils in the cultivated area in Sao Tome and Principe soil belong to the following groups: tropical paraferralitics, fersialitics black clay and lithic soils.

The fersialitics soils are also deep soils, fine-textured, red to brown, well-developed, consistent and firm.

The black soils are clay, black/dark gray or dark brown in which the clay fraction is composed of montmorillonite which gives them very high levels of plasticity and adhesiveness and hard consistency.

The lithic soils are poorly evolved soils, generally not very thick, medium to fine texture. The soils are, in general, a good fertility. The slightly acidic pH is near neutral. Rich in potassium and phosphorus, have a good calcium exchange capacity (Cation) and water retention.

The black tropical type have paraferralitics, lithic and fersialitics textures and may be whether or not the organic matter content is above the horizon or not A1 7.5% (in cases of heavy texture or median) and 4.5% (where light textures). On the island of Principe, paraferralitics and lithic textures are predominant.

Sao Tome and Principe, being an archipelago of volcanic origin, possesses a very rugged land area. The central-southwest, corresponding to approximately 2/3 of its territory, because it is very difficult to access sites with even impossible access, known as orohydrographic center, because there is also that part of all major rivers and water flowing radially in all directions to the sea.

The main mineral deposits are offshore oil (recently discovered), the beaches with the inert, the coral reefs on the coast near the Blue Lagoon (Lagoa Azul) and clay used in pottery[2].

I.4 –Costal Zone

The coastal zone of Sao Tome and Principe is the boundary between the Exclusive Economic Zone (EEZ) which extends to 200 nautical mile limit and the mainland is situated 100m above sea level from the shoreline.

The salinity of water varies with the season. The production of seaweed is relatively limited because the continental shelf is not extensive.

Average temperatures in the coastal zone are around 26°C from March to May and 23ºC in July and August.

The ecosystem of the transition zone of brackish water, and populated by mangroves (mangroves), is very peculiar. It is characterized by the existence of a great biodiversity with rare species such as the snail from the islet of Rolas Island, south of S. Tome.

The continental shelf is relatively small, with about 1,500 square kilometers. Two-thirds (1,023 km ²) belong to the island of Principe and only 436 km2 belong to the island of Sao Tome[1].

Most of the rocky coastline is very rugged with relief, but there are numerous sandy bays that make up a whole system of beaches along the coast.

The coastal zone of Sao Tome and Principe has a great biodiversity, consisting of an abundant flora and fauna, as well as mineral and water resources.

The availability of freshwater in the coastal zone is very limited due to intrusion of salt water into aquifers.

I.5- Forestry and Land Use

The land use system that exists today in Sao Tome and Principe is the result of a phenomenon that *Carvalho Rodrigues (1974)* termed as "Land of Green Fields." It was actually the natural adaptation of each type of crop to the ecological space that is most appropriate, and consequently, every land was occupied so more conducive to the sustainable management of land resources of the country

Sao Tome and Principe has abundant forest whose characteristics vary depending on several factors including the topography, altitude and therefore characteristic of the micro-climate of each region.

Firstly, could be found, the dense forest or wetland located in upland areas of steep topography and difficult access and high rainfall. It corresponds to the parks ("*Obô")* which are protected forest areas. These parks have never known human activities and constitute the areas of CO_2 "absorption".

There is an area of secondary forest called "*capoeira*" and is situated on the edge of dense forest and meets the old plantations of coffee and cocoa in Sao Tome and Principe abandoned and which knew a regeneration great big tree. It is located at medium altitude in a very rugged landscape with very steep slopes and difficult access.

Another cvonfiguration of the Saotomean forest is the shaddy forest characterized by the presence of cocoa or coffee plantations with a coverage of more or less densed tree layer composed of introduced natural species.

In the Northeast region of São Tomé (area of Praia das Conchas and Lagoa Azul) the savanna trees and shrubs are predominant. The terrain is relatively flat compared to the archipelago as a whole. This area is covered by a mosaic of grassy savannah, interrupted by small tree and shrub formations of small dimensions and contrasts sharply with the rest of the country. It is believed that this landscape has its origins in the shifting cultivation practiced on the land burned since the beginning of colonization, including the culture of cane sugar.

There is a recent survey through which they could have been effectively quantified belched areas of different forest formations. The only existing data of this nature come from the second National Forest Inventory (1999).

Existed in 1999, the date of completion of the second (final) National Forest Inventory and it is thought to maintain the same estimates, a total volume of standing timber under bark of 12.8 million m^3, considering all species and a trade volume of commercial species of 2.7 million m^3.

Of these together, as shown in Table 1, the surfaces of the fields of vanilla and green pepper, installed in the area of forest shade, which was provided in part by Salt and Green Pepper, PAPAFPA (Support Program for Family Agriculture and Artisanal Fisheries).

Negative numbers were considered as land clearance occurred in the *Forests of shadow* (wet, short dry season) and in *Natural Forests outside the park* (Moist Highlands)

[1] National Environmental Plan for Sustainable Development (Vol.II) – UNDP/DRSTP

Table 1- Establishment of Areas Cultivated for Crops

Year	Surface (in hectare) of Forest Formations per Inventory			
	primary Forest (Outside the Park)	**Secondary Forest**	**Forest Shade**	**Other Lands**
1989	3 416	13 572	22 838	6 646
1999	2 995	14 368	21 622	7 488
Variation (in hectare)	**- 421**	**+ 796**	**- 1 216**	**+ 84,2**
	Green Pepper		**-41,84**	
	Vanillha		**-10,00**	
Total change in forest shade			**-1 267,84**	

There were no other significant decreases in overall volume of wood in the period between the two inventories; one can conclude that the situation is as follows:

a) Volume per hectare available for operation: 125 m^3;
b) Exploration of wood with bark for sawmills: 70,000 to 103,000 m^3/year;
c) Exploration of wood with bark for firewood 43,000 to 65,000 m^3 per year.

The difficult economic situation of the populations has led to indiscriminate felling of trees for charcoal production, firewood and timber for construction, all over the country, except in protected areas. The decomposition of wood scraps and burns resulting from high temperatures, the latter modification of vegetation cover, makes the archipelago's forests area a source and also a consumer of CO_2.

The timber resources of Sao Tome and Principe are used primarily as an energy source but also as a timber for house construction and manufacture of furniture and a smaller proportion for the manufacture of utensils and art objects and spatial planning (poles and poles for street lighting).

Note that the island of Principe has less wood resources per unit area than the island of Sao Tome, but also, in general, has less commercial species.

In Sao Tome, exploitation of wood is not homogeneous. Some regions, such as the District of Lobata are subject to an over-exploitation.

I.6 - Socioeconóomic Situation

Population

The population is approximately 152, 000 inhabitants in 2006 (Graph 2), which corresponds to a population density of 151.8 inhabitants per km^2.

Of the total population, 34.85% live in urban areas, 41.84% in peri-urban and 23.31% live in rural areas. On average, the population has grown at an annual rate of around 2%.

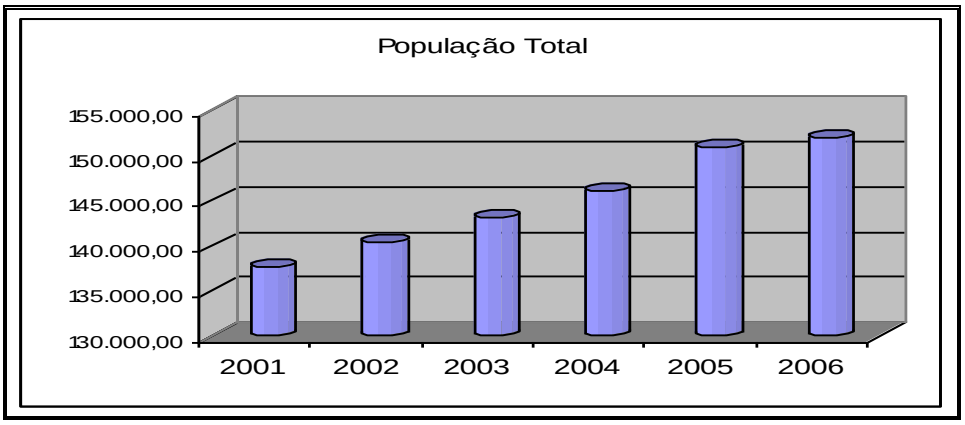


Chart 2- Population Growth

Population Distribution

The population is unevenly distributed with a tendency to focus on more economically developed districts. As shown in Table 2, the Agua Grande District, (the smallest district of the country) receives 37.19% of the population of Sao Tome. The Autonomous Region of Príncipe, the discontinuity in terms of geography in the context of the country and the District of Caué, (the largest district in the country) by the high rate of poverty, are hosting the smallest percentage of the population.

Table 2- Percentage of Population by District

Population by District	**Em (%)**					
Distritos	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Agua Grande	37,71	36,87	37,29	37,08	36,38	37,19
Mé-Zochi	25,51	25,42	25,47	25,44	25,08	25,45
Cantagalo	9,64	9,68	9,66	9,67	9,55	9,66
Caué	4,00	4,26	4,13	4,20	5,53	4,16
Lembá	7,77	7,72	7,75	7,73	7,62	7,74
Lobata	11,04	11,55	11,29	11,42	11,40	11,36
R.A Principe	4,34	4,50	4,42	4,46	4,44	4,43
Total	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**

Source: INE

Population Density

The imbalance in the spatial distribution of population also causes differences in population density, while the District of Caué records 23.7 inhabitants/km^2, Agua Grande exceeds 3,400 inhabitants/km^2. After the proclamation of independence in 1975 and particularly since 1980, with a certain abandonment of farms and degradation of its infrastructure, STP met an important internal migration, led to urban centers, especially in the capital. Currently, the urban population is higher than the rural population and the trend is an increase of urban population to the detriment of the rural population. Table 3 below illustrates this fact.

Table 3 - Population Density by District

Districts	Population/Km²					
	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Agua Grande	3.144,60	3.136,20	3.235,90	3.282,20	3.328,70	3.423,80
Mé-Zochi	287,70	292,50	298,90	304,60	310,40	317,00
Cantagalo	111,40	114,20	116,20	118,70	121,20	123,00
Cauê	20,60	22,40	22,10	23,00	31,30	23,70
Lembá	46,60	47,20	48,30	49,20	50,10	51,10
Lobata	144,60	154,40	154,00	158,90	163,80	164,30
R.A Príncipe	144,60	154,40	154,00	158,90	163,80	164,30
Total	**137,50**	**140,20**	**143,00**	**145,90**	**148,00**	**151,80**

Source: INE

Other Vital Features

The results in Table 4 below, (HDI, UNDP 2008) in a global perspective, places STP in the group of countries with medium HDI 0654, placng it in 123th position in a list of 177 countries.

Table 4 – Human Development Indicators of STP from 2001 to 2007

Description	**2001**	**2003**	**2005**	**2007***
Basic Data				
Life Expectancy at Birth (years)	63.8	64.7	65.6	66.4
Adult Loiteracy Rate (%)	83.1	83.8	84.4	85.1
Gross Joint Education (%)	57.7	79.0	86.7	88.2
Real GDP per capita (PPP $)	1183.3	1239.3	1467.0	1515.2
CÁLCULATING THE HDI				
Índex of Life Expectancy	0.647	0.662	0.677	0.690
Índex of Education	0.746	0.822	0.852	0.861
a) Adult Literacy Rate	0.831	0.838	0.844	0.851
b) Rate of schooling combined	0.577	0.790	0.867	0.882
Índex of adjusted real GDP per capita (PPP $)	0.412	0.420	0.448	0.454
Human Development Índex (HDI)	0.602	0.635	0.659	0.668

Source: INE, RSTP

* Estimated figures based on the trend.

Health

It is the duty of the Saotomean State to promote Public Health, which aims at the physical well-being of the population and its balanced integration into the socio-ecological environment in which it lives according to the National Health System.[20]

The National Health System is comprised of three levels: central, regional and district levels.

The structure is formed primarily by the central referral hospital - Dr. Ayres de Menezes Hospital in the city of S. Tome and the Directorates of the Ministry of Health.

The Regional Infrastructure in the Autonomous Region of the Principe, with the Manuel Quaresma Dias da Graça Hospital and the Secretariat of the Social Area

The structure of the District Centres consists of Clinics and run by doctors health delegates and nurses.

The health coverage of Sao Tome and Principe is not satisfactory. There is one doctor for about 2,000 inhabitants. There is one nurse to 800 people and 1 midwife for every 4,000 inhabitants. However, this distribution of health professionals per population is uneven. There are wide disparities between cities and countryside, with greater density in major conurbations such as Água Grande District.

The vulnerability of the health sector to climate change due to natural events such as extreme rain or drought could undermine the efforts of sanitation in the fight against major endemic diseases, if preventive measures are not taken into account. These extreme events can cause flooding or scarcity of water supply for the population.

The health situation in the country is still worrying, because, despite recent efforts to improve the system of collection and refuse collection, water supply, elimination of breeding sites of the vector of malaria, the level of public sanitation is down. All this, coupled with poverty, is subject to the majority of the population of Sao Tome and Principe, though, in addition to sexually transmitted diseases, particularly AIDS, malaria and tuberculosis still remain the major endemic diseases in the country.

The economic impact of malaria control is positive. The results show that in 2003 the indirect costs to malaria were USD 4, 887,183.20 with 193 deaths and in 2007 these costs decreased to $ 84,000.00 with 3 deaths.

Education

Education, as recognized right of all citizens, seeks the integral formation of man and his participation in the community (Article 55 of the Constitution of Sao Tome and Principe). It is a component of the social sector which is of major importance for the society.

School Education is the central axis of the National Education System. It comprises three levels:

- Basic Education;
- Secondary education;
- Higher Education.

Basic education in Sao Tome and Principe is universal, compulsory and free. The compulsory education is six years, i.e. up to the 6th grade, which defines this level as a priority for the education sector. At this time and in the education reform is an ongoing process of curriculum reform for the 1st cycle of basic education (1st to 4th grade). The implementation of new programs and textbooks for this cycle of basic education was completed in the 2009/2010 school year.

Tables - 5 and 6 below show some indicators of the System for 1st and 2nd cycles of basic education for the academic year 2007/2008. These indicators reveal that the need to improve some factors for the basic education is universal and quality desired, particularly in the second cycle of basic education.

Table 5- Some System Indicative Indicators (1st Cycle of Basic Education)

Indicators	Academic Year 2007/2008
Gross Enrollement Rate	127,6%
Net Enrollment Rate	93,6%
Dropout Rate	43,3%
Student/Classroom Ratio	32
Teaching staff	708
Teaching staff with specific training	334
Teaching staff with training in other areas	25
Untrained Teaching staff	349
% of Teaching staff with training	51
% of Untrained Teaching staff	49
Children Enrolled	23,247
Children from 7 to 10 years in nthe Country	18,213
Students out of school age	29,6%
Rate of admission in Grade 1	43,8

Source: Statistical Bulletin of the Ministry of Education & Culture, 2008

Table 6- Some System Indicative Indicators (2nd Cycle of Basic Education)

Indicadores	Ano lectivo 2007/2008
Gross Enrollement Rate	109,7%
Net Enrollment Rate	47,9%
Dropout Rate	47,4%
Student/Classroom Ratio	43
Teaching staff	330
Teaching staff with specific training	114
Teaching staff with training in other areas	28
Untrained Teaching staff	188
% of Teaching staff with training	43,0%
% of Untrained Teaching staff	57,0%
Children Enrolled	9369
Children from 7 to 10 years in nthe Country	8537
Students out of school age	56,3%
Rate of admission in Grade 5	84%

Source: Statistical Bulletin of the Ministry of Education & Culture, 2008

The level of literacy of Sao Tome and Principe is relatively high compared with the average of African countries (Chad, Malawi and Rwanda, less than 40%), amounting to between 1991 and 2001 by about 85% in Água Grande capital, against 65% in Caué, the District that traditionally has lowest rates of IHD compared to higher rates of poverty presents.

It should be noted a good evolution of the national literacy levels between 1991 and 2001 which increased from approximately 16.9% during this period. In 2001, the literacy rate was 83.1%.

Higher Education and Scientific Research

After an initial period characterized by some uncertainty and disbelief, higher education in Sao Tome and Principe currently experiencing a tendency to reverse this situation, thanks to the efforts of the actors engaged in the process. The performance of persons coming from these institutions, gives them a credibility that gradually improved over the years.

We highlight the Higher Polytechnic Institute (ISP), established in 1998 with an ever increasing number of students. In 1997/1998, it was about 8 dozen students enrolled in 2007/2008 and the number of students enrolled was 604 students.

Besides ISP, there are two private higher education institutions, including the Graduate Institute of Accounting and Information Management (IUCAI) and the University of Lusíada. These higher education institutions teach courses in undergraduate, graduate and Masters.

With regard to scientific issues related to the Convention, i.e. Climate Change, institutions such as the INM and CIAT show visible signs on weather forecasts and early warnings about the weather and durable development of agricultural techniques, diagnosis of the soil situation, respectively.

But the development of technologies and equipment and equipping human resources foreseen for the near future will bring a new breath. However, stock exchanges and cooperation with institutions of higher education above make the process more fruitful.

Economy

The Democratic Republic of Sao Tome and Principe is considered a poor country, to the extent that the gross domestic product per capita in 2009 is U.S. $ 1,231 (INE 2011). The study on the poverty profile in 2001 indicates that 54% of the population lives below the poverty line and 15% are classified as extremely poor. Poverty remains a predominantly rural phenomenon, with 65% of rural population living below the poverty line and 22% in extreme poverty.

It is an agricultural country whose economy based on cocoa exports in 2001 represented 30% of all agricultural production and 86% of exports. INE estimates indicate that in the period 2001-2007, the economy grew 50% in cumulative terms, equivalent to an average annual growth of 7%.

According to the same UNDP report, in the same period the performance of the Saotomean economy was evident with highlight to the tertiary sector, driven by the health services, accommodation and catering services and transport and communications grew in cumulative terms 91.7%, 88.3% and 61.1% respectively.

For the secondary sector which represents 20% of GDP, its contribution was 42% in the same period. According to national accounts estimates of the National Statistics Institute (INE), the share of tertiary sector in GDP rose from 54% in 2001 to over 60% in 2007, driven by increased trade and transport services primarily in the informal sector.

According to the GDP of approximately U.S. $ 181 million in 2008, the main contributions of sectors of economic activity are: i) Trade (23%), ii) transport and communications (13%), iii) Agriculture, Livestock (12%), iv) Financial (10%) (INE, 2008).

Table 7 below illustrates the sectarian distribuition of production.

Table 7 - Sectarian Distribution of the Population

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Primary Sector *	26,4	24,8	24,8	21,3	20,5	20,0	19,1	18,0	20,3	23,1	18,1
Secondary Sector **	19,6	18,8	16,4	16,7	17,0	17,4	16,7	15,5	18,0	22,2	22,9
Tertiary Sector ***	53,9	56,3	58,8	62	62,4	62,6	64,2	66,5	54,4	48,1	53,1

Source: INE, 2008; * Agriculture & Fishery; ** Indústry, Energy and Construction; *** Commerce, Transports, Financial Institutions & other Sservices

Agriculture & Livestock

Representing the backbone of the Saotomean economy, this sector absorbs about 30% of the workforce with equal participation in the GDP. It also provides the largest source of foreign currency in the country.

The structure of GDP witnessed the fragility of the Saotomean economy. The primary sector contributes about 18.10% of GDP and remains dependent on cocoa. The production of other agricultural exports (copra, coffee) dropped dramatically or did not increase. The main positive developments associated with land reform, was due to some growth in subsistence agriculture in recent years, especially cocoyam and bananas, see Table 8 below.

Table 7- Crop Production from 1993 to 2003 (tonne.)

Crops	1993	1994	1995	1997	1998	2000	2001	2002	2003
Cocoa	ND	ND	3671	3.138,0	3.928	2.883	3.652	3.662	3.820
Banana	3.000,0	13.650,0	12.685	25.0	34.596	42.245	27.020	28.620	29.050
Cocoyam	7.000,0	8.500,0	8245	15.000,0	20.964	26.976	26.000	24650	24.750
Bread Fruit	18.000,0	1.500,0	1600	2.000,0	2500	3.267	14.900	18400	18.500
Coffee	22,7	21,4	17	44,1	36	12	13	ND	ND
Copra	ND	ND	507	ND	433	882	363	ND	ND

Source: INE/ DPE (2004) citado pela CAPADRP (2006).

Since the redistribution of large cocoa farms in the early 90s, most of the agricultural production has been carried out by small farmers to the extent that cocoa alone does not guarantee a livelihood, many find additional work in the cultivation of vegetables, fruits, vanilla and green pepper for export. Despite the immense importance of the cocoa economy in Sao Tome and Principe, the export quota of the country in the world market was estimated at only 0.11% between 2000 and 2005 by the International Cocoa Organization (ICCO). However, Saotomean cocoa is prized for its high quality and is often mixed with lower quality cocoa to improve the final product. There is also a growing cocoa sector "biological" whose export in 2010 was about 1,009 tones (ENAPORT, 2011).

Fisheries

Despite the relatively small continental shelf due to its volcanic origin, the fishing sector is relatively unimportant to national economy with the potential of fisheries resources of around 12,000 tonnes of fish per year (7,500 in 4500 and Prince in S. Tome)

Biodiversity surveys indicate that the country's waters contain 185 species of fish from 67 families. Other features include nesting sea turtles, seabirds and marine mammals, making the waters of Sao Tome and Principe play an important base of the humpback whales that migrate between Antarctic and the Gulf of Guinea. Studies by ORSTM / SGTE, 1982 and oceanographic ships of the Soviet Navy in 1986 and 1983 indicate a potential fish biomass of 12,000 tones per year, 8,500 of which are pelagic and demersal species remaining 3,500. The fish species are most abundant *flying fish (Cypselurus melanurus), squid (Loligo vulgaris), snapper (Pagrus Caeruleostictus), groupers (Epinephelus adscensionis) and snorers (Roger and Pomadasys Pseudotolithus senegalensis*).

The local fishing industry's contribution to the Saotomean GDP is very low (about 4.8% in 2007), according to Table 9, but the annual catch is estimated at 4,000 tones (Table 10), representing about 70% consumption of animal protein in Sao Tome and Principe (INE).

Table 8- Contribution of Fisheries to GDP (2002 - 2007)

Year	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
GDP (%)	5,6	5,7	5,8	5,8	5,0	4,8

*Source **: INE, Direcção das Pescas, 2007***

Table 9- Fish Production

Fishery	**Production/Ton**					
	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Semi-Industrial Fishing	36,50	29,40	32,10	37,80	nd	nd
Artesanal Fishing	3.655,50	3.790,00	4.005,90	4.103,50	3.336	nd
Total	**3.692,00**	**3.820,00**	**4.038,00**	**4.141,30**	**nd**	**nd**

*Source**: INE, Directorate of Fisheries, 2007***

According to the survey conducted by the Directorate of Fisheries in 2007, there were 1,655 canoes used for fishing vessels of 20 and 12 to 16 meters for semi-industrial fishing.

With regard to the fishing industry, it is noted that Sao Tome and Principe is limited only to the granting of fishing license under the protocol signed with the European Union for the period 2006 - 2010, which allowed the use of 18 vessels for catching and 25 freezers vessels, totaling 43 vessels. In this context, the catch taken by five boats registered in 2007 totaled 1,729.69 tons.

Table 11 shows the number of fishermen and vessels registered in the period between 2001 and 2004.

Table 10- Fishery Activity

Name	Number of Fihsermen and Registered Fishing Vessels			
	2001	2002	2003	2004
Fishermen	3.906,00	4.687,00	5.296,00	6.090,00
Existing Vessels	2.253,00	2.524,00	2.953,00	3.544,00
With Engine	682,00	884,00	1.207,00	1.666,00
Without Engine	1.571,00	1.640,00	1.746,00	1.878,00

Source: INE, Direcção das Pescas, 2007

Service Sector

Tourism

Tourism is a promising activity in Sao Tome and Principe, despite its slow growth to show. Most tourists come from Europe and a small minority from Africa.

A good example to illustrate the attractions that Sao Tome and Principe can provide is its potential in terms of endemic bird watching.

There are 27 endemic species of birds in an area of 1000 km^2. On the other hand, any guide service in the country responsible for ensuring that a tourist can see 25 or 26 endemic species in a few days, which is a concentration of rare species almost unparalleled in the world.

The tourism sector is thus a key but insufficiently explored. In fact, the country boasts important natural attractions: exceptional flora and fauna and the enormous scientific interest. Twenty-seven species of rare birds or 30% of the species resident (distributed in five genera) are endemic to the islands.

In Sao Tome and Principe, there are recorded 895 species of higher plants, of which 134 are endemic, 63 species of birds (25 endemic), 16 reptiles (seven endemic) and 9 amphibians (all endemic).

In due time, can also be seen passing *dolphins* (*Delphinus delphis*) and *humpback whales* (*Megaptera novaeangliae*). The *leatherback turtle* (*Dermochelys coriacea*) *spawn* at various locations along the coast.

Table 12 below gives an overview of the number of visitors to the tourism sector.

Table 11 - Number of Foreign Tourists (2001-2006)

Country of Nationality	Years					
	2001	2002	2003	2004	2005	2006
Europe	1.565,00	2.799,00	2.068,00	1.962,00	3.003,00	2.430,00
USA	1.239,00	251,00	369,00	412,00	327,00	277,00
Africa	1.530,00	1.938,00	2.550,00	2.076,00	3.730,00	2.751,00
Portugal	2.673,00	2.630,00	4.674,00	4.841,00	7.028,00	5.138,00
Others	453,00	1.571,00	378,00	1.285,00	1.658,00	1.670,00
Total	**7.460,00**	**9.189,00**	**10.039,00**	**10.576,00**	**15.746,00**	**12.266,00**

Source: INE, SEFSTP

Seaport

The main port of S. Tome is located in the Bay of Ana Chaves, on the east coast of the island. There is a fuel terminal in the port of Nevis on the northwest coast of S. Tome and one in Santo Antonio Bay on the island of Principe.

The vulnerability of the port of "Ana Chaves" likely comes from the action of the adverse effects of climate change, including rising sea water levels, which may cause flooding across the harbor. According to the IPCC predictions for the 2100 horizon, an increase is expected in the levelçs of sa water from 0.18m to 0.56m on the scenario (SRES) A_2.

This port, through which most of the operations of national loading and offloading of vessels have normally been carried out, is not a whaff, reasons for which it has resorted to tugs and barges for the clearance of goods that are imported and exported to/from the country, at great distance from the coast[2] (140KM, about 8h).

Therefore, these operations involve high costs, high rates for long stay.

According to data provided by the National Port Authority (ENAPORT, 2011), the frequency of ships in the country was 305 in 2007 and 191 in 2008. In 2007, about 6,000 containers were traded, about 65,000 tonnes of freight (cargo - 3000 tons. And discharge - 62,000 tons.). In 2008 about 6,500 containers of about 69,000 tonnes (cargo - 2500 tons. And discharge - 66,500 tonnes).

Sao Tome and Principe does not have its own maritime fleet. The ships are mostly from Europe (Portugal, Spain and Belgium). The connection between the country and the world by sea is by large ships carrying goods to and from Europe, for fishing boats (semi-industrial and industrial) and also by small vessels carrying passengers and goods between Sao Tome and Principe and the ports of Angola, Gabon, Cameroon and Nigeria.

The connection between the two islands is very deficient. It is done through small vessels vulnerable to accidents that happen with some frequency.

The fact that Sao Tome and Principe being away from Europe, its main market, and use a path of low intensity for a small market, it allows one to benefit from very low-cost global ocean freight and container transport. The establishment of regional relations could become a beneficial strategy to diversify the economy and create a platform for future integration into the global economy.

An agreement of 400 million dollars between the Saotomean Government and Terminal Link (transport company) in August 2008, after conducting a feasibility study highlighted the possibility of Sao Tome and Principe becoming an ideal place to a hub of container held by the Agency for Trade Development of the United States (U.S. Trade and Development Association). The agreement is aimed to build a deepwater port within eight years on the north coast of the island of S. Tome in the district of Lobata, about 12 kilometers from the capital of the country, to serve as a hub in West Africa. Such infrastructure will occupy an area of 80 hectares, 50 percent of the space on land and half in the sea.

In the first phase, the company responsible for the building will carry out an environmental impact study that will last for four years, and then enter the period of execution of works which can absorb more four years.

Energy & Transport

In the energy field, Sao Tome and Principe is a very deficient counry. The hydroelectric power produced in two small rivers in the central counter and Manuel Jorge, represents a small fraction of actual needs of the country. Thermal energy is obtained by using imported fuel. This causes a high cost of production in thermal power plants, reflected in higher consumer prices, charged by the Water

and Electricity Company of Sao Tome and Principe (EMAE). In addition to this high cost, it adds a tiny and outdated network of production and distribution of energy.

The supply of electricity in Sao Tome and Principe is unreliable and their distribution reaches only about half the population. EMAE currently has 12 MW of installed capacity, 80% from power plants and 20% hydroelectric Counter and Guegue. However, availability has increased to 15 MW and will continue to increase along with the economic growth in coming years.

The country has a hydrographic network composed of more than 50 waterways from an average length between 5 and 27 km and a vertical drop of 1,000 and 1,500 meters. It is a network of nature that extends radially from the center (located at altitude) in the direction of the coastline that surrounds the country.

The rivers are fed largely by precipitation during the rainy season, but also by groundwater during the dry season.

Sao Tome and Principe has a high water potential composed of more than 50 rivers fed by rainfall rates relatively high, ranging between 1,000 and 5,000mm of rain per square meter. These rivers have a total volume estimated at 410.55 million cubic meters, according to recent studies conducted by the company of the Republic of China-Taiwan, "CECI CONSULTANTS, Inc., Taiwan", in June 2009.

About 4.93% is used in agriculture, 2.98% in hydropower production, and 0.45% to supply the population. The remaining 91.64% are not used. These resources are distributed unevenly, exposing certain regions to water shortages, with more than 60% of watercourses located in the areas south and west of both islands.

The sector of production, transmission and distribution is also lacking, if we consider the application of efficient and renewable technologies in the sectors of production, transmission and distribution and the thermal component representation in very (85%) and lower expression in water (15%) in national energy system. It has a generating capacity of approximately 17.915MW, while demand is around 30 MW, i.e. a demand of approximately 12.085MW unsatisfactory by the year 2010.

The energy production in S. Tome that was 23.5 x 106 kW / h in 1997 rose to 42.8 x 106 kW.h in 2006, representing an average growth of 10.5% per year. However, the hydro production was in this same period, a decrease of around 4.2%, which means that the heat production and its consequences in terms of emission of greenhouse gas emissions are growing at a rate of approximately 19 % per year (Graph 3).

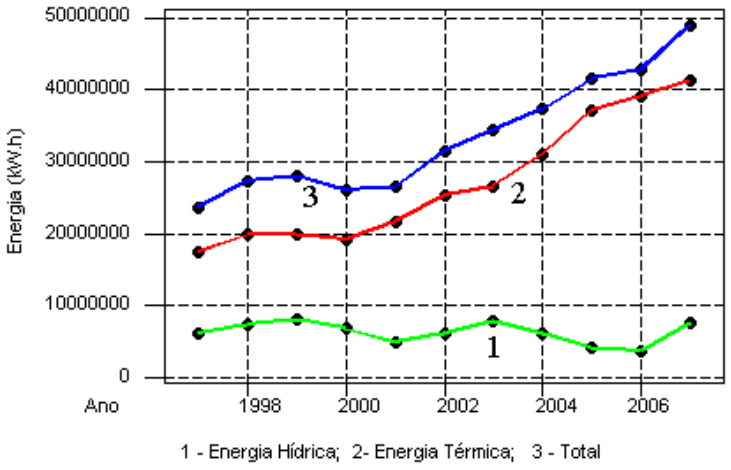


Figure 3- Energy Production of S.Tome & Principe

During the period from 1998 to 2005, there was only an increase of 4.256 MW of thermal power diesel to meet the demand of the country, this is an average of 0.6 MW per year. This level of growth is clearly too low, and as a result, the electricity sector is not able to meet all the demand of the country.

Air Transport

The link between Sao Tome and Principe and the world is made, especially by air. With Europe, it is performed with a frequency of two to three weekly flights.

Due to the prospects for business expansion at the national level and the expectations of developing the country's oil, is expected to increase the number of weekly flights to Europe. Currently there are about four direct flights and three options by the African continent.

Several weekly flights to African regions are carried out: three to Luanda, two to Libreville, two to Cape Verde and one in Lagos and Equatorial Guinea.

There are also domestic flights between the islands, with a frequency of four flights per week.

Industry and Constructions

With a fledgling industrial park, the secondary sector is very expressive in the national economy, contributing about 14% to the GDP, of which 11% is due to the construction industry. Today, this branch is very active due to the large reclamation projects, maintenance and construction of new infrastructure, economic and social structures.

Apart from construction, other industries are: food industry (beer and bread), wood processing, shipbuilding, energy production, clothing, furniture production and some artisan production of alcoholic beverages.

It should also be noted that although in its infancy, this industry is responsible for emitting greenhouse gases, especially in the bakery industry and handicraft production of alcoholic beverages because they generally use firewood as an energy source.

Regarding buildings, taking into account the traditional ways of building homes, cooking food and lighting, it is urgent to seek alternative solutions to replace the use of wood and sand from the beaches and other aggregates in construction so that in the near future, it may begin to take safer steps towards mitigating this sector.

To this end, pilot experiments carried out with the production of clay bricks with deposits taken from local kilns improved substantially, thus reducing losses and consequently the energy consumption obtained from the wood, among others, should be the subject of specific legislation, for its gradual implementation throughout the country.

Mineral Resources (Oil)

Sao Tome and Principe is located in the Gulf of Guinea, a well known oil area. The country has recently started negotiations for oil exploration. There is in effect an agreement with Nigeria for the joint exploration of oil (the ratio of 40/60 to Sao Tome and Principe / Nigeria respectively), meeting some of the blocks already being explored by international oil companies.

The hydrocarbon potential of the country is located in three distinct areas, referred to as "provinces": the Province of JEZ (Joint Exploration Zone), Province of the EEZ (Exclusive Economic Zone) and the Province of coastline (Onshore) of Sao Tomeand Principe.

There is a consensus, both within the population and the authorities that, oil being a limited natural resource, the financial results resulting from its exploitation should be used to invest in other sectors of the economy such as agriculture , fishing, tourism, basic infrastructure, education, health etc… in order to deliver sustainable development.

It is hoped that this activity will produce a major economic impact in the country in terms of opportunity for new business, growth of the existing business, job creation, investments in terms of preserving the environment, improving services and infrastructure, health and education.

I.7 – Climate Change and the Millennium Development Goals

The adoption of the Millennium Development Goals (MDGs) by the Heads of State and Government Members of the United Nations General Assembly in 2000, including Sao Tome and Principe, launched a decisive process of global cooperation in the XXI century, giving a huge boost to development issues.

The objectives of the Millennium Declaration to be achieved by 2015, the highlights are 1 and 7, which are respectively, "Eradicate Extreme Poverty and Hunger" and "Ensuring Environmental Sustainability"

Sao Tome and Principe is a small island country, fragile, vulnerable and developing countries, which is why all measures should be taken to minimize the negative impacts of climate change that may result from the process of socio-economic development which advocates.

According to the Human Development Report, produced by the United Nations Development Programme (UNDP) in 2008, meeting Millennium Development Goals (MDG) 1 "Eradicate extreme poverty and hunger", divided into three indicators, namely, 1 - Poverty rate, 2-Incidence of extreme poverty and 3- Prevalence of underweight among children under 5 years, has the following assessment:

- For indicator - 1, from assessment, it can be deduced that the progress is slow and the possibilities of achieving the goal in 2015 are reduced.
- For indicators 2 and 3, there are some possibilities to achieve the goal in 2015.

According to the same UNDP report of 2008, the achievement of MDG 7 "Ensure environmental sustainability" indicators divided into two, namely, 1-Population with sustainable access to improved sanitation (%) and 2- Population with sustainable access to an improved water source (%), there are also possibilities of Sao Tome and Principe to be able to meet the goal set for 2015.

I.8 - Institutions and legal framework within the Framework of Climate Change

Sao Tome and Principe is an island country and to a lesser extent, making it vulnerable to changes that take place at the earth planet and is subject to direct influences of the possible increase in the level of the sea as a direct result of rising global temperature.

In this sense, is engaged in the implementation of actions aimed at mitigating the adverse effects of climate change. To this end, the country has signed and ratified the three conventions of Rio de Janeiro on environment, as has already ratified the Kyoto Protocol.

On the other hand, STP beyond the drafting of the First National Communication, produced the document "National Strategy for Implementation of the United Nations Convention Framework on Climate Change" and the National Action Plan for Adaptation to Climate Change.

The Saotomean state engaged with environmental issues decided by the creation of the Directorate General for Environment (DGA), a structure created in 2007 through Presidential Decree No. 2 / 2007 and protected by the Ministry of Natural Resources and Environment.

According to the Decree, the DGA is the body responsible for implementing and coordinating all policies and strategies of the government of the Democratic Republic of Sao Tome and Principe on the environment and has as its mission the implementation of all environmental conventions.

The institution involved in the implementation of the United Nations Convention Framework on Climate Change is the Ministry of Natural Resources and Environment through the Directorate General of Environment, in collaboration with the National Institute of Meteorology.

The Law on Environment, Law No. 10/99 of April 15, creates the legal framework of the environment in Sao Tome and Principe. This law defines the bases of policy for sustainable development.

In addition to the basic law of the environment, there is a framework consisting of the following laws: Law of conservation of flora, fauna and protected areas; Forestry Law, Decree-Law on national parks *obôs* STP; Law of Fishing and Fishery Resources; Regulation on Environmental Impact Assessment; Decree on aggregate extraction in coastal areas and rivers.

Based on previous proposals in the document "Strategy for Implementing the United Nations Convention Framework on Climate Change" and "Profile Theme Climate Change" for implementation, coordination, monitoring and evaluation of the United Nations Convention Framework on Climate Change proposes the creation of a national committee on climate change and mandate in order to consolidate the actions under way in climate change.

I.9 - Education, Training & Awareness

Education, training and awareness for climate change issues, such as the "ozone layer", "Global Warming" among others, can contribute substantively to a better understanding of environmental issues and hence to behavior change.

Moreover, in accordance with subparagraph i) of Article 4 of the Convention, "All parties, taking into account their common but differentiated responsibilities and their development priorities, specific national and regional objectives and circumstances, should promote and cooperate in education , training and public awareness regarding climate change and encourage the widest participation in this process, including the participation of nongovernmental organizations. "

In this perspective, a partnership with the Ministry of Education, Culture and Training to implement educational programs that meet the objectives of the Convention, should be part of school curricula.

I.10 – Motivation

The Democratic Republic of Sao Tome and Principe, as already mentioned, is a very rugged country with many mountainous regions, some of which are difficult to access, and are therefore a prime habitat for many species endemic to this country, both animal and vegetable.

In this context, it is necessary that adequate measures are taken to preserve this natural heritage.

The preservation of flora and fauna of Sao Tome and Principe has positive effects on the country's economy and consequently the life of its populations because they are exceptional tourist attractions.

They are home to many endemic flagship species whose habitats are located mainly on sea grass beds and coastal and forest environment (see chapters IV.5.2 and IV.5.4). Also in the annexes, one may see in Table 7, some known endemic and emblematic organisms of the forests of the islands of Sao Tome and Principe.

Because it is an island country, pressure on coastal areas which is the habitat of these endangered species is even greater because they are subject to coastal erosion and the possible rising of the sea.

Similarly, endemic species whose habitat is located in the forests also show some vulnerability on climate change. Increased temperature and decreased precipitation, climate impacts identified in the baseline study on climate of Sao Tome and Principe, are the elements that may contribute differently to migration and condition the survival of the species.

In the first National Communication on Climate Change of Sao Tome and Principe published in 2004, projections were made of the sub-regional climate as well as possible changes in climate in Sao Tome and Principe generated through simulations of the General Circulation Model (ECHAM4) of Max Planck Institute (Hamburg) assuming an IS92a scenario. These simulations suggested that a temperature increase of 2°C can be expected until 2100, associated with a decrease by approximately 15% in Sao Tome and Principe.

According to the new IPCC report, based on different scenarios (including SRES A1B scenario and models should occur, on average, the following changes for the period 2080 to 2099: rainfall tends to increase during December, January and February and lower during June, July and August, when temperatures tend to increase from 2 to 2.5°C.

All these aspects are referred to factors of motivation for an analysis of the current climate of the country in the light of observed data available, and considering the projections made by climate models.

PART - II

CHAPTER II- EMISSION INVENTORY OF GREENHOUSE GASES

II.1 - Introduction

This chapter is meant to make an inventory of the emission of greenhouse gases for the various sectors of national life, according to Article 4, paragraph 1 (a) and Article 12, paragraph 1 (a) of the Convention, namely, energy, industrial processes and waste, land use change and forestry, agriculture and livestock, to overcome the shortcomings identified in the evaluation of the First National Communication, and proceed to the quantification of emissions from these sectors.

Men and women in the development of the production process of their consumer goods exploit the existing resources in forest ecosystems degrading its natural dynamics or even its complete destruction. Industries develop, produce waste, and thus enhance the emission of different gases that cause greenhouse gases such as CO_2, CH_4, N_2O, CO and NO_x, which will be the subject of this inventory.

Table 13 below shows the referenced sectors and gases included in the inventory of greenhouse gases.

Table 12- Selected Sectors and types of greenhouse gases included in the 2005 IGHG

Sectors	GHG (Gg)					
	CO_2	CH_4	N_2O	CO	NOx	NMVOC
Energy	✓	✓		✓	✓	✓
Industrial waste and Procedures		✓	✓			✓
Land Use Change and Forestry	✓	✓		✓	✓	
Agriculture and Livestock	✓	✓	✓	✓	✓	

To perform this inventory, it was established under the coordination of the Ministry of Public Works and Natural Resources, a panel of national experts involved in various sectors of national life. In this context, we designed a series of sectarian reports which have described the level of greenhouse gas emitted by these sectors. The process of collecting and processing of data involved a group of national staff, both in offices and on the ground and counted with the participation of various sectors of national life, especially the central bodies of state administration, the private sector, organized civil society, socio professional groups (farmers, coal miners, coal saleswomen, and even the housewives).

The inventory process began with the completion of a staff training to strengthen the national capabilities in the areas of methodologies of the Intergovernmental Panel on Climate Change (IPCC), to use the NAI software, the Good Practice Guides (GPG) and methodology for collecting and processing data. Were established the following working groups:

- Energy
- Industrial Processes and Waste
- Forestry and Land Use Change
- Agriculture & Livestock

The reference year chosen by the Convention for the elaboration of SNA in the countries of "Non-Annex I" is 2000. However, Sao Tome and Principe chose 2005, under a special provision for the countries considered "least developed" in this category. They were then allowed to choose freely the

year, taking into account the technical constraints, material and human resources with which they face in fulfilling this obligation.

II.2 – General Emissions Framework at the National Level

Table 14 and Chart 4, below, present an overview of the 2005 GHG emissions by sector.

Table 14 - Estimate of GHG emissions in STP, 2005

Sectors	Gases						
	Emissions CO_2	Removals CO_2	CH_4	N_2O	NO_x	CO	NMVOC
Energy	66,29	-	0,22	0,03	0,50	5,48	0,67
Forestry & Land Use Change	97,2	727,57	0,05	-	0,01	0,41	-
Agriculture & Livestock	-	-	0,68	0,001	0,26	11,28	-
Industrial Processes & Waste	-	-	0,17	0,01	-	-	2,32
Total Emissions	**163,49**	**727,57**	**1,12**	**0,041**	**0,77**	**17,17**	**2,99**

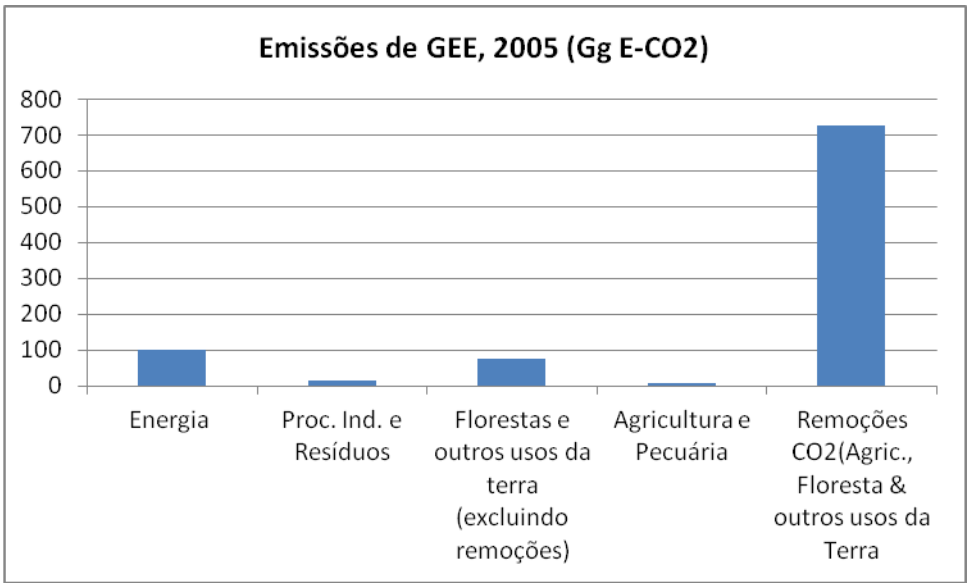


Figure 4- Summary of GHG Emission (2005)

To better elucidate the sequestration capacity of our forests, Table 15, below, shows the summary of emissions between 1998 and 2005, in CO_2 equivalents.

Table 15 - Summary of Emissions from 1998 and 2005 (Gg E-CO_2)

Sectors	1998 (Gg CO_2 -E)	2005 (Gg CO_2-E)
Energy	79,08	101,48
Industriais Processes & Wastes	34,08	13,96
Forestry & other Land Use (excluding removals)	73,78	73,78
Agriculture & Livestock	43,15	7,42
Total Emissions	**230,09**	**196,63**
Estimation of CO_2 removal		
Agriculture, Forestry & Other Land Use	**704,55**	**727,57**

II.3 - Methodology

Of the methods recommended by the IPCC, we used the "Tier 1" to the inventory of greenhouse gases. The same method allows the use by default when countries do not have the methodology and data series representing the various anthropogenic emissions by sources and removals by consumers of greenhouse gases not controlled by the Montreal Protocol.

II.4- Sector Emissions

II.4.1- Emissions from Energy Sector

Emissions of carbon dioxide (CO2) were 66.29 Gg, referring to the burning of oil, of which the sub-sector of the energy industry and the largest contributor, with about 32.39 Gg, followed by sub-sector Transport with 28.23 Gg and finally, the residential sub-sector that issued only 5.67 Gg.

Emissions from the energy industry are derived mainly from the burning of diesel fuel used to produce electricity.

The Land Transport issued a considerable amount of CO_2, with 22.71 Gg, representing 80.4% of emissions from transport sub-sector, followed by 4.9 Gg with shipping and civil aviation (domestic flights) with only 0.63 Gg.

As recommended by the guidelines and the IPCC Good Practice Guidance (GPG), the calculations of GHG emissions from bunkers should not be considered in net emissions of the country. Emissions from biomass burning were not considered in CO_2 emissions for the energy sector, are already accounted for in the field of land use changes and forest. However, these emissions should be reflected in the inventory for information. Thus, due to the burning of biomass, the use of firewood and charcoal, were issued 71.037 Gg of CO_2 and in the case of bunkers (international flights) was issued a total of 9.818 Gg of CO_2. (See Table 16) The calculations performed for the reference year 2005 took into account data for more detailed consumption derived from fossil fuels and wood. A rigorous analysis was made, thus allowing reaching the best figures, see Table 16 below.

Table 16 - Summary of GHG Emissions for the reference year (2005)

GREENHOUSE REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**CO2**	**CH4**	**N2O**	**Nox**	**CO**	**NMVOC**
Total Energy	**66.29**	**0.22**	**0.00**	**0.50**	**5.48**	**0.67**
1 Energy Industry	**32.39**	**0.001**	**0.000**	**0.09**	**0.01**	**0.002**
2 Transport	**28.23**	**0.00**	**0.00**	**0.33**	**1.49**	**0.28**
a Civil Aviation	0.63	0.000	0.000	0.003	0.001	0.000
b Land Transport	22.71	0.004	0.000	0.22	1.42	0.27
c Maritime Transport	4.9	0.000	0.000	0.10	0.07	0.01
3 Other Sectors	**5.67**	**0.21**	**0.00**	**0.08**	**3.99**	**0.38**
a Residential	5.67	0.211	0.003	0.08	3.99	0.38
A Informative Title						
Bunkers	**9.818**	**0.003**	**0.000**	**0.04**	**0.01**	**0.01**
Aviation (International Flights)	9.82	0.003	0.000	0.04	0.01	0.01
International Navigation	0	0	0	0	0	0
Biomass CO2 Emmissions	**71.037**					

Table 17 presents the emissions obtained for 1998, following a reassessment of the calculations. Were taken into consideration some aspects such as converting liters into tons of data collected on the amount of fuel used, the exclusion of CO_2 emissions from coal and wood for better use of the revised 1996 IPCC software.

Table 17 - Results of the calculations of GHG emissions for 1998 (FNC)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC
Total Energy	**45.73**	**1.01**	**0.01**	**0.61**	**18.64**	**2.28**
1 Industrial energy	**18.93**	**0.001**	**0.0002**	**0.05**	**0.004**	**0.001**
2Transport	**22.08**	**0.004**	**0.000**	**0.21**	**1.54**	**0.29**
a Civil Aviation	0.38	0.0000	0.0000	0.0016	0.0005	0.0003
b Land Transport	21.41	0.004	0.000	0.21	1.54	0.29
c Maritime Transport	0.30	0.000	0.000	0.01	0.004	0.001
3 Other Sectors	**4.72**	**1.01**	**0.01**	**0.35**	**17.09**	**1.99**
a Residential	4.72	1.01	0.01	0.35	17.09	1.99
Informative Title						
Bunkers	**7.06**	**0.0002**	**0.0002**	**0.06**	**0.03**	**0.01**
Aviation (Internationl Flights)	5.41	0.0000	0.0002	0.02	0.01	0.00
International Navigation	1.64	0.0001	0.0000	0.03	0.02	0.00
Biomass CO2 Emissions	**121.42**					

II.4.1.1 – Conclusions

The CO_2 emissions from energy industries increased 71% (Table 18), the result of an increased consumption of fossil fuels (diesel), with the aim of producing electricity.

However, the transport sub-sector contributed an increase of 28%. The greatest variation was found in terms of shipping.

The residential sector accounted for a growth of around 20%

There was a total change in CO_2 emissions in energy sector 45%.

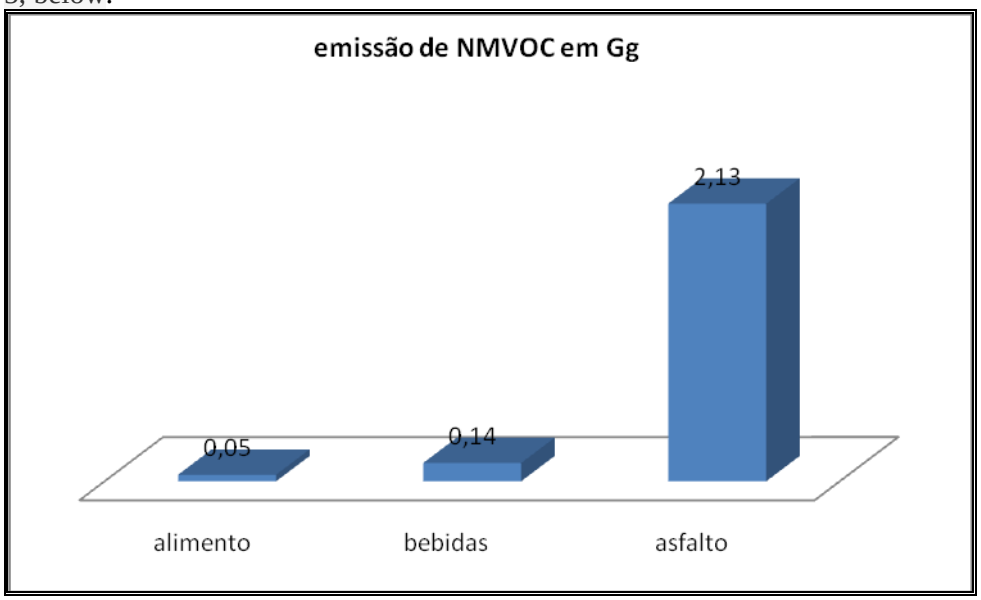
II.4.2 - Sector Emissions from Industrial Processes and Waste

II.4.2.1- Industrial Processes Subsector

Sao Tome and Principe does not have the so-called polluting industries. Its status is still embryonic and existing units are mostly craft.

However, there are some industrial activities in the country such as the industrial production of alcoholic beverages (Beer Rosemar) and artisanal production of distillates (factories distillation of spirits, those belonging to the group from the food industries such as baking, pastry) whose processes preparation are likely to issue the non-methane volatile organic compounds, the production of paints, printing (among other graphical model), the production of vegetable oil from palm, soap production and the production of animal feed.

Regarding the industrial sector, the emission of greenhouse gases, in particular, non-methane volatile organic compounds (NMVOC) emissions from industrial processes, was estimated from the worksheets 2-13 of the manual and software was obtained from the IPCC the value 2.32 Gg, chart No. 5, below.



Fiogure 5- Emission of NMVOC

II.4.2.1- Waste Subsector

The calculations of the estimated greenhouse gas emissions in the waste sector have been made for the following gases: methane (CH_4) from municipal solid waste, sewage, sludge and domestic trade, industrial organic water and nitrous oxide (N_2O) from human excrement.

The emission of methane (CH_4) from solid waste was calculated from the default values according to the tables of the IPCC, 1996 and obtained a value of 0.17 Gg. The analysis of emissions of methane (CH_4) from domestic wastewater and trade were made based on the procedures for estimating emissions of greenhouse gases from the spreadsheet NAI 6-2, obtaining the value of 0.02 Gg, chart No. 6, below.

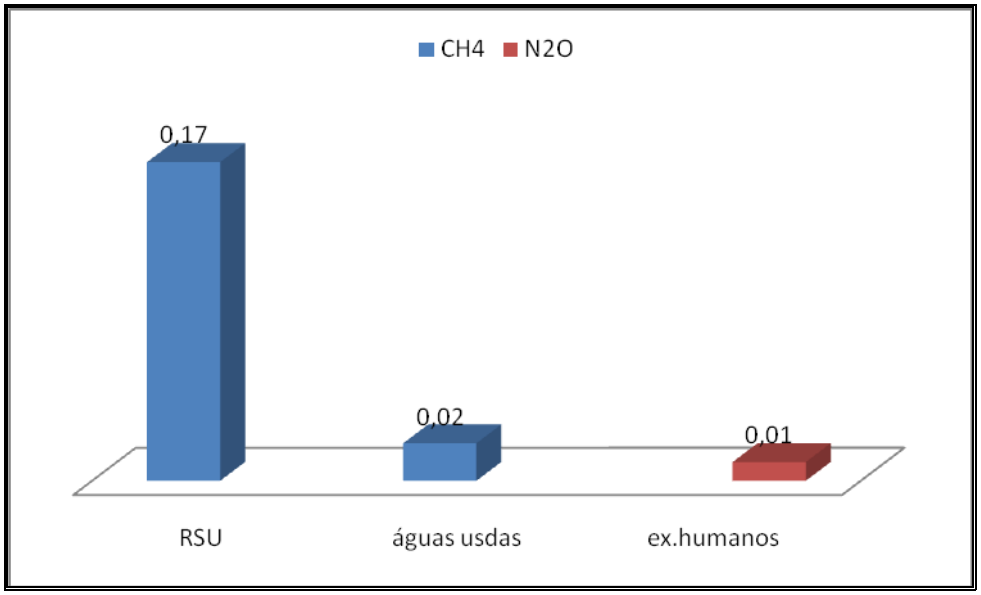


Figure 6- GHG Emissions in Gg (Wastes)

The estimate emission of nitrous oxide (N_2O) was made from 6.3 spreadsheet software NAI, having obtained a value of 0.01 Gg.

Table 18 below shows the general framework of the sector's emissions for 1998 and 2005.

Table 18 - Total GHG emissions for 1998 and 2005

General Emission Framework for the two IGEE						
Sectors	Gases (Gg)					
	N_2O		CH_4		MNVOC	
	1998	2005	1998	2005	1998	2005
Industrial Processes	------	-------	---------	-------	0,08	2,32
Wastes	0,01	0,01	0,12	0,19	------	-------

II.4.2.2 – Conclusions

According to Table 18 above, the emission levels are the most significant of methane (0.12 Gg CH4 - 0.17 Gg CH4), respectively for 1998 and 2005. There is a slight increase in the value of 0.05 Gg. This is due to population growth which implies higher consumption of goods and consequently, increased production of waste.

For industrial processes (see Table 18, emissions of NMVOC), observed an increase of 2.24 Gg. In 1998, the emission value was 0.08 Gg of NMVOC and in 2005 was 2.32 Gg due to increased production of brandy in the country.

II.4.3- Forestry Sector and Change of Land Use

II.4.3.1- Sector Emissions

Given the current global issue of greenhouse gas emissions that cause climate change, forest ecosystems for its integrated interactive components play a key role. For these ecosystems, when protected and maintained, are considered a major contributor to remove CO_2 (carbon dioxide) from the atmosphere, which is the greenhouse gas essential for formation of the phenomenon of global warming.

When, instead of that expectation to avoid impacts of climate change phenomena, man, in the development of the production process of his consumer goods, exploits existing resources in forest ecosystems degrading its natural dynamics or even its complete destruction, in trigger these activities will be issued, CO_2 and other gases treated as CH_4, N_2O, CO and NOx.

Observing the forest mantle covering the country, estimated at about 90%, apparently it can be deduced that the emissions in this sector are negligible and that this archipelago is a sharp summer gas emissions. However, the intensification of forest exploitation and the occurrence of certain forms of land use change, impose the choice of performing efficient calculations, to put in evidence these natural assumptions.

Table 19 presents the summary of GHG emissions and removals for the sector. Thus, the absorption of CO_2 for the changes in forests and other woody biomass stocks (-689.14 Gg) and the abandonment of managed lands (-38.43 Gg), give the country the status of "carbon sink". The set of global emissions of this sector, i.e. the conversion of forests and fields (37.58 Gg) and changes in soil carbon (59.62 Gg), plus all other national sectors, are lower in value.

Table 19 - Total Emissions and Absorptions through Change of Land Use and Forestry

Change of Land Use and Forestry	**Type of Gases**				
	Absorbtions / Sectoral Emissions (Gg)				
	CO_2	**CH_4**	**CO**	**N_2O**	**NOx**
Changes in Forestry and other woody biomass stocks	- 689,14				
Conversion of the forest and fields	37,58				
Burning of forests and greenhouse gass emission equivalent to CO_2		0,05	0,41	0,00	0,01
Abandonment of managed Lands	- 38,43				
Changes in soil carbon	59,62				
Global Emission (Gg)	**- 630,37**	**0,05**	**0,41**	**0,00**	**0,01**

II.4.3.2- Conclusions

One of the objectives of this Second Inventory of Greenhouse Gases (IGEE) is to address the gaps observed in the first inventory through the system recommended by the IPCC calculations. Sector Change of Land Use and Forests, efforts were made in this direction and we obtained a better determination of the results. However, there are still some uncertainties in the results obtained, which can only be overcome through applied research and carried out in long term, fixed work team.

However, although still with uncertainties, the results obtained here largely betray the realities of Sao Tome and Principe in terms of emissions and removals of carbon dioxide (CO_2).

Emissions were calculated 37.58 Gg of CO2 in the subsector of the Conversion of forests and fields. Emissions of other gases equivalent to CO_2 was 0.05 Gg of CH_4, CO 0.41, and 0.01 Gg of NOx emissions related to changes in soil carbon were 59.62 Gg of CO_2. In addition, the overall results showed an absorption of 630.37 Gg of CO_2.

To avoid double counting of areas corresponding to the secondary forests, it was not necessary to perform the calculations concerning the Annual Absorption of Biomass Carbon in the air to land abandoned for more than twenty years, as has already been included in the calculations of the energy sector. Also to be insignificant, the use of lime by Saotomean farmers, calculations related to this activity was neglected.

The results gotten from the GHG Inventory relatively to the sector of Changes of Land Use and Forests, reveal that Sao Tome & Principe is a consumer country of Carbon Dioxide (CO_2).

II.4.4- Agriculture and Livestock Sector

The GHG emissions for agriculture and livestock are summarized in Table 20 below:

Table 20 - Total GHG emissions in Agriculture and Livestock

GHG (Gg)						
	CO_2	**CH_4**	**N_2O**	**NO_x**	**CO**	**NMVOC**
Burning of Savanah		**0,39**	**0,0**	**0,18**	**10,34**	**-**
Burning of Agriculture Residues	**-**	**0,04**	**0**	**0,08**	**0,94**	**-**
Manure management	**-**	**0,064**	**0,001**	**-**	**-**	**-**
Enteric Fermentation	**-**	**0,186**	**-**	**-**	**-**	**-**
Total Emissions	**-**	**0,68**	**0,001**	**0,26**	**11,28**	**-**

GHG emissions from the burning of savannahs and agricultural residues is relatively insignificant. However, carbon monoxide (CO) amounted to 10.34 Gg in the burning of the savannah.

The issue caused by manure management and enteric fermentation is quite low, with the issuance of Nitrous oxide (N_2O) value of 0.001 Gg, as shown in Table 1, shown above.

Similarly, emissions of nitrogen oxide (NOx) were found only in the savannah burning and agricultural residues whose value is around 0.26 Gg.
An analysis of the contribution of different activities in the farming sector appears that carbon monoxide (CO) represents 71% of total emissions of gases in Sao Tome and Principe, followed by

methane (CH_4) with 27.2% and nitrogen oxide (NOx) with 1.7%. Production of nitrous oxide (N2O) is practically zero, since it represents only 0.06% of total issuance. The process of burning of the savannah is what contributes to a greater extent for the emission of greenhouse gases in the farming sector in Sao Tome and Principe.

II.4.4.1 – Conclusions

In the field of Agriculture (Table 19) the emission levels in 2005, when confronted with the inventory conducted in 1998, it was found that the values remain in the same order of magnitude of overall emissions of greenhouse gases, with the exception of carbon monoxide (CO) for which in 1998 was 2.474 Gg and in 2005 there was an increase to 11.28 Gg due to burning of the savannah. The estimated values for the other greenhouse gases were 0.117 -0.68 Gg to Gg CH_4, Gg 0.019 - 0.001 Gg to Gg N_2O and 0.0712 - 0.26 Gg, respectively for I and II Inventory.

II.5- Comparison Analysis between 1998 and 2005 inventories

The revised calculations of IGEE for the year 1998 arose from the need to compare the results and the year 2005, to enable an analytical assessment of the evolution of emissions and sequestrations between the two inventories.

It was not to review the calculations based on a new methodology but using the same guidelines of the IPCC (1996), with new knowledge about how to use available data.

Table 21 permits to better visualize the variations in CO_2 emissions between the two reference years (1998 and 2005).

As can be seen in this Table, the energy sector in 2005 gave about 66 Gg of CO_2 emission corresponding to the sub-sector of the energy industry around 32Gg of CO_2, the transport sub-sector about 28Gg of CO_2 and the sub-sector in Residential about 6 Gg of CO_2.

It represents an overall increase compared to 1998 for the energy sector of 45%, of which 71% for the energy industry sub-sector, 28% for the sub-transport and 20% for the residential subsector.

Table 21 - Comparison between GHG Emissions between 1998 and 2005

	1998		2005				
Inventory Year >>>>>>>	CO2						
Greenhouse gas source and sink categories	**Emissions (Gg)**	**LUCF (Gg)**	**Emissions (Gg)**	**LUCF (Gg)**	**Variation of emissions**	**Variation LUCF**	**Particp. Setors 2005**
Total national emissions and removals	**46**	**-609**	**66**	**-630**	**45%**	**3%**	100%
1. Energy	**46**	**0**	**66**	**0**	**45%**		
A. Fuel combustion (sectoral approach)	46	0	66	0	**45%**		
1. Energy Industries	19	0	32	0	**71%**		49%
3. Transport	22	0	28	0	**28%**		43%
4. Other sectors	5	0	6	0	**20%**		9%
5. Change of Land-use and forestry	**0**	**-609**	**0**	**-630**		**3%**	
A. Changes in forest and other woody biomass stocks	0	-666	0	-689		**3%**	
B. Forest and grassland conversion	0	37	0	38		**3%**	
C. Abandonment of managed lands	0	-38	0	-38		**0%**	
D. CO_2 emissions and removals from soil	0	59	0	60		**3%**	
International bunkers	**7**	**0**	**10**	**0**	**39%**		
Aviation	5	0	10	0	**81%**		15%
Marine	2	0	0	0	**-100%**		0%
CO_2 emissions from biomass	**121**	**0**	**71**	**0**	**-41%**		

In Table 21 above, for the sector of land use change and forestry, the difference in the ability to sequestration of emissions between the two surveys (1998, 2005) was about 21 Gg of (-609 to -630 Gg Gg) , i.e. an increase in the sequestration of about 3% between the two IGEE.

With regard to other similar gases CO_2, CH_4 i.e., NO, NOx, CO and NMVOC emissions changes are minor. The records remain negligible, similar to I º IGEE with figures very low or even zero in some cases not listed in Table 15, Model required the IPCC (CRT) for the reporting of national communications.

Thus, for the sub-waste (see Table 18), the emission levels of methane are the most significant (0.12 Gg CH_4 - 0.17 Gg CH_4), respectively for 1998 and 2005. There is a slight increase in the value of 0.05 Gg. This is due to population growth, which implies greater consumption of goods and, consequently, increased production of waste.

For industrial processes (see Table 18), NMVOC emissions observed an increase of 2.24 Gg. In 1998, the emission value was 0.08 Gg of NMVOC and in 2005 was 2.32 Gg due to increased production of brandy in the country.

Regarding the sector of Agriculture (Table 20), the emission levels in 2005, when confronted with the inventory conducted in 1998, it was found that the values remain in the same order of magnitude of the overall emission of these gases. With the exception of carbon monoxide (CO) for which in 1998 was 2.474 Gg and 2005, there was an increase of 11.28 Gg due to the burning of the savannah. The estimated values for the other greenhouse gases were 0.117 -0.68 Gg to Gg CH_4, Gg 0.019 - 0.001 Gg to Gg N_2O and 0.0712 - 0.26 Gg, respectively for I and II Inventory.
With regard to emissions from biomass, there is between IGEE of 1998 (121 Gg CO2) and 2005 (71 Gg CO_2), a reduction of 41%, Table 21.

II.6- Recomendations

Reduction of the degree of uncertainty to the results of IGEE forSao Tome and Principe in all sectors is considered a gradual process that will improve as the national system for collecting and processing data knowing a proper development.

It is necessary that the competent institutions are provided with sufficient resources to monitor, record, evaluate and analyze in a timely manner, all activities, changes and developments that are occurring over the years in related fields.

With regard specifically to the sector of land use change and forestry, the realization of an Inventory of Greenhouse Gases efficient can only be possible if the following actions are implemented:

a) Completion of the 3rd National Forest Inventory (conducting systematic forest inventories from 10 to 10 years);

b) Survey of all systems of land management and updating of the letter of Land Use in Sao Tome and Principe;

c) Strengthening of technical and operational capacity of the Forestry Department, especially the Forestry Statistics Section;

d) Creation of a monitoring system for land management in Sao Tome and Principe;

e) Creation of a multispectral team (Cabinet, committee, commission, etc.) that deals specifically with issues related to climate change, which has as its mission the following tasks:

i. Inventory of Greenhouse Gases;
ii. Studies on Vulnerability and Adaptation;
iii. Research, collection and systematic data processing.

Basically, these actions will be implemented only if they are considered essential to the economic development of the country. Therefore, it becomes imperatively necessary to take actions to make them included in the National Development Strategy and are actually performed.

PART - III

CHAPTER III –BASELINE AND CLIMATE SCENARIOS

III.1 – The baseline climate

The study was performed from a series of daily data of precipitation and temperature collected from the meteorological station of the Saotomean International Airport from 1951 to 2010. This station is the only one offering at this time, relatively long time series.

After all, this assumption is only possible if we assume that the use of data from at least one ground station location, always be more representative than the projections of any global or regional model.

The series of data collected from the airport weather station of S. Tome, though singular has proven to be representative of the climate of Sao Tome and Principe, in the selected period. Corroborates the findings of the regional climate analysis carried out by researchers at the University of Cape Town, including Mark and Fiona Tadross Tummon.

Indeed, based on the GCM model used by the team of national experts, Manuel Penhor, Bernardina Vaz and Madival Neves, were taken as reference GCM scenarios (STARDEX / ETCCDMI) produced by Mark and Fiona Tadross Tummon, University of Cape Town, climate studies in the region where Sao Tome and Principe falls.

The GCM data used in this modeling are from collections obtained by satellite for several decades, through which we analyzed the variations in this period in the aspects of the regional circulation of certain climate parameters, including wind, pressure, geo-potential height, sea surface temperatures and rain.

The verification of consistent changes in this circulation area was done through an analysis of the results obtained by mean and reanalysis data sets collected during the period between 1979-1988, 1989-1998 and 1999-2008, which is estimated to correspond roughly to the years 1980, 1990 and 2000 respectively, using an analysis system called (NCEP / DOE AMIP-II (NCEP-II[2]).

The construction of these data series is obtained using a system of global data assimilation which includes a variety of sources, such as probes radio, satellite, aviation, merchant ships and meteorological observation stations.

In preparing the study on Vulnerability and Adaptation in Sao Tome and Principe, this team of national consultants made climate projections about the behavior of temperature and precipitation on the islands at the horizon 2040-2060, with reference to a study by the Group Analysis of the Climate System of the University of Cape Town - South Africa, the climate of the geographic region where Sao Tome and Principe is found.

Thus, according to analysis by the team of national experts that conducted the study within the SCN, on the climatic situation of Sao Tome and Principe, there has been the following:

[2] NCEP/DOE AMIP-II (NCEP-II- Regional Sistem of data analysis on winds, temperatura e alture, geopotential, over decadas.

- **Temperature**

The trend analysis of real data shows that the values of the average annual temperature has been a growing trend at an annual rate of less than 0.01ºC between 1951 to 1977, moving average, respectively 21.3°C, 29.3ºC and 25.3°C both the minimum, the maximum and the mean, respectively, graph 7.

From 1978 to 2000, there is a worsening of the temperature rise. The average temperature increased by 1.15°C at a rate of 0.05°C.

In a comprehensive manner for the period from 1951 to 2010, the average temperature increased by 1.5°C corresponding to a rate of 0.025°C per year.

With regard to simulations of the Global Circulation Models for temperature, the emission scenarios A2 and B1 projected a mean temperature increase by 2050 between 1 and C 2. For the A2 scenario, the largest increase is expected to take place in June, July and August and September, October and November.

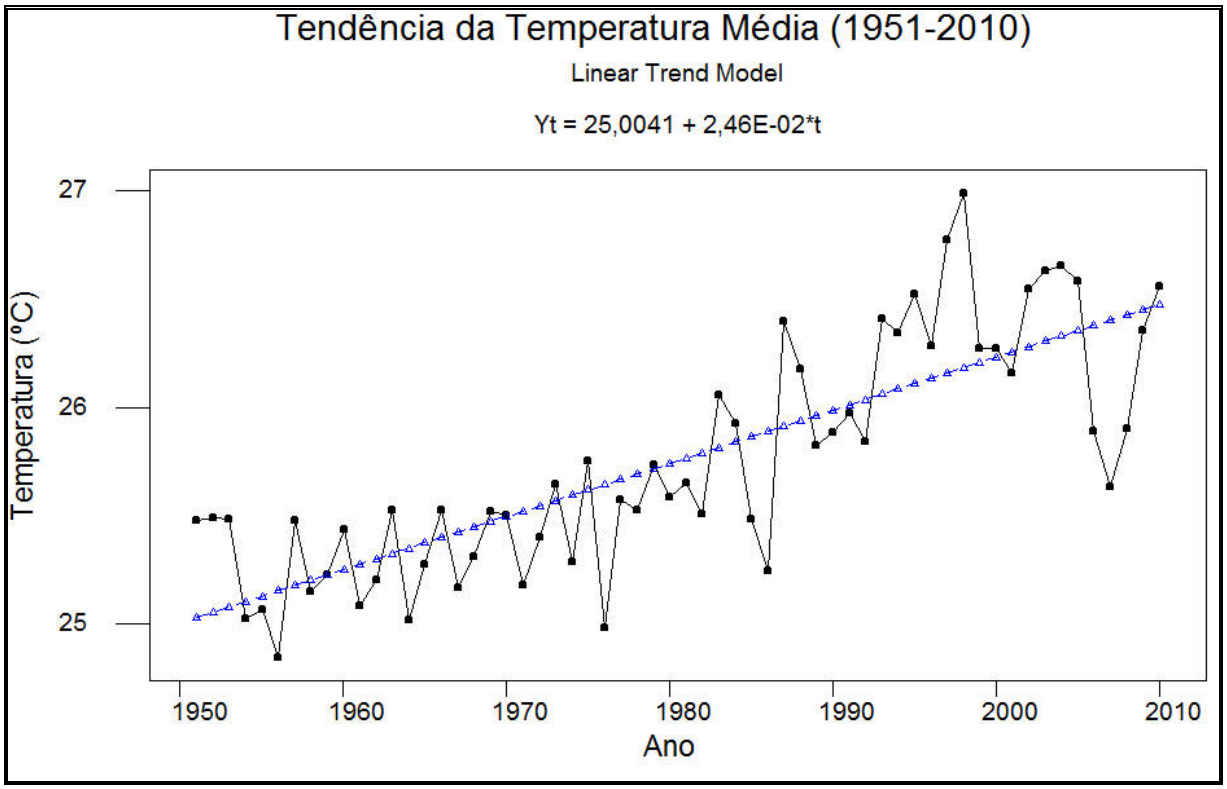


Chart 7- Average Annual Temperature (1951 - 2010)

- **Precipitation**

- The trend of decreasing rainfall is between the years 1951 and 2010, Figure 8. In a comprehensive manner for the period 1951 to 2010, precipitation has decreased to an average annual rate of 1.7mm per year.
-
- With regard to projections made by the model for the precipitation between the years 2040 and 2060, this team came to the conclusion in scenario B1, graph No. 9, that the precipitation might

have increased 6-8 mm / month during the months of September, October and November and 12-14 mm / month in these same months for the A2 scenario.

- However, for the months of March, April and May, the model projected in scenario B1, an increase between 0-2 mm / month and from -4 to -2 mm / month in the A2 scenario.
- The downward trend in rainfall observed in the analysis of observed data is consistent with the projection model in the A1 scenario for the months of March, April and May.

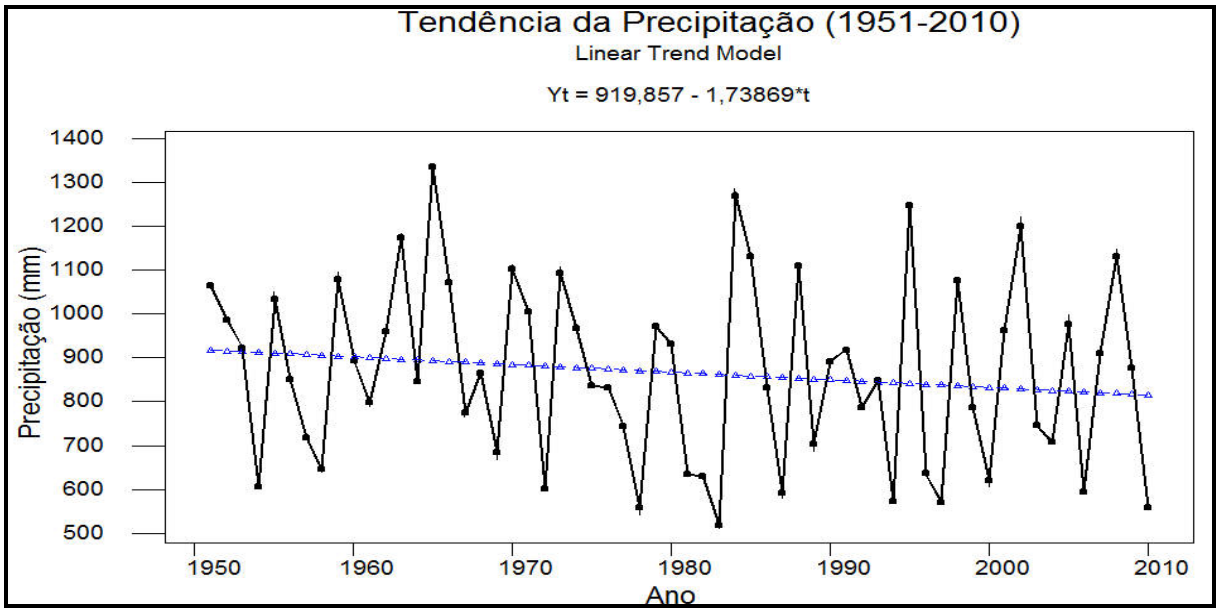


Figure 8 - Trends in Precipitation (1951-2010)

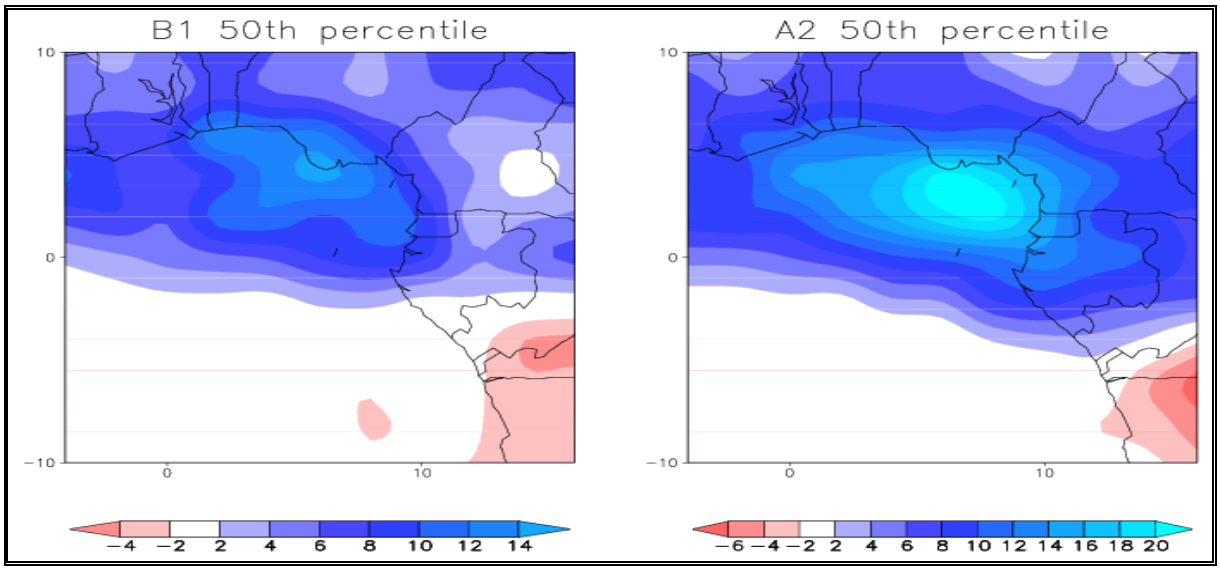


Figure 9 - Global Circulation Model (GCM) Scenarios for Precipitation (2040-2060)[3]

However, like the experts of the UNDP / Oxford University, who reported extreme events in the trend of decreased precipitation in Sao Tome and Principe, a team of national experts found, in the 60, 80 and 2000, "Gravana "anomalous periods of increased precipitation, fig.4.

[3] Assessment of climatic changes of S.Tome & Principe - Penhor, M.; Vaz, B.; Neves, M. (2011)

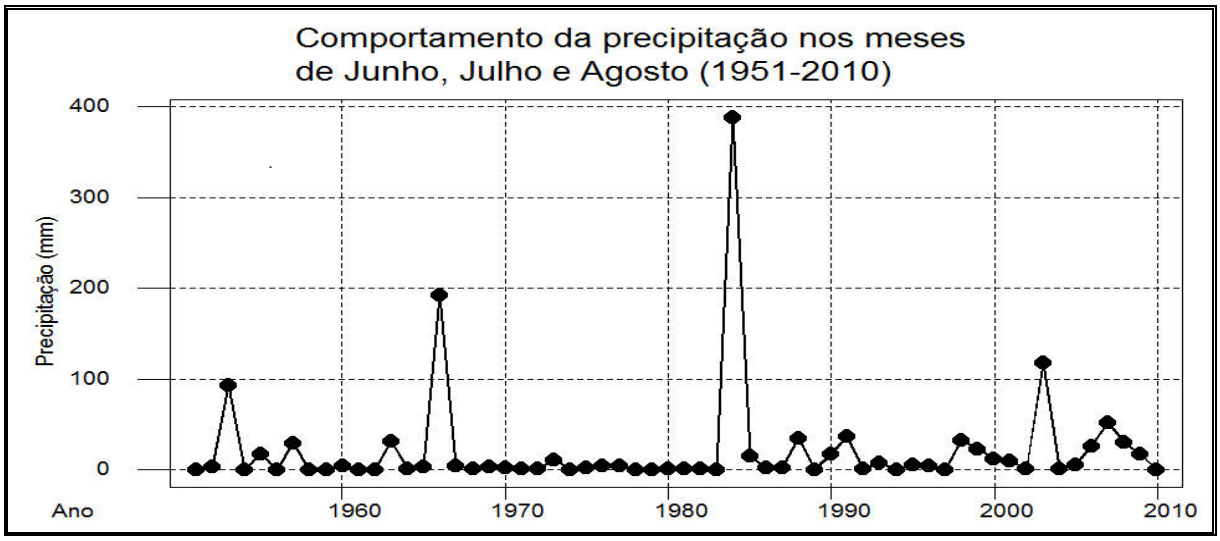


Figure 10- Extreme Events of Increase in Precipitation in the Dry Season (Gravana)

The flow of rivers has declined significantly, according to information gathered from people. Due to erratic rainfall observed, occasionally, there are floods reaching cause flooding and landslides.

III.2 – Conclusions on climatic evolution

The analysis of the basic climate of Sao Tome and Principe was made through a series of data on temperature and precipitation collected primarily from the airport weather station of S. Tome from 1951 to 2010.

These data allowed us to analyze trends in precipitation and temperature and to establish a likely behavior of the climate by future projections through scenarios. On this basis, it was possible to evaluate the vulnerability and adaptation of socio-economic sectors to global climate change likely to the horizon 2040-2060.

Note that the results of the analysis of climate sensitivity made from weather data in the SCN did not vary greatly in terms of trends presented to the ICN, see Table 22 and Table 23, shown below.

For the SCN, according to the scenarios presented by the GCM model (STARDEX / ETCCDMI), the horizon was chosen in 2050 for temperature and precipitation for 2040-2060. The results presented by GCM model for SCN allow a detailed analysis over the months of the year.

For the CBI, the ECHAM4/IS92A 2100 model was used and the horizon was chosen for both the temperature and for precipitation.

Using different models and different time horizons, the overall results show the following differences:

Indeed, in the ICN for the 2100 horizon, the figures for temperature and precipitation are +829.6°C and +2.84mm respectively for the high sensitivity and -35.66°C and +1.32mm respectively for the low sensitivity.

For the SCN, the figures show an increase in temperature between 1°C and 2°C for A2 and B1 scenarios by 2050, from 25.9°C, temperature of 1990 base year chosen for the analysis.

For the precipitation in the B1 scenario, increased from 0mm to 306mm in March, April and May and an increase of 918mm to 1224mm in the months of September, October and November, 2040 to 2060 on the horizon.

Even for the SCN, for the A2 scenario, the decrease in precipitation from -612mm to -306mm in March, April and May and increased rainfall, from 1836mm to 2141mm in the months of September, October and November, 2040-2060 on the horizon.

Table 22 - Changes in climate parameters as scenarios (SNA-2005)

Parameters	Year	GCM (STARDEX/ETCCDMI)			
		Scenario B1		Scenario A2	
T (ºC)	1990	25,9 ºC		25,9 ºC	
	2050	26,9ºC to 27,9ºC		26,9ºC to 27,9ºC	
	ΔT (ºC)	1ºC or 2ºC		1ºC or 2ºC	
Parameters	Year	GCM (STARDEX/ETCCDMI)			
		Scenario B1		Scenario A2	
		MAM	SON	MAM	SON
P (mm)	1990	401,1	252	401,1	252
	2040- 2060	401,1 to 707,1	1170 to 1476	-209,9 to 95,1	2088 to 2384
ΔP		0 to 306	918 to 1224	-612 to - 306	1836 to 2142

ΔP- Variation of Rainfall

Table 23 - Changes in climate parameters and climate sensitivities FNC-1998)

Parameters	Years	Scenarios		
		Ref 51/70	Ref norm 61/90	ECHAM4/IS92A
T (ºC)	1990	25,52	25,5	25,5
	2100	26,73	28,25	29,57
	ΔT (ºC)	SHT = 2,84	SBT = 1,32	0
P (mm)	1990	951,4	924,8	924,8
	2100	1160,4	330,8	803,8
	Δ P (mm)	SHP= 829,6 mm	SBP = 35,66 mm	0

CHAPTER IV - ANALYSIS OF VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE

IV.1 – Introduction

Manifestations of temperature increase recorded in meteorological data used in studies of basic climatic situation and future increases in rising sea levels detected by the population living in coastal areas, the decrease in visible precipitation in rainfall and hydrometric data available, coastal erosion and to advance the area in the Savannah area in the district of Lobata, among others, indicate that Urgent mitigation and adaptation measures should continue be taken by national authorities, in order to fulfill the commitments made by Sao Tome and Principe while "Non ANNEX I Country."

Another impact to consider is the change in the regime of torrential rains that can cause flooding and landslides. According to the study conducted by the University of Cape Town, on the Program for Climate Change Adaptation of Sao Tome and Principe (NAPA), came to the conclusion that the allegation in the last two decades, the dry season (Gravana) became drier and wetter rainy season, are in line with the changed data in the CMAP (*Merged Analysis of Precipitation*) on rainfall in Sao Tome and Principe.

The study of vulnerability and adaptation within the SCN has the following objectives:

- Review the impacts identified in the context of the baseline situation for the climate of Sao Tome and Principe, in relation to ICN, compared to the subjects enumerated in the various target sectors, bearing in mind the biodiversity, the anthropic action, the social and cultural phenomena and evolution of the global climate.
- Carry out a scientific analysis to estimate the uncertainties inherent to impacts, adaptation strategies and mitigation.
- Provide options for decision-makers to decide on environmental policies to take into account in development plans.
- Making a continuous advocacy with the relevant authorities, including the Ministry of Public Works and Natural Resources (MOPRNA), Ministry of Planning and Development (MPD) and the Ministry of Planning and International Cooperation (MPCI), to put in place permanent mechanisms for the collection and processing of data at the national level.
- Develop a base of scientific information for decision making.
- Develop a scientific methodology through a consistent approach for collecting and processing data on trends in the environment and society in interconnection.
- Urge the Coordination and Evaluation Committee of Climate Change in their midst to create mechanisms linking experts, technicians, policy makers and planners.
- Provide basis for negotiations on issues related to climate change.

IV.2- Methodology

The methodology is based on the analysis of the basic current climate, the projections based on trends observed here, by presenting various scenarios to forecast the future evolution of temperature and precipitation with the Global Climate Model (GCM) and the STARDEX ETCCDMI softwares.

The collection and systematization of the data for the study of Vulnerability and Adaptation to Climate Change for the sectors noted above relied on several phases:

An analysis of the different indicators in different sectors, in order to establish a correlation with climate change, which allowed to identify a first stage, the impacts of climate on them.

In the second step, proceeded with the selection of the most prominent adverse effects, which arise from the impacts identified for each sector.

In the third phase, an analysis of the sensitivity of sectors, based on adverse effects due to the impacts of climate diagnosed.

In the fourth phase, presented proposals for adaptation measures as well as the identification of organisms responsible for the resilience of adverse events compared to events due to climate change.

In the fifth and last phase, we proceeded to the standardization of criteria to be used in the systematization of the various parts of the target sectors of the study.

IV.3 – Definition of the target sectors of study

The definition of the sectors that were included in the study of vulnerability and adaptation to its second national communication and the hierarchy corresponds to the analysis of results and experiences obtained from the selected sectors in 2002 for the preparation of the first national communication and analysis of the sensitivities of these sectors face to climate impacts identified in the current climate baseline situation.

Despite the analysis of the vulnerability of the islands, there is a tendency to place the coastal zone and the adverse effects arising out of the vulnerability of this condition in the foreground, the consultant team, not to mention this weakness really is, take into account the fact that (i) agriculture has played a key role in the economy, (ii) the industry is still nascent, is generating low emission of greenhouse gases in this sector and (iii) the sequestration capacity of the country comes from its abundant forests and put "agriculture and livestock" and "forests and soils" in the first and second place respectively.

In the thirdly place comes the area of "water, energy and fisheries' for the important role in the economy and the vulnerabilities presented by the sector.

In the fourth place comes the "coastal zone", as was said, presenting major vulnerabilities to climate change..

In the fifth and last is "population, health and education," also an important sector with major vulnerabilities to climate change, especially from the social point of view.

The affinities between the various sectors, the synergies observed during this period, coupled with its economic weight to sustainable development of Sao Tome and Principe and face to the same vulnerabilities to exposure to weather, allowed to group them as follows:

1. Agriculture and Livestock
2. Forests and Soil
3. Water, Energy and Fisheries
4. Coastal Zone
5. Population, Health and Education

IV.4 – Definition of the status of sectoral basis

The baseline sector was established in a panel of national experts from various sectors, from climate impacts identified, i.e. the decrease in precipitation and temperature increase of the conjugated form. Later in sectoral working sessions, the experts saw the need to examine the sensitivities of sectors compared to the combined impact of increased precipitation and increased temperature, due to the realization considered extreme weather events, for speaking out of the usual period. For example, the occurrence of precipitation during June, July and August, traditionally dry period with no precipitation, known as "Gravana."

During these tests, on several occasions, it had to resort to the method of the expert's opinion because of insufficient data.

The time horizons used in the projections took into account the scenarios made based on GCM climate models. It retained the horizon 2040-2060.

For the series of temperature and precipitation data used is the same from 1951 to 2010.

As stated above, the reference year is 2005. The reason for choosing this year relates to the fact that it gives more assurance than the various sectors in terms of data availability that favor a more careful analysis of the same vulnerabilities, despite the immense difficulties that exist in an overall manner in systematic collection of data.

IV.5 – Vulnerability assessment of the sectors

The panel of national experts, on establishing the financial sector-wide, had in view the possible adverse effects for each sector to the impacts selected and carried out an analysis based on their experiences in order to identify possible sensitivities that could result from such climate scenarios proposed.

Factors that were considered are:

1. The impacts identified
2. The adverse effects
3. The sensitivities

It was established in a collective manner that adverse effects and sensibilities intrinsic to each sub-sector, the analysis would be undertaken with greater emphasis on three, considered the most important.

The adaptation and the bodies responsible for forecasting, monitoring and resilience were also identified in the Panel of Experts.

IV.5.1 – Agriculture and Livestock

IV.5.1.1 – Baseline

In Sao Tome and Principe, a gross area of 45,589.34 hectares of land was distributed to small and medium farmers, representing small and medium agricultural enterprises in the period1993 to 2005 (according to the statistics office of the Land Reform - 2008).

The area allocation as a function of culture farms is as follows:

- Cacoa: 26.076 hectares;
- Coffee: 984 hectares;
- Coconut: 7.676 hectares ;
- Food crops: 2.110 hectares ;
- Banana: 592 hectares ;
- The rest of the agricultural land is occupied by pastures and diverse cultures.

With land reform, no longer poses the problem of lack of arable land for small farmers. The main problem is the lack of financial resources to exploit the land. According to the 1990 Agricultural Census, agriculture employs 35,072 people, of whom 35% are women.

The distribution by type of farm areas represents 69.7% for small farmers and 23.5% for medium business.

Land reform also allowed a significant increase in the number of small private breeders, as a consequence of the disappearance of large agricultural companies in the country. About 3,000 hectares of pasture land are essential natural feed in the country, however, the business of raising animals for consumption is concentrated in a limited number of animals, including cattle, pigs, sheep, goats and poultry. Currently, the livestock sector has about 11,783 farmers, among whom 50% are women.

The three agricultural products considered most vulnerable to climate change within the framework of this study are:

- Cocoa occupying approximately 26,076 hectares of plantations in the country (Directorate General for Agriculture, 2010) and forms the basis of livelihoods of households in rural areas. Its contribution to GDP is about 18% (INE, 1999) and is the largest export product;
- Banana, which is the staple diet of the population and is grown, although in the vast majority of cases, in co-association with other crops, most of the national agricultural area;
- Corn, that has a strategic importance in feed and food.

Table 24, as shown below, presents the agricultural production of major crops, resulting from the allocation of shares to small farmers. It is worth noting that it forms the basis of livelihood of the population, especially in rural areasTable 24, as shown below, presents the agricultural production of major crops, resulting from the allocation of shares to small farmers. It is worth noting that it forms the basis of livelihood of the population, especially in rural areas.

Table 24 - Production of Local Crops in tonnes (1996-2002)

	YEARS						
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
PRODUCTS							
Banana	13.500,0	25.000,0	34.596,0	39.785,4	42.245,6	39.805,4	39.795,4
Cocoyam	10.000,0	15.000,0	20.964,0	24.605,0	26.979,3	24.905,0	24.955,0
Cassava	8.500,0	5.000,0	4.400,0	5.324,0	nd	5.424,0	5.474,0
Corn	4.500,0	4.000,0	1.352,0	2.230,5	nd	2.260,5	2.290,5
Bread Fruit	1.800,0	2.000,0	2.500,0	2.500,0	3.276,9	3.045,0	3.075,0
Total	**38.300,0**	**51.000,0**	**63.812,0**	**74.444,9**	**72.501,8**	**75.439,9**	**75.589,9**
Vegetables							
Tomato	5.000,0	6.000,0	8.000,0	9.064,0	9.624,5	9.084,0	9.104,0
Lettuce	850,0	1.000,0	2.000,0	1.980,0	1.980,0	nd	nd
Onions	350,0	300,0	400,0	396,0	400,0	nd	nd
Green Beans	230,0	300,0	400,0	440,0	458,0	nd	nd
Cabbage	100,0	100,0	150,0	168,0	nd	nd	nd
Total	**6.530,0**	**7.700,0**	**10.950,0**	**12.048,0**	**12.462,5**	**9.084,0**	**9.104,0**
Export Crops							
Cocoa	3.752,9	3.138,3	3.928,3	3.160,8	2.883,2	3.651,5	3.883,4
Copra	612,8	433,1	161,8	190,3	882,0	362,8	1.382,0
Coffee	20,6	44,5	36,4	17,8	14,6	12,8	42,3

	YEARS						
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Palm Oil	1.083,6	1.163,2	979,5	831,6	446,2	318,7	474,0
Total	**5.469,9**	**4.779,1**	**5.106,0**	**4.200,5**	**4.226,0**	**4.345,8**	**5.781,7**

Source: - INE (1993,1995,1999) - Ministry of Agriculture

IV.5.1.2- Analysis of vulnerabilities, adverse effects and sensitivities

Climate change, namely the decrease and increase, and the variation in rainfall distribution and temperature increase, may have negative impacts on various sectors of agriculture and livestock.

Having the different agricultural sectors, their specificities, it becomes necessary to check with the greatest possible depth the extent to which elements of climate under consideration may contribute to the deterioration of conditions in those sectors in the context of developments in the medium and long term.

Plant growth is also often limited by temperature. But in a situation where we can observe a rise in temperature without major changes in precipitation means in high yields for growing grass.

High precipitation can lead to floods causing loss of trace elements in soil and consequently the depletion of the limited land for agriculture and pasture.

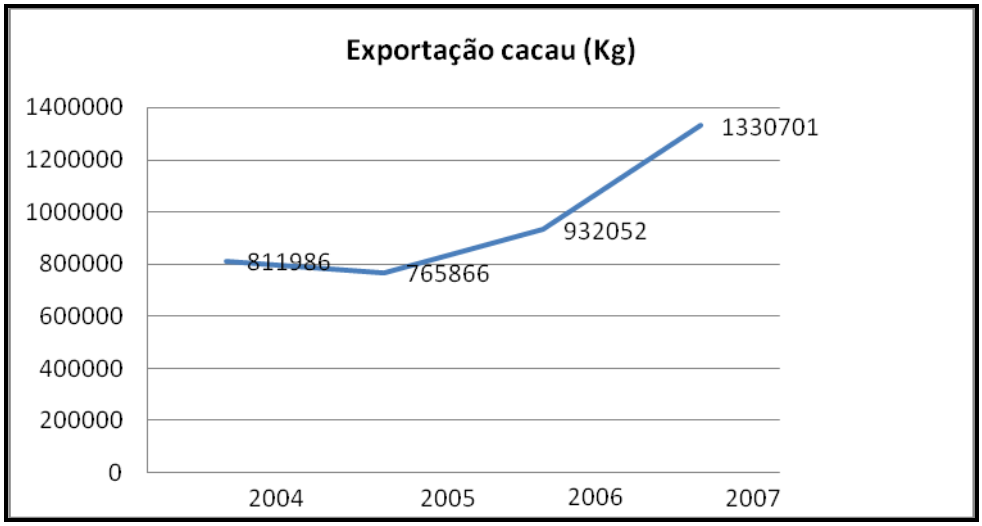
Phytopathogenic microorganisms such as fungi, bacteria and viruses, under conditions of increased rainfall and increased temperature are equally more reproductive and a greater proliferation. This proliferation is sustained by water that facilitates the transport of these microorganisms.
In the case of livestock, temperature rise causes difficulties, especially in warm periods which may lead to a proliferation of parasites, effectively inhibit the metabolism of animals, especially in the production cycles of the pastures.

The areas currently cultivated with cocoa and located in areas where annual rainfall is less than the current 1800 mm for the 2040-2060 horizon, could become unviable for culture, whereas the values of precipitation may be less than 1500 mm, with the aggravation of drought can be very long.

This could lead to reduced productivity of existing crops and pastures thus reduce production and because of this, the income of farmers and number of animals may also be lower. On the other hand, the parcels are located outside the thresholds of acceptable rainfall for crops; (1,500 mm of rain for cocoa) becoming unviable for exploitation.

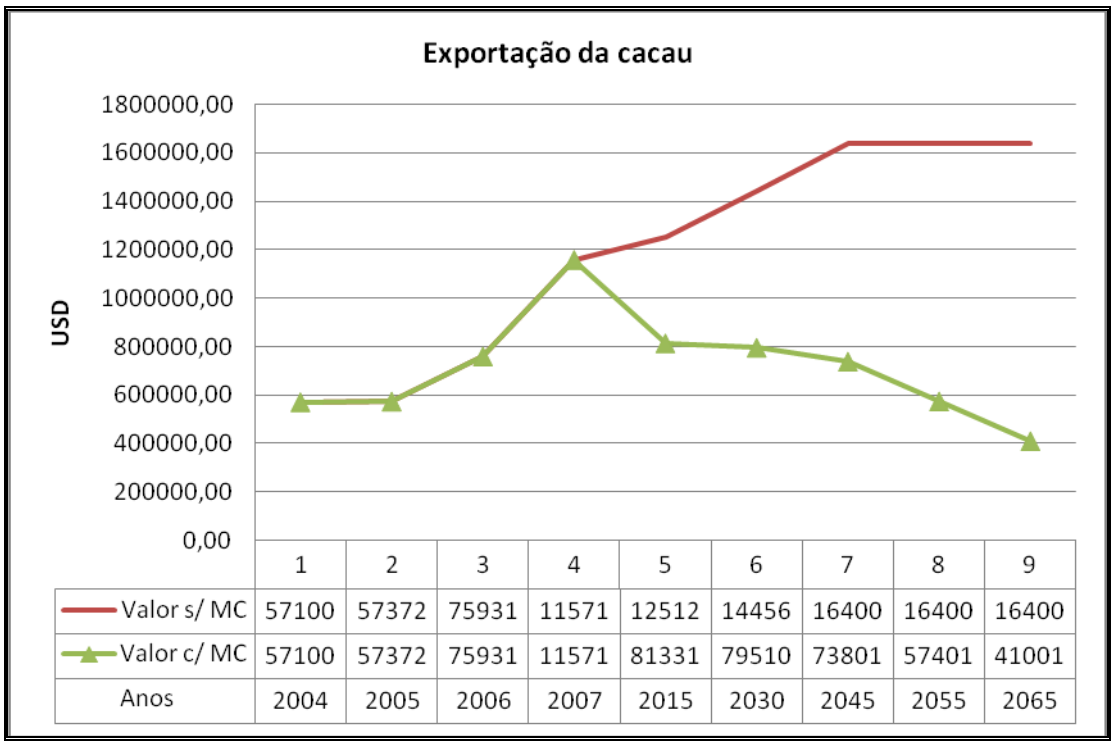
If we take into account the evolution trend of precipitation which may decrease by about 1.7 mm per year and the dry period may be longer, it may arise as a consequence of reducing the export of cocoa which is the product with the highest percentage of export. Graph 11 shows the trend of exports from 2004 to 2007.

Figure 11 - Trend of Cocoa Export (2004-2007)



Source : epartment of Commerce, 2009

Figure 12 – Cocoa Export Scenario by value (2004-2065)



	1	2	3	4	5	6	7	8	9
Valor s/ MC	57100	57372	75931	11571	12512	14456	16400	16400	16400
Valor c/ MC	57100	57372	75931	11571	81331	79510	73801	57401	41001
Anos	2004	2005	2006	2007	2015	2030	2045	2055	2065

Source: Department of Commerce, 2009

The references in terms of future climate change impacts described above, could affect the economic performance of the largest agricultural export product, 2040-2060 on the horizon, given that its contribution to GDP is about 18% (INE, 1999) and represents about 95% of exports.

The value referenced for the export of cocoa from 3061 three years $ 144.93 (Department of Commerce, 2009) decreased by about 75% for the 2040-2060 horizon in absolute terms, according to the estimate of economic losses for agricultural products of the coastal zone (Figure No. 24-cap.IV, 5.4.3), as its share of GDP.

Graph No. 12, represented above, demonstrates the economic loss in value (USD).

The adverse effects on crops such as maize, due to decreased precipitation, would be immediate, because the corn crop, in relation to the water needs to be considered one of the most demanding, particularly in the so-called critical period that corresponds to the time of flowering and the period immediately thereafter. It is estimated that the water needs to be approximately 5.2 to 5.5 mm/day.

Currently, corn is grown under the regime of two harvests per year, in almost all regions of the country under different conditions of climate and soil. The estimated total area cultivated in 2008 was 564 hectares (Vila, A., 2009), distributed by the prevailing north and center of the country.

In this context of reduced rainfall, planted area of corn could be reduced dramatically, from 506 hectare, much lower values in the horizon 2040-2060.

Temperature is a very important factor in the cultivation of banana, because it directly affects the respiratory processes of photosynthesis and the plant, being related to the altitude, and winds light. The optimal temperature range for the development of this crop is around 26-28ºC. With values below 15ºC and above 35°C, the activity of the plant is shut down and its development is inhibited, mainly due to dehydration of the tissues, especially the leaves.

The increase and proliferation of ticks (Boophilus Amblyoma cajensis and microphilus) and disease germs in animals, conditioned by reduced rainfall and increased temperature, could cause a decline in yields in animal livestock species (cattle, sheep, goats and pigs) with high mortality, in extreme cases.

Likewise, pastures could be affected and livestock production could be severely reduced. Species such as cattle and sheep with the lowest number of animals reported in Table 25e No. 13 on the chart, then, could run the risk of reducing significantly or disappear.

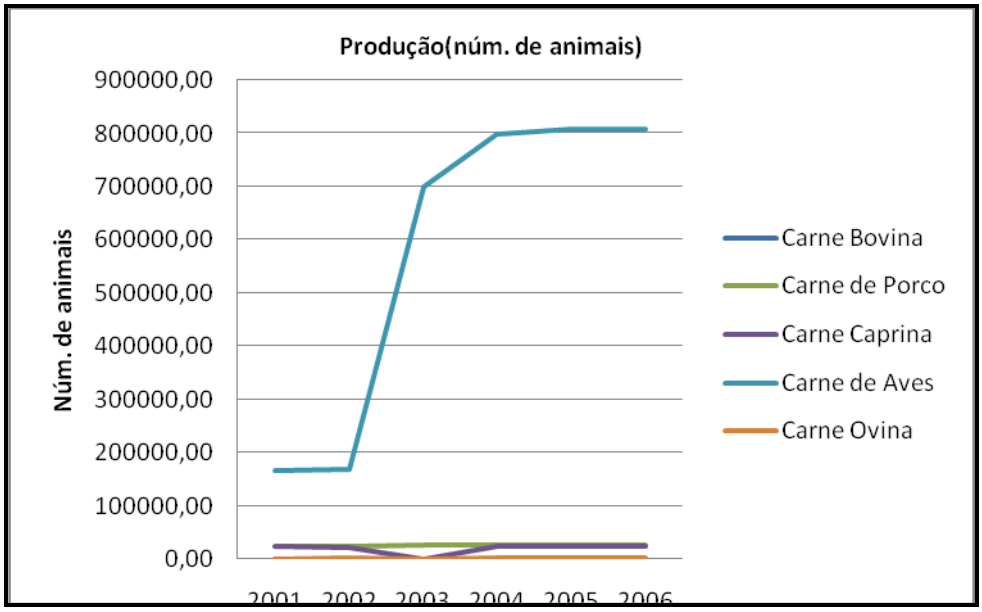
Table 25 - Livestock Production

Livestock	Production (number of animals)					
	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Beef	421,00	457,00	546,00	699,00	834,00	857,00
Pork	24.038,00	24.092,00	25.990,00	26.321,00	26.452,00	26.882,00
Goat meat	25.001,00	23.588,00	nd	24.055,00	24.506,00	25.100,00
Poultry meat	167.200,00	169.535,00	700.631,00	798.446,00	808.378,00	nd
Sheep meat	1.090,00	2.060,00	nd	2.530,00	2.249,00	2.361,00

Source: INE Directorate of Liovestock, 2011

Graph No. 13, below, shows the evolution of livestock production, from 2001 to 2006.

Figure 13 - Livestock Production without climate change



Source: INE Directorate of Liovestock, 2011

Figure 14 - Livestock Production with climate change

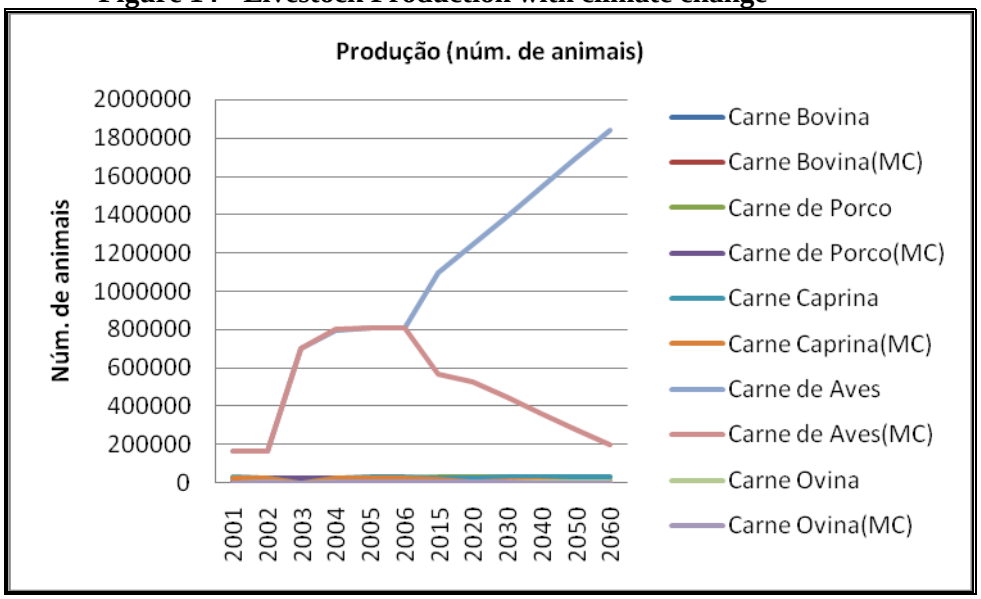


Figure 14 reflects the decreases that would take place in livestock production, according to an estimate of losses due to climate change in the order of 75% in the 2040-2060 horizon like the projected economic losses to economic activities in the coastal zone.

IV.5.2- Forest and Soil

IV.5.2.1 – Baseline sector

The display units of forest resources and soil diagnosed in the ICN, or some forest species of high economic value, considered according to the available data as the most sensitive to variations in climate and paraferralitics soils that hold part of them, are target of adverse effects and become increasingly rare due to strong anthropogenic pressure to which they are subject.

These are the following species: *Milicia excelsa* (Mulberry), *sidifolia Ficus* (Fig pork), *Albicelestes falcataria* (Acacia), *Cedrela odorata* (Cedrela), *Artorcarpus communis* (Fruit), *Artorcarpus heterophylla* (jackfruit), *Carapa procera* (Gogo) *Scytopetalum kmerunianum* (Viro) *Eanthoxylum Gillette* (Marapião) and others that inhabit the forests and mountainous areas of shadow.

The fog and part of the *tropical forest of the lower region* and the *mountain forest*, which are still in their natural state, were almost entirely integrated in the national parks "*Obôs*" of Sao Tome and Principe. These protected areas cover both the center-south of an island as another, a distance of more than 200 km2 (40% of the country).

The main soil types are: *paraferralitics, tropical fersialitics, black and brown clays* and / or lithic. All of them can be humiferous or not, as the organic matter content in the A1 horizon or not more than 7.5% under the median or heavy textures and more than 4.5% in the light texture.

Tropical Fersialitics soils and the brown and black clays are those that support the savannah, forest shade of the forest and secondary forest ecosystems located in areas of micro-arid, semiarid and dry sub-humid. In principle, they are more vulnerable to any climate change scenarios projected for the region where Sao Tome and Principe is located.

IV.5.2.2 – Analysis of vulnerabilities, adverse effects and sensitivities of the sector

In the period roughly between 1980 and 2000, were found in the Districts of Cantagalo, Mé-Zochi and Lobata, about 85% of total cuttings made legal in the country (Proposal of the National Plan for Forestry Development, 2002). In the District of Lobata in particular, the situation was more pronounced. In this district were cuttings approximately 72% (2,500 m3) of the total harvested wood in the country.

The over-exploitation practiced in productive forests of the districts of Cantagalo, Mé-Zochi and Lobata, deteriorated sharply in the same timber resources. Given this lack, the loggers moved its exploration activity in the last ten years, to areas of secondary forests in the districts of Lembá and Caué.

This is a new era of forest exploitation that carries serious risks for the protection and conservation of the ecosystem and catalyzes its vulnerability to the adverse effects of climate change, because the new exploration target areas remained relatively intensive protected before, because they are located in areas of difficult access along major watercourses, on steep slopes, hills and / or mountains.

The dismantling of the agrarian system that was based on previous large agricultural companies, which is currently being adapted to a new farming system whose contours are not well known, has caused a dispersal of authority and forest land in general, that does not allow a system to support reliable data base, forward-looking statements in favor of safer, based on projections.

There is need to be put in place consistently and promptly with the package of measures suggested in the chapter on adaptation measures to better adapt to climate change.

The sequestration capacity of present and future of Sao Tome and Principe, people's access to a healthy environment depends on the capacity of national authorities in maintaining the balance between the levels of exploitation of our forests and self sustainable growth which is intended, having in view the fight against poverty.

The districts and regions of the country, considered the most vulnerable to the populations who live in them and STP in general, should be made aware of the risks facing the planet if we continue to have the usual behavior in relation to environmental resources.

The analysis of the sensitivities of the various sectors targeted in the study of vulnerability and adaptation was made for the following adverse effects: reduction of forest cover in the event of

prolonged drought, increase the extent of the savannah area in the NE of the island, the proliferation of insect predators forest formations; Reduction of water content in soils, reduction of agricultural / forestry, changes in physical-chemical structure of soils; proliferation of insect predators in forest ecosystems, flooding of lowland forests, loss of forest cover by landslides, leaching of soils, soil erosion and gradual emergence of the phenomenon of "hydromorphism.

Table 26 reflects the sensibilities of different species in the forests of Sao Tome and Principe, and the different soil types to the adverse effects mentioned above with moderate climate change.

Table 26 - Matrix of sensitivities to the area of forests and soils with moderate climate change

Adversed effect (Forest & Soil)	Increase in T & Decrease in P	Increase in T & P	Drought	Floods
Increase of the length of Savanah area in NE of the Island	+ + + +	+ +	+ + + +	+
Leaching of soil	+ +	+ + + +	+	+ + +
Degradation of the forest density	+ + + +	+ + +	+ + + +	+ +
Proliferation of insect predators in forest ecosystems	+ + + +	+ + + +	+ + + +	-
Increased risk of forest fires	+ + + +	+	+ + + +	-
Extinction of certain species and biodiversity loss	+ + +	+ +	+ + +	+ + +
Migration of species	+	+ + + +	+ + + +	+ + + +
Reduction of forest area in the event of prolonged drought	+++	-	+ + + +	-
Degradation of living conditions in STP due to the reduction of forest resources	+ + +	+	+ + + +	+ +
Reduced capacity for regeneration of vegetation cover	+ + +	+	+ + + +	+ + + +
Disabilities in carrying out photosynthesis and progressive decrease of the current annual growth (m3/ha/year) of woody essences	+ + + +	+	++++	-
Reduction of micronutrients and loss of bio-productive capacity of soils in the semi-arid, arid and dry sub-humid	+ + +	+ + + +	+ +	+
Reduction of soil water content	+ + + +	+	+ + + +	-
Reduction of agricultural and forestry production	+ + +	-	++++	++
Flooding of forest areas of flat terrain Flooding of forest areas of flat terrain	-	+ +	-	+ + + +
Loss of forest cover by landslides	+	+ + + +	+	
Growth in excess of abundance of species suitable for rainwater	+ + + +	+	++++	-
Emergence of invasive pioneer species	+ + +	++	+ + +	-
Emergence of the phenomenon of "hydromorphism	-	+	-	+ + +

NB - sensitivity levels are considered on a scale of 0 -5: (0 -) nil (1 +) very low (2 +) down (3 +) normal (4 +) high (5 +) very high

Table 27 reflects the sensibilities of different species in the forests of Sao Tome and Principe and the different soil types to the adverse effects on climate change dramatically.

Table 27 - Matrix of sensitivities to the forestry sector and climate change soils with sharp

Adverse Effects (Forests and Soils)	Increased T and decrease in P	Increased in T & P	Drought	Floods
Increase in the length of the Savannah area in the NE of the Island	+ + + + +	+ +	+ + + + +	+
Leaching of soil	+ +	+ + + +	+	+ + +
Degradation of forest density	+ + + + +	+ + +	+ + + ++	+ +
Proliferation of insect predators in forest ecosystems	+ + + + +	+ + + ++	+ + + ++	-
Increased risk of forest fires	+ + + ++	+	+ + + ++	-
Extinction of certain species and biodiversity loss	+ + + +	+ +++	+ + ++	+ + +++
Migration of species	++++	+ + + ++	+ + + ++	+ + + ++
Reduction of forest area in the event of prolonged drought	+++++	-	+ + + ++	-
Degradation of living conditions in STP due to the reduction of forest resources	+ + + + +	+	+ + + ++	+ +
Reduced capacity for regeneration of vegetation cover	+ + ++ +	+	+ + + ++	+ + + +
Disabilities in carrying out photosynthesis and progressive decrease of the current annual growth (m3/ha/year) of woody essences	+ + + + +	+	+++++	-
Reduction of micro-nutrients and loss of bio-productive capacity of soils in the semi-arid, arid and dry sub-humid	+ + +	+ + + ++	+ +	+
Reduction of soil water content	+ + + + +	+	+ + + ++	-
Reduction of agricultural and forestry production	+ + + + +	-	+++++	++
Flooding of forest areas of flat terrain	-	+ ++ +	-	+ + + ++
Loss of forest cover by landslides	+	+ + + + +	+	+ ++
Growth in excess of abundance of species suitable for rainwater	+ + + ++	+	+++++	-
Emergence of invasive pioneer species	+ + ++	++	+ + ++	-
Emergence of the phenomenon of "hydromorphism	-	++ +	-	+ + ++

NB - sensitivity levels are considered on a scale of 0 -5: (0 -) nil (1 +) very low (2 +) down (3 +) normal (4 +) high (5 +) very high

IV.5.3- Water, Energy & Fisheries
IV.5.3.1 – Water resources and hydropower
IV.5.3.1.1 –Hydrological and Energy-based Situation
Sao Tome and Principe has a high water potential composed of more than 50 rivers fed by rainfall rates relatively high, ranging between 1,000 and 5,000 mm of rain per square meter.

These rivers have a total volume of water estimated at 410,550,000 cubic meters, according to recent studies conducted by the company of the Republic of China-Taiwan, "CECI CONSULTANTS, Inc., Taiwan" in June 2009.

Electricity production in Sao Tome and Principe, in recent years has been mainly based on fossil fuels, i.e. diesel.

Electricity from hydro in 2005 was only 10% (see charts 15 and 16), reaching its peak in 2003 with 7892 MWh. The production of water has diminished in recent five years and in 2005 the value was the lowest, i.e. 4248 MWH. On the other hand, the thermal production has peaked, that is 37,206 MWh (graph # 15).

Figure 15 - Evolution of Electricity (2000-2005)

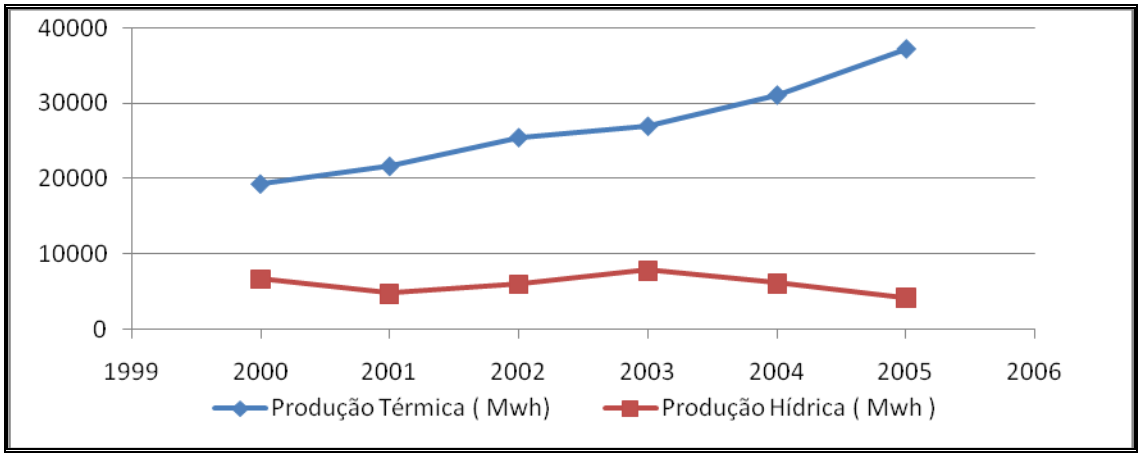
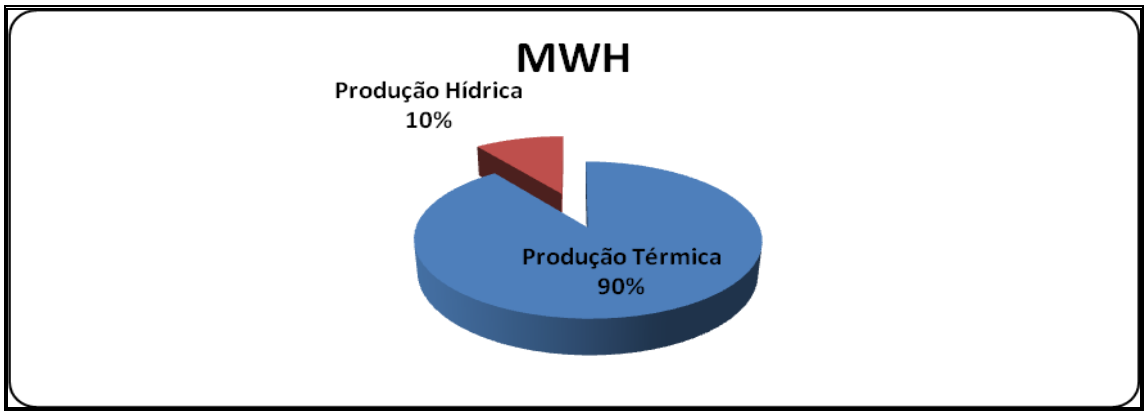


Figure 16 - Production of electricity and thermal water (2005)



Meanwhile, firewood and charcoal remain the main sources of energy and is designed for domestic consumption, the production of food and some small industries (bakery, catering, etc..). According to data from the Directorate of Statistics, in 2005 were 53,769 kt of fuel consumed, being part of this fuel, i.e. Kt 16.452, for the manufacture of coal. Coal consumption was 4.432 Kt.

IV.5.3.1.2 – Analysis of vulnerability, adverse effects and sensitivities of the hydro-electric sector

The hydro potential available, about 4.93% is used in agriculture, 2.98% in hydropower production, 0.45% to supply the population and the remaining 91.64% have no defined use. These resources are unevenly distributed, which exposes certain regions to water shortages.

There was a long period of drought (about 7 months) during the years 2010 and as a consequence, the flows were reduced by about 1 / 3 in both rivers (surface water) as the springs (groundwater).

The decrease of 67% of the volume of water, which registered the largest collection of spring water from Sao Tome and Principe, Água Amoreira I, whose production capacity is around the usual 800 m³ / h, is the greatest light on the low precipitation and reduces uncertainty as to whether climate change in Sao Tome and Principe, presents very visible signs.

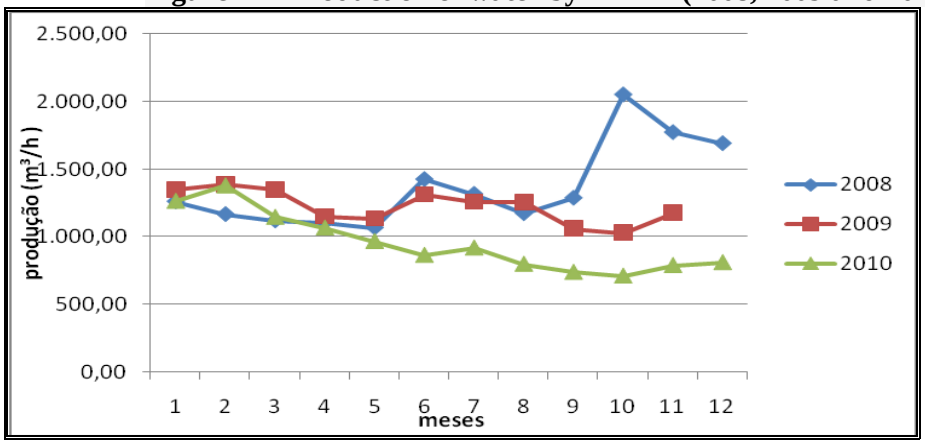
The potential reduction of groundwater has resulted in the reduction of reserves of water resources, such as decreased water flow of the springs, major water courses (rivers) used as a source of hydropower, irrigation of agricultural crops and extinguishing some watercourses with lower flow.

Results in the production of water (amount of water collected and treated to be distributed to the population) from the main water supply company of Sao Tome and Principe (EMAE) in the last three years, 2008, 2009 and 2010, has noticed a progressive decrease in the flow of water produced.

EMAE manages 16 water supply systems (about 70% of the population), of which 10 are from springs and 6 surface source systems (rivers). Comparing the annual totals of 2010 compared to 2008, there was a decrease by about 30%, a phenomenon which may be related to the reduction of groundwater as a result of low rainfall throughout the year 2010.

Chart No. 17 reflects the production of water by EMAE, illustrating the relative decrease in flow of springs and rivers distributed throughout the country, a phenomenon which may be related to the reduction of groundwater, to worsen the horizon from 2040 to 2060.

Figure 17 - Production of water by EMAE (2008, 2009 and 2010)



Source: Water Production Service of EMAE

Another negative consequence of lower water levels probably lies in the increased rate of mortality and migration of species (Fauna and Flora). The construction of artificial lakes, dams and reservoirs in order to store rainwater and rivers in order to increase the capacity of water resources, prevention measures are effective.

The decrease in precipitation and increased temperature, may lead to considerable reduction of energy production from hydro, which has a stake in the country's energy production in 8 to 9% or approximately 4788.615 kWh / year production of 2010 (second EMAE).

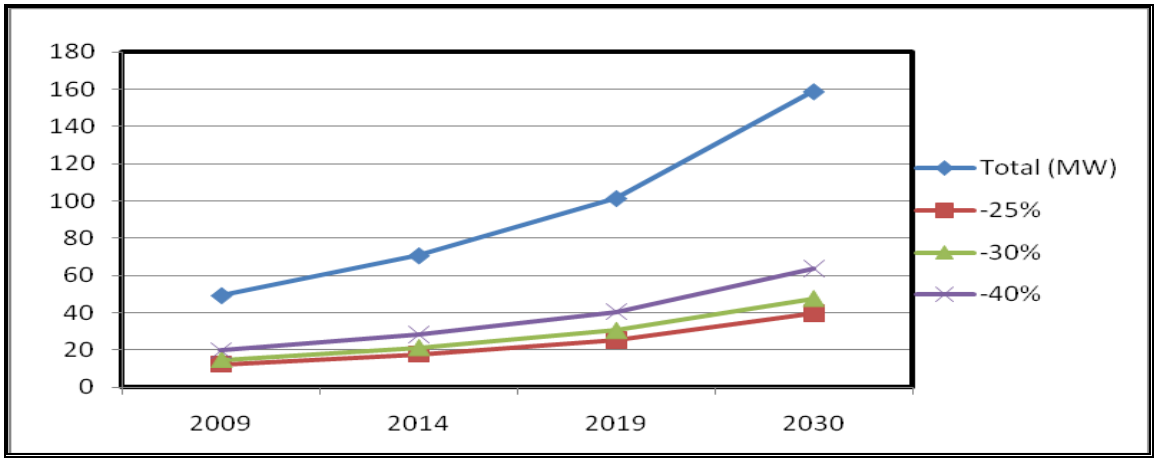
Hydropower should be a source of clean energy more prominently in the country, according to the study of national hydro potential, updated by the company "CECI Studies Consultants, Inc, Taiwan, in June 2009, entitled "*General Development Plan of Water Resources of STP*."

According to this study, the share of hydropower in electricity generation in the demand side of the country by 2030 may grow and reach 158.890 MW of installed capacity, with the construction of PCHs and Mini-hydro. As illustrated in the graphs No. 18 and No. 19, current production is 51 GWh.

However, the climate projections made under the Second National Communication at the horizon 2040-2060, show a reduction in rainfall as a whole. Greater precipitation is expected in the dry season "Gravana" roughly from June to August, considered extreme events. According to these studies, increased rainfall may also take place in September, October and November (SON) or in March, April and May (MAM), as the scenarios presented.

Efforts should be made by the national authorities, in order to also take this volume of rainwater as a source of hydropower. This is possible thanks to processes of technology transfer through South-South cooperation with countries like Brazil, or through other types of cooperation.

Figure 18 - Hydroelectric Development Scenario on the horizon 2030 **(MW)**



***Source:* CECI Consultants Studies, Inc, Taiwan June - 2009**

No. 18 The graph shows different scenarios between 2009 and 2030, which provides a considerable growth in demand.

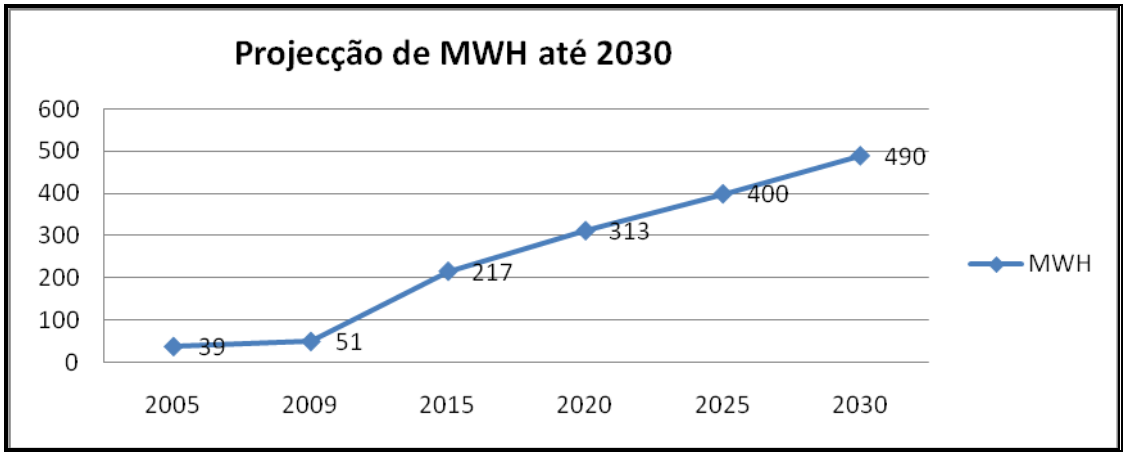
Currently, thermal production represents about 92% of the total national production, but with regard to the prospect of the country's economic growth, we intend to invest in the water sector in the short, medium and long term, i.e. installed capacity of 39.722 MW, 47.667 MW and 63.556 MW, with a sharp reversal of the current national energy matrix.

To this end, there will need to build hydro plants, small hydro and between the Mini-hydro, conceiving also increase the production of electricity as in chart No. 19.

According to the engagement of the private sector perspective in the short and medium term (2014 and 2019) 19.14MW installation, building hydroelectric plants, hydroelectric plants using water from the edge of the rivers, Iô Grande (9.6MWx1), Abbot (3.5MWx1 / 2.0MWx2) and Manuel Jorge (1.15MWx1 / 0.89MWx1), a total of six (6) mini-hydro.

Similarly, there are plans for the installation of a wind farm and solar photovoltaic for 850x4 (3.4MW) and 5 MW, respectively. These interventions will also help to reverse the national energy matrix.

Figure 19 - Curve of energy demand by 2030



Source: CECI Consultants Studies, Inc, Taiwan June – 2009

The adverse effects of climate change on energy subsector above are reflected in the Saotomean society. Having regard to the prediction of reduced precipitation and increased temperature, there will be the tendency to exacerbate these vulnerabilities in the sector.

IV.5.3.1 – Fishery Resources

IV.5.3.1.1 – Baseline of the Fishery Sector

According to studies conducted by ORSTOM / SGTE (April to October 1982) and campaigns by the Soviet Navy Oceanographic vessel (March 1983 and from February to March 1986), the fishery potential comprises data within the area for traditional fishing, which is about 8500 t / year for coastal pelagic species (1500 t being in Sao Tome and Principe in 7000 t) and 3500 t / year (being 1500 t Sao Tome and Principe in 2000 t) for the demersal species.

According to the survey conducted by the Directorate of Fisheries, in 2007 there were 1.655 canoes used for fishing vessels of 20 and 12 to 16 meters for semi-industrial fishing.

Today, more than 98% of fishermen practice small-scale fishing in small canoes from 3 to 8 meters, built with trunks of trees, propelled with the help of oar, sail or outboard motors and many of which are not fitted with navigation and visualization equipment . For reasons of low productivity of fishing grounds, they are obliged to wander far from the coast to catch fish, putting them at risk of accidents and loss of human life and materials.

With regard to the fishing industry, it is worth noted that Sao Tome and Principe is limited only to the granting of fishing license under the protocol signed with the European Union for the period 2006 - 2010 which allows the use of 18 ships and 25 Vessels with freezers, totaling 43 vessels. In this context, the catch taken by five boats in 2007 totaled 1,729.69 tons.

In addition to the fishermen, about 200 to 300 fishermen work in semi-industrial fishing. Although fishing is most productive where they are concentrated in the Island of Principe, two thirds of the resources, the geographic distribution of the number of fishermen shows a certain concentration in S. Tome, which also hosts the most important markets.

On the other hand, despite the weak contribution of fisheries to GDP for the last ten years (about 6%), there were years in which fish products accounted for up to 10% of operating revenue of the country. The sector occupies about 15% of the workforce.

The local fishing industry's contribution to GDP of Sao Tome and Principe is very low (4.8% in 2007) according to Table 28, but the annual catch is estimated at 4,000 tons (Table 29), represents about 70% of consumption animal protein in Sao Tome and Principe.

Table 28 - Contribution of the fisheries sector to GDP (2002-2007)

Year	2002	2003	2004	2005	2006	2007
GDP (%)	5,6	5,7	5,8	5,8	5,0	4,8

Source: INE, Directorate of Fisheries

Table 28 - Fish Production

Fishing	Production/Tone					
	2001	2002	2003	2004	2005	2006
Semi-Industrial Fishing	36,50	29,40	32,10	37,80	Nd	nd
Artesanal Fishing	3.655,50	3.790,00	4.005,90	4.103,50	3.336	nd
Total	**3.692,00**	**3.820,00**	**4.038,00**	**4.141,30**	**Nd**	**nd**

Source: INE, Directorate of Fisheries

The Directorate of Fisheries (DP) is not involved in monitoring the activities of fishing vessels. Currently, the SCS system (satellite communications) is almost nonexistent. Both the maritime safety, the protection of the coastline against ocean storms are not guaranteed, which often causes dramatic situations in coastal communities.

IV.5.3.1.2 – Analysis of vulnerability, adverse effects and sensitivities of the fisheries subsector

According to the average production of statistical information available (see Table 29) artisanal captures now registered in 3500 to 4,000 tons per year. However, the available data, the volume of catches for fishing, 12,000 tons, can be operated up to 50%, or 6,000 tons. In this paper, we can conclude that the small fishing fleet needs to be equipped with new ways to be able to apply their efforts a little more off, also facilitating the replenishment of resources near the coast where they have access today.

The lack of fish that is currently happening in the future may be more pronounced with the reduction in fishing activity.

We recall that, in view of the abovementioned conditions, the fishermen cannot stay more than one day in fishing areas due to lack of equipment, which does not guarantee them greater productivity. Only 2% of them practice a semi-industrial fishing mainly in the rich waters of the southern Island of Principe.

Most rivers of S. Tome were born on the outskirts of peak of S. Tome and Amelia Lake. These rivers have decreased their throughput considerably. However, taking into account the size of the same, the volume of water discharge that they send to the Atlantic Ocean, is not significant in relation to the great rivers of the continent.

The archipelago gets relatively little salt water from December to February resulting from the maximum discharge of rivers, including the Niger, due to significant rainfall in the Central African region at this time of year. These contributions of inland waters weaken the ability of biogenic marine waters of STP. However, a brewing located causes an upwelling of deep water, producing a certain balance in the general circulation of water masses in this region.

The system of wind affects ocean circulation and precipitation. In the tropical Atlantic, the westward drift of the hot water surface in July / August and the effect of compensation induce in the eastern part of the basin and the Gulf of Guinea, a replacement of surface water in deeper waters and thus more cold. This is the phenomenon of emergence "Upwelling." The deep waters rich in nutrients, promote primary production (phytoplankton) that feed the first animal organisms (zooplankton) which

in turn feed the fish. Thus, the available stocks are maximum between May and October in the Gulf of Guinea, where the cold waters are present.

In the specific case of Sao Tome and Principe, the winds are mainly oriented towards North-East in January and July in North-West. They are also a little stronger during the rainy season in the dry season or Gravana.

These two currents, the cold Benguela and warm Gulf, due to various phenomena related to climate change, tend to divert the course and with this the decrease of the clash between them and hence the phenomenon of "Upwelling" less action in the region.

Because of this phenomenon for a reduction of marine resources, which leads some fishermen to use fishing gear and materials not recommended, such as the trinitroglicerine (TNT), grenades, non-selective networks, among others.

The reduction of marine resources at the surface may deteriorate in the horizon 2040-2060, with the anticipated increase in temperature of 2.25 ° C.

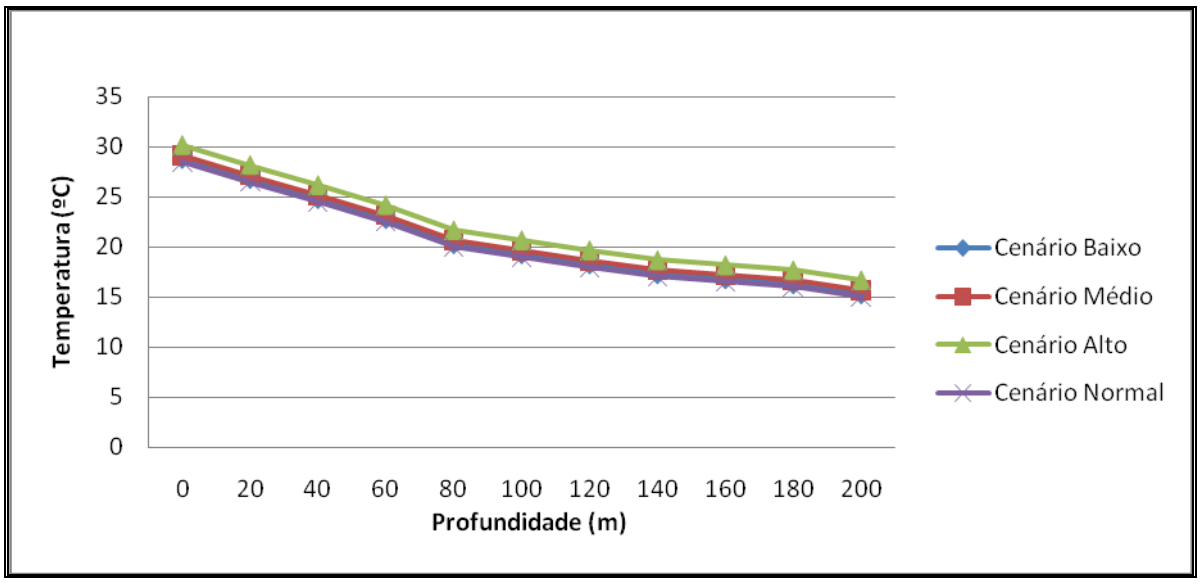
The results of a heliolithic campaign carried out in the Gulf of Guinea (FAO, 1999) and studies of the FAO / UNDP / Project GLO 92/013 (1999), have highlighted a close link between migration and increased depth of biomass surface temperature of ocean waters. This scenario of increased surface temperature of ocean waters translates, according to experts, to low level of production of fish stocks back STP.

As with ICN, we propose a scenario of change of temperature (° C) versus depth (m), graph No. 20, reflecting the migration depth of biomass and increased surface temperature of ocean waters.

The projected global temperature rise for Sao Tome and Principe, are located in the order of 2.25°C in the horizon 2040-2060. Given that the surface temperature of the ocean on the coast of Sao Tome and Principe has a mean value of 26°C, with an expected increase of 2.25ºC, this means, the fisherman, to reach the fishing grounds that are located at depths where the water temperature is about 24.5 ° C, would have to descend to depths of about 60m. The graph No. 20, shown below, illustrates this situation.

This medium-term would lead to the impoverishment of artisanal fishermen and dwindling supply of fish populations.

Figure 20 - Scenario of Temperature Variation with depth



IV.5.4- Coastal Zone

IV.5.4.1 – Baseline

Biophysical aspects

The Coastal Zone of Sao Tome and Principe extends from the boundary of the exclusive economic zone (EEZ) that starts in the 200 nautical miles and goes up to 100m altitude, from the coastline.

Ecosystems of the coastal area of S. Tome and Principe, there are three different zones, each with its population and characteristics. The most peculiar is the transition zone, which contains the brackish water and mangroves. On one side lies the mainland, the terrestrial ecosystem and across the sea, which houses the marine ecosystem.

In the transition zone, there are small reserves along the beaches or rocky holes, micro - ecosystems that constitute true nurseries and coastal marine life, such as snails (the islet of Doves - south of S. Tome) fish (*Holocentrus-Ascension "khaki*"), and octopus. In fact, the mangrove ecosystem hosting the "sui generis" and constitute a buffer zone between land and sea, with its fauna and flora and play a balancing and purification role of the coastal environment.

There are five endemic species of turtles, seabirds in Sao Tome and Principe, populations of the snails of the Rolas islet, lizards and other species that inhabit the mangroves.

There are also birds belonging to endemic fauna, such as *Lamprotornis ornatus "choucador* of Principe" and *Dicrurus modestus "Drongo* Principe."

Increased level of sea water is undoubtedly one of the biggest impacts in the coastal zone, in relation to the phenomena related to climate change.

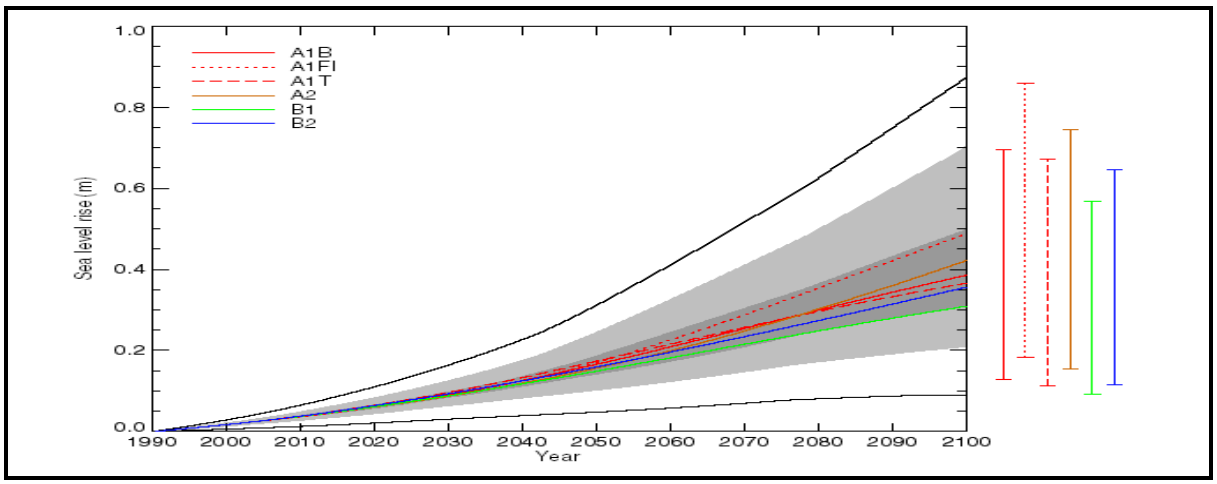
The sea level has risen gradually. Reports from coastal populations, e.g. in the area called "Fishing Beach", located south of the country, revealed this fact at the time of conducting field surveys in the preparation of National Adaptation Plan to Climate Change (NAPA). The resident population had been peremptory and landmarks on the coast, which visibly witness the retreat of the coastline.

In designated IPCC SRES scenarios (Figure 2), designed specifically for this region of the globe where Sao Tome and Principe is situated, according to the study of the climate presented in the analysis carried out by the University of Oxford, which we will cite the predictions of high levels of sea water of the same are as follows:

- 0.13 to 0.43m in SRES B_1
- 0.16 to 0.53m in SRES A_1B
- 0.18 to 0.56m in SRES A_2

Through them, one can preview the impacts and economic losses of significant fauna and flora, which would take place on the coast of Sao Tome and Principe.

Figure B: Global Scenario of rising average levels of the sea (1990-2100)



Economic Aspects

São Tomé and Príncipe is an archipelago, where the vast majority of economic infrastructures are located in the coastal zone.

Global forecasts of the IPCC have various scenarios for increasing the level of the sea. For example, the B2 scenario (Figure 2) shows an increase in the level of the sea, from 0.1m to 0.65m by 2100, or approximately (0.5 m).

The adjoining dwelling houses, hotel infrastructure located in coastal and farming, banking, insurance, telecommunications and energy could be affected.

A more detailed analysis allows us to visualize the economic losses for the different sectors in STD above, the contribution from these sectors to the GDP (Table 30).

Table 30 - Share of GDP of the main economic activities located in the coastal zone (STD x10^6)

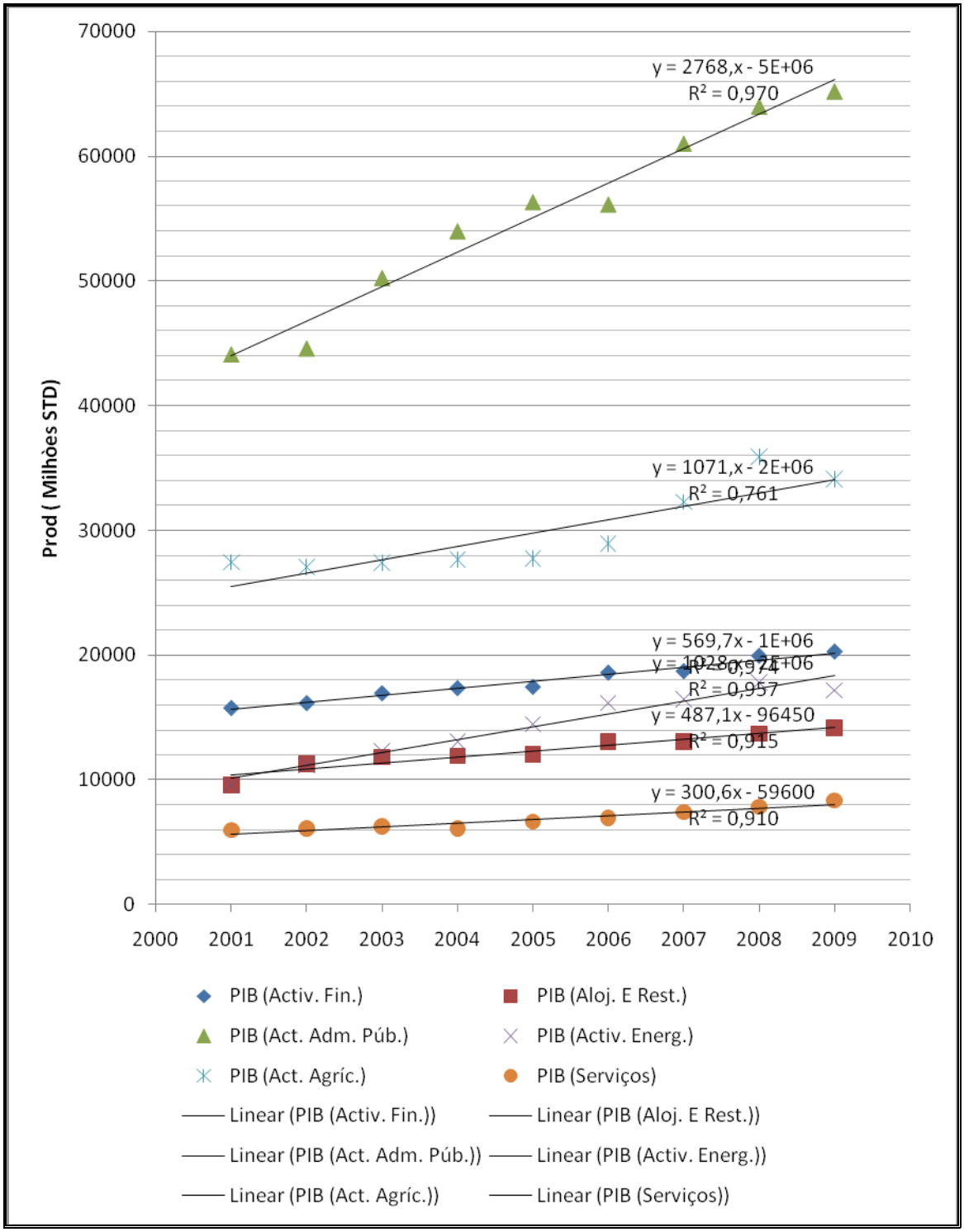
Years	GDP (Activ. Fin.)	GDP (Aloj. E Rest.)	GDP (Act. Adm. Pub.)	GDP (Activ. Energ.)	GDP (Act. Agríc.)	GDP (Services)
2001	15.756	9.567	44.139	9.595	27.423,9	5.953,2
2002	16.142	11.296	44.618	11.227	27.008,7	6.057,2
2003	16.937	11.846	50.264	12.350	27.379,8	6.238,8
2004	17.344	11.931	54.010	13.111	27.613,8	6.053,0
2005	17.438	12.028	56.337	14.484	27.729,9	6.623,4
2006	18.580	13.057	56.149	16.188	28.909,5	6.923,4
2007	18.701	13.059	61.027	16.468	32.233,2	7.406,2
2008	19.928	13.697	64.007	17.864	35.876,7	7.832,2
2009	20.271	14.186	65.212	17.215	34.092,0	8.330,6

Source: INE, 2011

For banking, insurance, administrative, agricultural, telecommunications, energy and other services located in the coastal zone, the estimated contribution from 2001 to 2009, is approximately 1,225,715 STD x106 to GDP, taking into account the percentages of these activities in the coastal zone.

Graph No. 21, below, displays the trend of growth of these sectors in the coastal zone and its contribution to GDP over the period covered.

Figure 21 - Baseline and current evolutionary trend of the main economic sectors of the coastal zone



IV.5.4.2 - Definition of a Future Baseline

Biophysical aspects

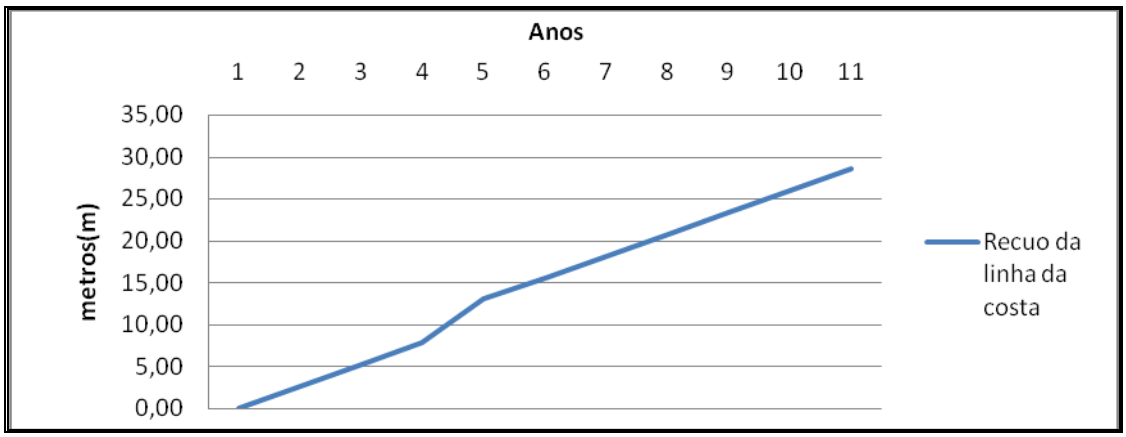
The future reference of coastal erosion is based on (i) measurements of Diogo Nunes Beach in S. Tome, by a team of national experts during the vulnerability and adaptation studies, conducted within the NCI and (ii) observations accompanied by visual reports of residents of Praia Grande, in 2011, also located at the NE of S. Tome.

According to the ICN calculations, the exploitation of aggregates on the beaches of Sao Tome and Principe, associated with other weather events that cause coastal erosion (wind, precipitation ...) could engender a retreat of the coastline around 5.2m per year.

In the face of awareness campaigns and adaptation measures carried out, a visual analysis of land allowed us to see a significant decrease in the levels of indentation of the coast, which leads us to make new estimates, based on these findings.

Projected to horizon 2040-2060, this erosion would be about 26m and would imply an area of approximately 51,400 m2 (51,433 m2), graph 22.

Figure 22 - Projection of retreat of the shoreline to the horizon 2040-2060



Economic Aspects

Port infrastructure, Maritime loading and unloading

As was said, the main port of Sao Tome and Principe is located in the Bay of Ana Chaves, on the east coast of the island of Sao Tome. There is a fuel terminal in the port of Neves on the northwest coast and another port on the island of Principe. The water is shallow (3m high tide to Ana Chaves and 1.70 m for Santp. Antonio), loading and unloading of ships must be carried out usually at a great distance from the coast (140 km, about 8 hours of journey) , making use of tugs and barges, with high costs, particularly high rates of long stays. The extension of the quay is 200m in S. Tome and has two medium-sized cranes and in Principe, the only crane truck and a small elevator are in a state of perfect ruin.

The insularity of the country causes a high dependence on the outside, reason why the port sector plays a leading role in the national economy, primarily with regard to consumer goods and equipment for the population, with a representation of about 90% of total imported and exported goods.

A recent study on the costs of isolation and insularity in Sao Tome and Principe, conducted by consulting firm, "Ogimatech Portugal" in 2010, when making a comparison between the ports in general in Africa and in Sao Tome and Principe, reveals that if the situation is worrying in the first, since the ports of S. Tome (Ana Chaves) and Prince (St. Anthony), is on striking.

Future references in terms of growth of economic activities in the coastal zone were defined from the rising level of the current average growth. Graph No. 23 below lets you to see the economic losses of the main activities located in the coastal zone due to climate change.

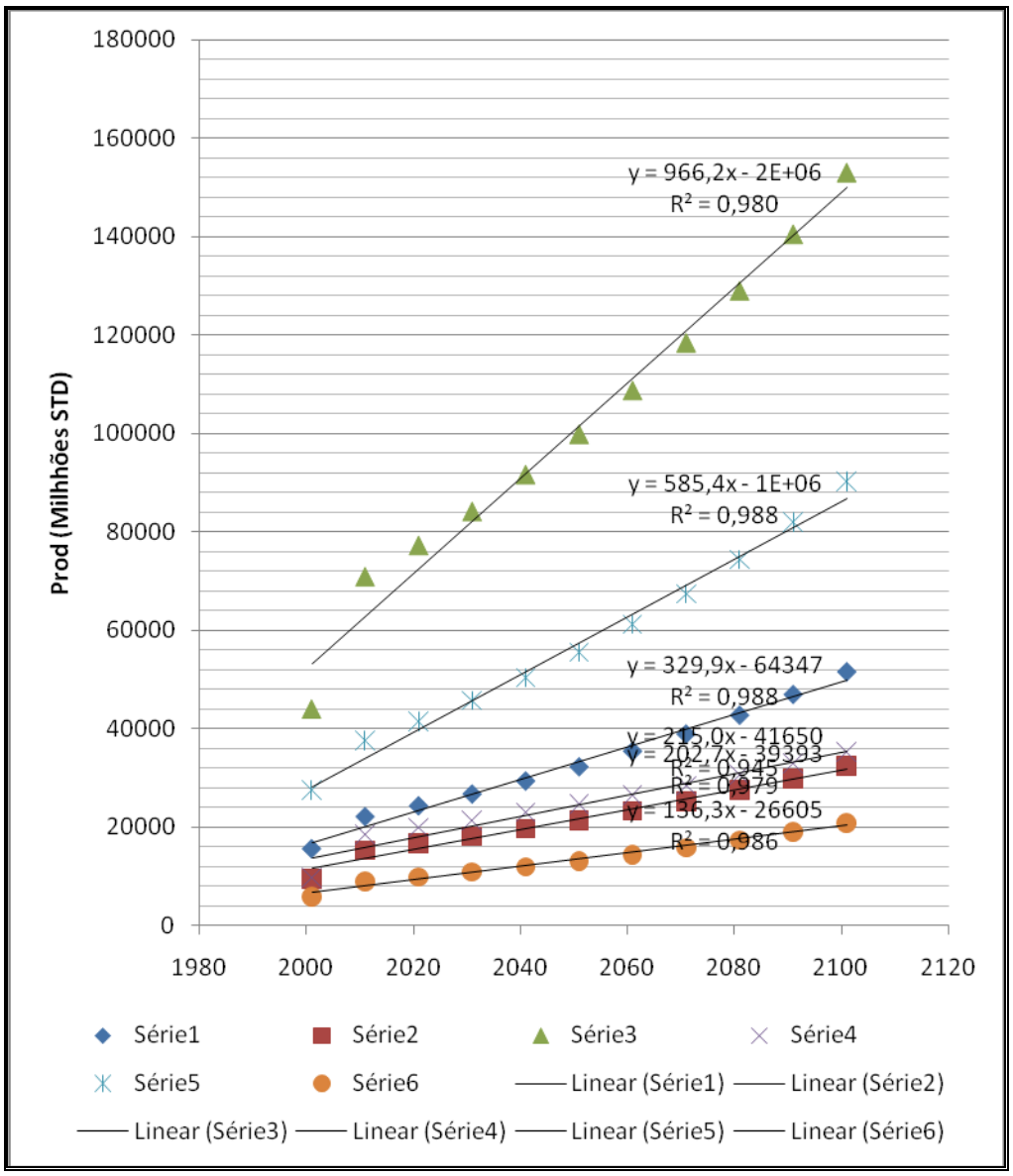


Figure 23 - Basic reference of future productions of the coastal zone on the horizon 2100

IV.5.4.3 - Climate Change Hypothesis

Economic aspects

Analysis of the sensitivities of the seaport (loading and unloading)

The main products of the country's export (cocoa, coffee, vanilla and pepper), the supply of the population living in Sao Tome and Principe in supplies and equipment, taking into account the country's dependence on the outside world because of its insularity condition , shows a great vulnerability in itself.

By associating the current actual conditions of seaports, described above, it doubles the degree of vulnerability, with additional costs normally attributed for insularity relatively to a non insular country such as the distances from the coast, difficult access and routing, discontinuity and smallness.

The impacts identified in the SCN, namely, increased temperature and decreased precipitation at local and regional levels, can give evidence to manifest in the coastal zone of Sao Tome and Principe of adverse effects. These manifestations can result in the rising of the sea, taking into account that this is an island country, due to the consequences of melting glaciers assisted with the anthropic action, aggregate extraction on the beaches.

The trend of economic loss can be seen from graph No. 24, shown below.

In figures, it is estimated that economic losses in the coastal zone for the 2100 horizon would be the order of 970 x 106 STD 028.1, which amounts in U.S. dollars approximately 55.43018 x 106 USD, taking into account that the exchange rate is USD 1 to 17 500 STD, because of:

- The losses in the main activities for the flooding of the infrastructure hosting these activities due to elevated levels of the sea;

- The decrease in local production of fish due to blockages in anchoring the canoes, the migration of fish to greater depths by increasing the surface temperature of the Atlantic Ocean and the destruction of boats and coastal infrastructure caused by the storms.

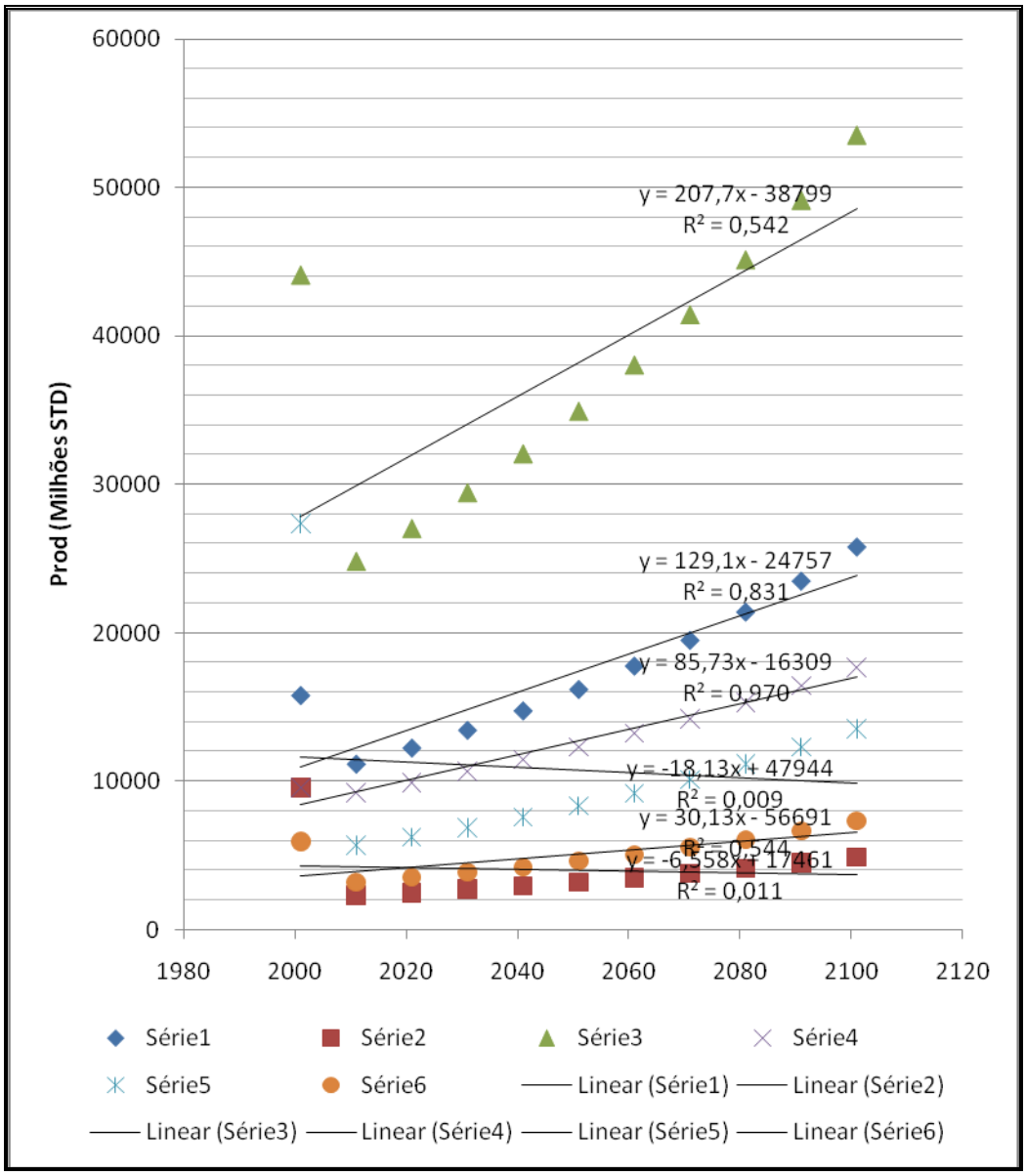


Figure 24 - Function of the evolutionary trend of economic losses in various sectors relative to Climate Change

IV.5.5- Population, Health and Education

IV.5.5.1 – Baseline Sector

For indicators on housing characteristics, emphasis was placed on indicators of comfort and social services and came out with the following conclusions:
It can be seen from Table 31 below, that 96.8% of households have access to water, of which 97.7% in urban areas (the district of Água Grande reaches 98%) and 95.7% in rural areas;

It is concluded that 88.7% of Saotomean families treat boiling water, using bleach, etc.., Of which 92.5% live in urban areas and 84.3% in rural areas, especially the position that the Água Grande District deals with 93.3%;

Table 31 below shows the general data on the social situation of the populations in Sao Tome and Principe.

Table 31: Questionnaire of Basic Indicators of Well-Being (QUIBB-2005), Sao Tome and Principe

	Total	Margin of error	Rural	Urban	Água Grande	Other Urban
Comfort and social services						
Access to water	96,8	1,5	95,7	97,7	98,0	97,0
Source of drinking water	88,7	4,9	84,3	92,5	93,3	90,8
Sanitation system	29,7	4,6	19,2	39,1	44,8	25,7
Access to electricity	48,5	5,8	33,7	61,6	65,8	51,5
Waste produced	6,6	3,9	1,0	11,5	10,3	14,6
Use of coal and firewood for food	78,2	5,4	92,0	65,9	55,7	90,3
Employment and unemployment						
Unemployment	14,8	1,9	13,5	15,9	14,5	18,9
Men	9,5	1,5	7,9	11,0	10,7	11,7
Women	21,1	2,8	20,8	21,3	18,7	27,7
Sub - Employment (precarious employment)	14,7	2,1	17,7	12,0	9,3	18,4
Men	19,5	2,8	23,2	16,1	12,7	23,4
Women	9,0	1,7	10,7	7,5	5,6	12,3
Literacy Rate - adult	84,4	1,8	81,4	86,8	89,1	81,4
Literacy Rate - Juvenile	93,8	1,4	92,3	95,0	96,3	91,9
Primary school						
Access	83,8	6,1	73,4	93,0	92,4	94,0
Rate of School attendance	88	1,7	90,2	86,1	86,1	86,3
Boys	89,1	2,2	91,4	87,1	87,3	86,7
Girls	87,0	2,3	89,0	85,3	84,9	86,0
Satisfaction	69,6	6,0	60,4	78,1	78,5	77,2
Secondary School						
Access	60,6	9,0	50,2	69,2	66,0	75,8
Rate of School attendance	59,7	3,5	55,8	62,9	65,6	57,3
Boys	57,5	3,8	54,6	60,1	63,1	53,9
Girls	61,9	4,2	57,2	65,6	67,9	60,6
Satisfaction	69,5	5,7	65,1	72,2	74,0	67,8
Health Service						

Access	74,1	7,9	59,0	87,0	86,1	88,9
Needs	18,7	1,7	17,9	19,3	19	20,0
Using	14,9	1,4	14,7	15,1	14,6	16,1
Satisfaction	68,6	5,0	68,5	68,7	69,1	67,9
Program monitoring and control	68,3	4,2	71,6	65,1	65,5	64,5
Professional assistance during delivery	85,1	2,0	68,4	90,7	0,0	0,0

Source: QUIBB Report 2005-INE

Regarding the use of electricity as a source of light, only 48.5% of Saotomean families benefit from this social good. In this case, there is great imbalance between the means of residence, i.e., about 62% live in urban areas, only 33.7% in rural areas.

With regard to health services, only about 14.9% of individuals have access to health services (15.1% Urban and 14.7% Rural), while the satisfaction rate reached 68.6% of which, 68.7% in urban areas (Agua Grande - 69.1%) and 68.5% in rural areas.

For sanity, about 30% of families benefiting from the system through proper sanitation, which can be considered a very low level, with large differences between urban (39.1%) and rural (19.2%) and the District of Agua Grande with a higher level (44.8%). 78.2% of households use charcoal and firewood to prepare food and only 6.6% use adequate means of evacuation of the waste produced.

IV.5.5.2 – Analysis of vulnerability, adverse effects and sensitivities of the sector

For the sub-population, the following sensitivities were highlighted, due to the adverse effects diagnosed. Table 32 below presents a matrix represented sensitivity to the sector, with moderate climate change and Table 33, the matrix of sensitivities to climate change dramatically.

IV.6 – Adaptation Measures

For each of the adaptation measures, appropriate technologies have been identified (see VI.1.2.4) to be transformed into projects of intervention as desirable.

IV.6.1 – Actions in progress

IV.6.1.1 - Regional project to support integrated approaches to climate change adaptation in Africa (AAP)

The District of Lobata due to the adverse effects of climate change, identified in the preparation of the National Climate Change Adaptation (NAPA), notably the extension of the dry season "Gravana" and its impact on the savannah area of S. Tome , welcomes the pilot project (2010-2012) referenced above, in order to mitigate the adverse effects of climate change.

The project may extend to other areas of the country, to give positive results.

So gradually, the integration of climate change in the national development process will continue, although the Project 00050191 - Preparation of Second National Communication (SNC) on Climate Change has come to its end.

Table 32 - Matrix of sensitivities for the field of population, health and education with moderate climate change

Adverse Effects (Population, Health and Education)	Increase in T & Decrease in P	Increase in P & T	Drought	Floods
Poverty index	+ + + +	+ +	+ + + +	+
Migratory Flow	+ +	+ + + +	+	+ + +
Change of eating habits	+ + + +	+ + +	+ + + +	+ +
Increase in the number of cases of malnutrition	+ + + +	+ + + +	+ + + +	-
Increase of skin diseases	+ + + +	+	+ + + +	-
Increases in respiratory diseases	+ + +	+ +	+ + +	+ + +
Reduction of school performance	+ + + +	+ + + +	+ + ++	+++
Decreased vitamin supply to school canteens	+ + +	+	+ + +	+
Lower rates of school enrollment	+ +	+ +	+++	+
Weak implementation of the urbanisation plan for the country	+	++	+	++
Difficulties with movement of population, transportation of goods and access to services	+	+ + + +	+	+ + + +
Decrease in health and hygiene conditions providing the increase of disease and consequently the increased mortality	+ + +	+ + +	+ + +	+ +
Increase of skin diseases	+ + +	+	+ + +	-
Increase in waterborne diseases	+ + +	+ + +	+ + +	+ + +
Increased outbreaks of malaria	+ +	++ ++	+	+ + + +
Increase of acute diarrheal diseases and other	+ + +	+ + +	+ +	++ +
Increase in diseases related to lack of sanitation	+	+++	+	+++
Increased dropout rate	++++	++++	++++	++++
Increased absenteeism	++++	++++	++++	++++
Degradation of school infrastructure	-	+++	+	++
Interruption and rescheduling of lessons	+ +	+ + + +	+	+ + +
Increased school failure	+ +	+ +	+	++
Decrease of the contribution (farmers production to feed	+ + +	-	+ + +	+
Decreased levels of literacy with the possibility of lowering the level of national economic development.	+ +	+ + +	+ +	++
Decrease school meals (school population	+ + +	-	+ + +	+

NB - sensitivity levels are considered on a scale of 0 -5: (0 -) nil (1 +) very low (2 +) down (3 +) normal (4 +) high (5 +) very high

Table 33 - Matrix of sensitivities for the field of population, health and education to prominent climate change

Adverse Effects (Population, Health and Education)	Increase in T & Decrease in P	Increase in T & P	Drought	Floods
Poverty Index	+ + + + +	+ + +	+ + + ++	+ ++
Migratory Flow	+ +	+ + + + +	++++	+ + + ++
Chnage in Eating Habits	+ + + + +	+ + +	+ + + + +	+ +
Increase in the number of cases of malnutrition	+ + + + ++	+ + + +	+ + + ++	-
Increase in skin diseases	+ + + ++	+	+ + + ++	-
Increase in respiratory diseases	+ + +	+ +++	+ + +	+ + +
Reduction of school performance	+ + + ++	+ + + +++	+ + +++	++++
Decreased of vitamin supply to school canteens	+ + +++	+	+ + +++	+++
Lower rates of school enrollment	+ +++	+ ++	+++++	++
Weak implementation of the urbinisation plan for the country	++	++	+	++
Difficulties with movement of population, transportation of goods and access to services	+	+ + + ++	+	+ + + ++
Decrease in health and hygiene conditions providing the increase of disease and consequently the increased mortality.	+ + ++	+ + +++	+ + +	+ +++
Increase of skin disease	+ + + ++	+	+ + +++	-
Increase in waterborne diseases	+ + ++	+ + +++	+ + +	+ + +++
Increased outbreaks of malaria	+ +	++ +++	+	+ + + ++
Increase of acute diarrheal diseases and others	+ + +++	+ + +++	+ + ++	++ ++
Increase in diseases related to lack of sanitation	+	+++++	+	+++++
Increased dropout rate	+++++	+++++	+++++	+++++
Increased absenteeism	+++++	+++++	+++++	+++++
Degradation of school infrastructure	-	+++++	+	+++
Interruption and rescheduling of classes	+ +++	+ + + ++	++	+ + ++
Increased school failure	+ +++	+ ++	+++	++++
Decrease of the contribution (farmers production to feed	+ + +++	++	+ + +	+
Decreased levels of literacy with the possibility of lowering the level of national economic development.	+ ++	+ + ++	+ ++	+++
Decrease school meals (school population).	+ + +++	++	+ + +++	+

NB - sensitivity levels are considered on a scale of 0 -5: (0 -) nil (1 +) very low (2 +) down (3 +) normal (4 +) high (5 +) very high

IV.6.1.2 – Actions for the Recovery and restoration of shoreline

The project funding under the AAP and the Global Environment Facility (GEF), actions are underway for the elaboration of a detailed study of the geomorphology and a participatory mapping of our coast, with World Bank support.

This action is also part of the responses of our development partners on the projects resulting from NAPA.

IV.6.1.3 – Others

Complementary actions resulting from placing barriers in the coastal zone, supply of places to dock their canoes, among others. These actions are part of a comprehensive program of support for the development of artisanal fishing.

Actions are underway for the establishment of a National Contingency Plan against Natural Disasters, led by the Committee on Disaster Contingency (CONPREC). These actions involve various sectors of national life, such as the INM, the Coast Guard, the Port Authority, Civil Protection, among others.

Chapter V- MITIGATION

V.1- Introduction

The inclusion of a chapter in the SCN of mitigation is relatively new to the ICN and represents an effort by the authorities and the team of national experts to improve each national communication submitted to the parties. Aspects relating to quality, for truth and transparency (QA / QC) were taken into account.

Indeed, the ability to sequestration of Sao Tome and Principe increased between the ICN and SCN.

The engagement of the country as a "non-Annex I" comes from having made aware of the fact that climate change has an effect that manifests itself on a global scale.

The chapters included in the analysis are: "Energy and Transport", "Agriculture, Forestry and Land Use Change" and "Waste, Industrial and Construction Procedures."

V.2 – Methodology

Based on the trend in emissions, verified for Sao Tome and Principe during the period between the reporting of GHG emissions for the ICN (1998) and the SCN (2005), we proceeded to a linear extrapolation of values, with horizon is the year 2030.

The extrapolation for the various sectors targeted by the present study takes into account the goals and commitments embodied in sector programs aimed at achieving the Millennium Development Goals (MDGs), including poverty reduction and self sustainable growth of the country.

Similarly, the commitments of the country at international level with the signing of various agreements and protocols, such as the United Nations Convention Framework on Climate Change (UNFCCC), the Kyoto Protocol among others, were respected.

V.3- Analysis, scenarios and mitigation measures

V.3.1 – Energy and Transport Sector

V.3.1.1- Energy Subsector

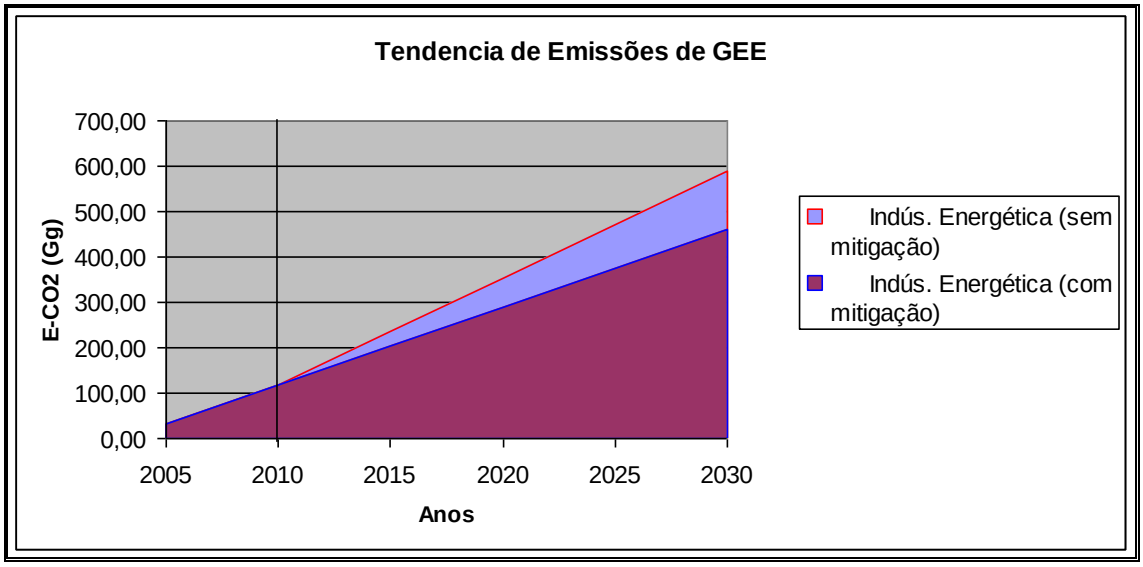
According to the study of scenarios for reducing emissions from the electricity sector in the country in the future, prepared by the expert team at V & A for this sub-sector, only the strategy of mitigation of GHG emissions may have the desired success. It is the scenario that allows for increased participation of energy from hydro and others considered clean, such as wind and solar.

As already mentioned in previous chapters, in 2030 the installed capacity could reach 158 MW, advocating the participation of clean energy (waterborne) in 25%.

Therefore, the estimated CO_2 emissions by E-may reach 513.5 Gg if the production is fully or thermal 385, Gg 1, if there is a 25% participation in other clean energy. The graph shows this reduction.

The graph No. 25, represented below, illustrates the mitigation scenario for the sub.

Figure 25 - Scenario Mitigation of GHG emissions



V.3.1.2- Transport Subsector

The latest national inventory, which goes back to 2005, emphasizes the increase of GHG emissions in the transport sub-sector. The sector grew by 28% compared to 1998, standing at 28.86 Gg CO2-E. However, it should be noted that this sub-sector participation in the energy sector was 39% lower than 1998.

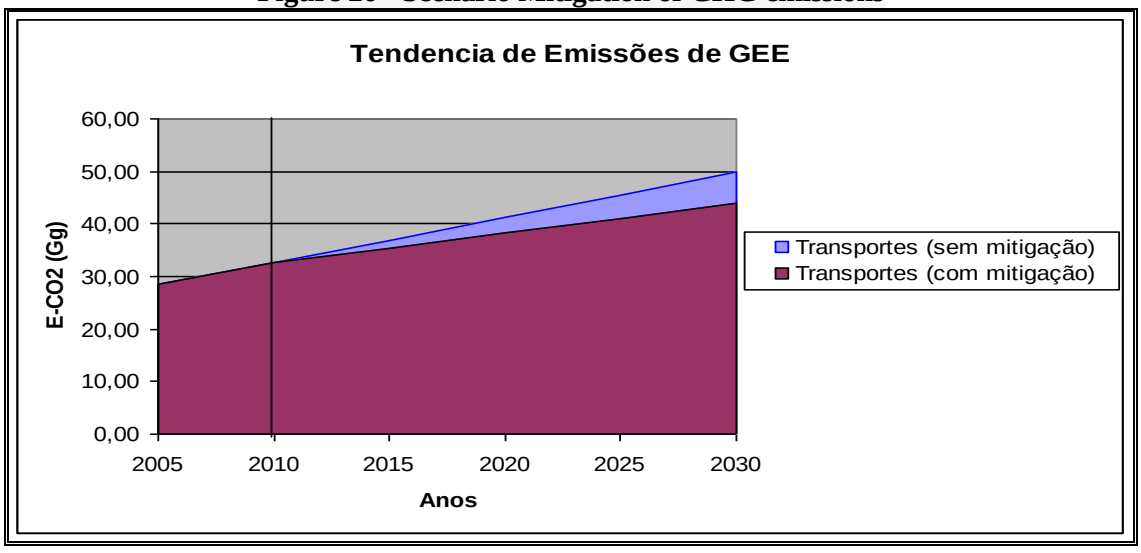
The Road transport subsector accounts for almost all of the GHG emissions of the transport sub-sector, with a 97% share in 1998 and 81% in 2005.

The change that has occurred in 2005 compared to 1998 GHG emissions of the transport sub-sector was 6.17 Gg CO_2-E, which represents about 0.88 E-Gg CO2 per year. Foreseeing that this trend will remain, that subsector would send about 50Gg of CO_2 in 2030.

Have been identified priority mitigation actions to reduce GHG emissions in the transport sub-sector, as indicated in the chapter on mitigation measures.

With the implementation of these actions, it is expected to reduce GHG emissions by about 12% by 2030, as shown in graph No. 26, shown below.

Figure 26 - Scenario Mitigation of GHG emissions



This finding was based on the current number of taxis estimated at about 1,500 vehicles and general vehicles of around 9,000, of which more than 3,000 are motorcycles. (Source: Directorate of Land Transport-2010).

V.3.1.3 - Summary of Mitigation Measures for the Sector

Energy

Specifically for the electricity sector, the following policies must be developed to take advantage of the existing resources and improve efficiency, including:

- Construction of several hydroelectric power plants;
- Construction of solar and wind park;
- Start a policy of energy planning of S. Tome and Principe;
- Encourage the use of alternative energy by creating legal tools and other investments in order to have these types of energy;
- Improve the technical, commercial and financial management of the power sector;
- Increase the power in the country, gradually eliminating the small diesel production centers;
- Reduce the maximum wastage of electricity supply and demand, introducing energy efficiency policies;
- Preparation and approval of the legislation of the national electricity system carefully and harmoniously, namely:
    - The Law on the Land of the National Electricity System (LOSEN), which would be made through the identification and inventory of potential natural resources, equipment and components inherent in the national energy area;
    - The Law of the Electricity Sector (LSE), which regulates the market exploration, production, transportation, distribution and marketing of national power;
    - Preparation and approval of a statute promoting domestic energy efficiency, encouraging the efficient import of electrical equipment, appliances, high efficiency electric motors efficient acquisition of high-efficiency,
- Implementation of programs and awareness campaigns to develop energy efficiency projects in the community and government agencies aimed at replacing incandescent light (LI) by low energy light bulbs (CFL), the culture of saving and rational use of electricity and their services contributing to the preservation of natural resources;
- Creation of tax incentives, customs and tax for investors in renewable energy technology, and import of energy-efficient equipment.

Transports

Among the national initiatives aimed at reducing GHG emissions, we can highlight the following:

- Renewal of "taxis" fleet in about 70% of the current, 1000 with the introduction of new vehicles by 2020 and the consequent removal of obsolete in circulation.
- Expansion of public transport vehicles with the introduction of 100 buses by 2015.
- Introduction of unleaded fuel.

V.3.2 – Land Use Sector, including Forestry, Agriculture and Livestock

CO_2 emissions produced through the activities in the forestry sector were estimated, both in 1998 as IGEE 2005, 72.55 Gg. As for gases other than CO_2, such as CH_4, CO, N_2O and NOx were estimated in these two inventories, very low emissions. For the case of nitrous oxide (N_2O), the issue is probably zero.

In S. Tome and Principe, the sources of emissions of greenhouse gases, relating to more harmful agro-forestry activities, come from burning of savannas and agricultural residues and were relatively

insignificant. It should be noted however that, the carbon monoxide (CO) only amounted to 0.88 Gg in the burning of the savannah. As to the management of manure and enteric fermentation emissions of the gases are similarly low.

Given that the sector is contributing directly to the carbon sequestration of Sao Tome and Principe, any mitigation scenario is dispensable.

V.3.2.1 - Summary of Mitigation Measures for the Sector

Of the reasons given above, one can envisage the following measures that could reduce GHG emissions in the sector of land use, including Forestry, Agriculture and Livestock:

1. Efficient exploration, through appropriate management techniques, potential agro-forest lands;
2. Reforestation through the application of agro-forestry techniques, forest areas, belching;
3. Introduction of kilns for making charcoal and improved stoves, and monitoring of fuel-wood consumption;
4. Efficient use of waste timber;
5. Promotion of sustainable use of agricultural land;
6. Efficient exploitation through appropriate techniques for managing agricultural land;
7. Application of compost instead of burning of agricultural wastes;
8. Promotion of sustainable agricultural practices in land use;
9. Rational use of fertilizers and animal manure;
10. Promote the use of renewable energy sources using agricultural waste and exploitation of timber;
11. Install irrigation system in areas of low rainfall, particularly in the savannah zone.

V.3.3 - Waste, Industrial Procedures and Construction Sector

V.3.3.1 – Waste and Industrial Procedures Subsector

For the waste sub-sector, the emission levels of methane are more significant. There was a slight increase in the value of 0.07 Gg (see Figure 6). This is due to population growth, which implies greater consumption of goods and consequently increased production of waste.

According to these values, the amount of waste produced in principle would not be sufficient to recover the natural gas formed to be a necessary infrastructure for large-scale energy.

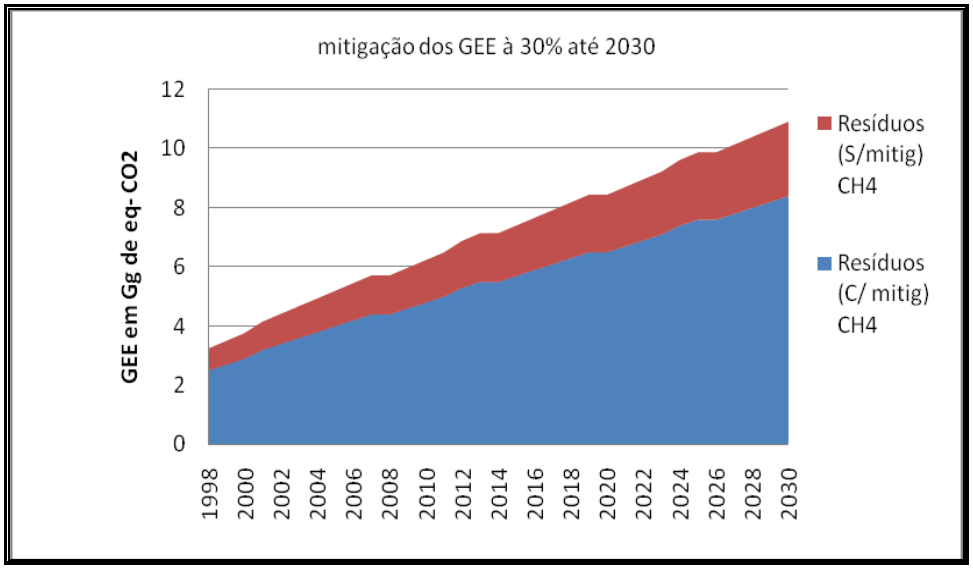
Therefore, with the amount of waste produced and due to the type of weather we have, we are led to the construction of centers for composting organic waste in the short term and long-term landfill accompanied by a triage center of solid waste.

For the Industrial Procedures sector, although the expansion of non-methane volatile organic compounds (NMVOC) in chart No. 5, assigned to asphalt in the construction or rehabilitation of roads, it presents a tendency of increase in emissions, a closer analysis of the development axes of this sector, leads us to predict that there is no prospect in the near future of significant growth for it, which means credible mitigation measures are not necessary at this time.

In view of the CDM, in addition to the potential reduction of GHG emissions such as methane by burning natural gas, this gas recovery system for the production of energy can be viewed with the construction of the landfill.

Chart No. 27 brings out the scenario of reducing GHG emissions from the extrapolation to 2030 based on the trend in emissions from 1998 to 2005. This reduction is achieved by the landfill that will allow a significant reduction in emissions of CH_4 in the order of 30% to about 2:52 E-Gg CO_2.

Figure 27 - GHG Mitigation Scenario at 30%

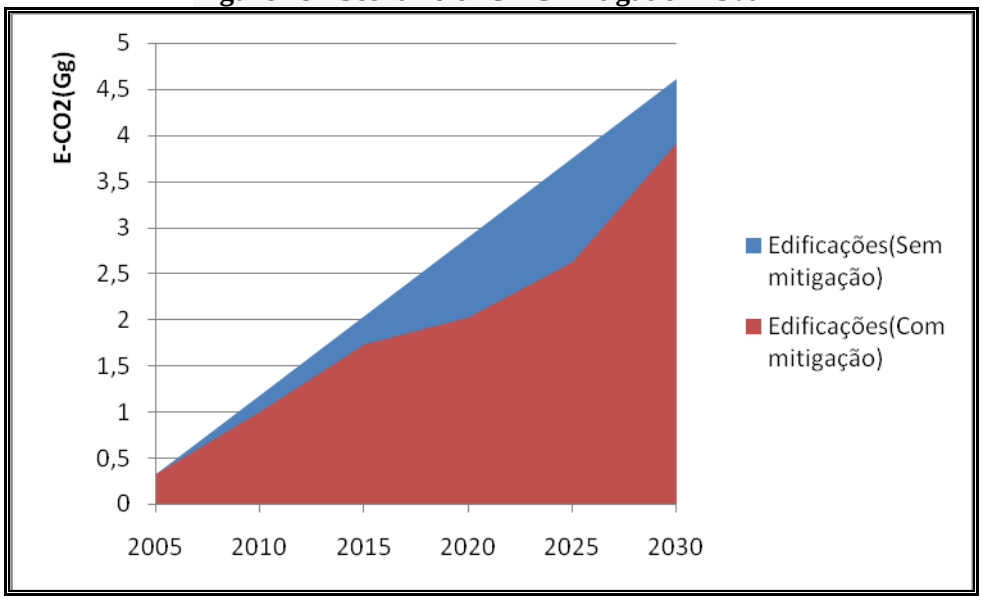


V.3.3.2 – Construction Subsector

For constructions, the trend in emissions is decreasing (see table No. 3), with no visible signs of increased emissions to the 2030 horizon, where it is estimated that our population will reach 153 886 inhabitants. Therefore, taking into account the source of emissions, i.e., the use of firewood and charcoal for cooking food and eventually added to the kerosene and the energy consumption of housing, it is assumed that mitigation measures will be largely turned to reduce energy consumption in homes, taking into account the internal efforts of national authorities towards the electrification of homes and neighborhoods.

Chart No. 28 brings out the scenario of reducing GHG emissions from the extrapolation to 2030 based on the trend in emissions from 1998 to 2005. This reduction will certainly be due to the replacement of incandescent and fluorescent bulbs (available now in most homes in the country) for light bulbs, low power consumption, which would allow a significant reduction of energy consumption and therefore emissions CO_2, to reach levels of around 327.33Gg CO_2-E.

Figure 28 - Scenario of GHG Mitigation 15%



V.3.3.3 – Proposed GHG Mitigation Measures for the sector

Relative to the level of growth of the main GHG emissions in this sector, that is methane (CH_4), note that the difference between the two inventories was not significant (even with population growth, which leads to heart the following measures taking into account the emission sources (household, commercial and industrial waste). On serializing the mitigation measures, it was taken into account the socioeconomic and environmental conditions of the country.

For the waste and industrial processes sector, include the following measures:

1. Composting (home, community) of organic waste accompanied by training and awareness;
2. Implementation of a composting center in the current bin at Penha (Agua Grande District);
3. Awareness and public information on recycling and reuse of solid waste;
4. Construction and rehabilitation of incinerators at health centers, for the incineration of toxic hospital waste;
5. Construction of landfill with gas recovery and transformed into electrical energy;
6. Construction of the station for collecting and treating of waste water with recovery of natural gas to reduce methane emissions;
7. Replacement of filling lines in existing plants undergoing the new clean technologies;
8. Introduction of a system efficiency of motor equipment;
9. Choose appropriate use of recyclable materials;
10. Implementation of the concept of safety, hygiene and health at work;
11. Staff training as part of HACCP;
12. Production of oil without the use of solvents;

For the subsector of constructions, are being proposed the following mitigation measures that have lowering effects with regard to GHG emissions with positive outcomes:

1. Preparation of a Master Plan for Urban Development;
2. More efficient lighting system in order to use natural light mainly during the day;
3. Use of electrical appliances and heating and cooling more efficient;
4. Passive and active solar heating and cooling;
5. Alternative refrigeration fluids more efficient and less aggressive;
6. Heat recovery and energy;
7. Material recycling and substitution;
8. Development of standards for sustainable construction.

V.4 - Lapses in Knowledge (Uncertainty)

According to the Fourth Assessment Report of IPCC (2007), Working Group III, there are still important lapses in existing knowledge about some aspects of current climate change mitigation, particularly in developing countries. The more research to address these lapses would reduce the uncertainties, facilitating decision-making on climate change mitigation.

Sao Tome and Principe is a developing country where data reliability is still a problem. The lack of data series over the years that may allow the development of scenarios supported by mathematical models or economic force the use of the so-called method of the discretion of the expert "jugement d'expert".

In terms of the IPCC, the most suitable system for mitigation scenarios is the LEAP (Long-range Energy Alternatives Planning System). This system requires data series over the years and a thorough knowledge of it in order to obtain measurable results, i.e. those that fit the pre-programmed spreadsheets. These models fit to the energy sector and all others with which it has synergies.

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V.5 – Conclusions

Despite the levels of GHG emissions for Sao Tome and Principe are scarce relatively to "Annex I" countries;

Having regard to the country's engagement in the presentation of mitigation measures as part of its Second National Communication;

As a result of various measures to reduce emissions of greenhouse gases in Sao Tome and Principe;

The consultant team presented a summary of the most important measures, namely:

- Need to increase electricity production, using a greater range of renewable energy sources that the country has, including hydro, wind and solar;
- Urgent need to introduce changes of several orders within the institutional framework, tariff policy and legislative national energy planning in order to achieve a decline in GHG emissions by 2030, about 25%;
- Urgency on specific legislation that will improve the quality of imported vehicles in terms of potential pollution;
- Promptness in the improvement of roads;
- Operating efficiently, through appropriate management techniques, potential agro-forest lands;

- Reforestation, through the application of agro-forestry techniques, forest areas, belching;

- Introdução de fornos para fabrico de carvão e de fogões melhorados e monitorização de consumo de madeira-com Introduction of kilns for making charcoal and monitoring of improved stoves and wood-fuel consumption bustivel;

- Conmstruction of the landfill with the recovery of natural gas which is a long-term measure that will allow the effective reduction of GHG emissions from solid waste;

- Development of a national master plan of urbanization, construction of stations to collect and treat wastewater from domestic and industrial and human resources training.

PART - IV

CHAPTER VI - OTHER RELEVANT INFORMATION

Introduction

As guidelines for the preparation of National Communication, in this chapter, we encourage the parties to provide information on any steps they have taken or intend to take to integrate analysis of climate change policies and actions in social, economic and environmental aspects. This would facilitate the formulation and implementation of sustainable development programs. In this National Communication, it was decided to refer to the following: Research and Systematic Observation, Education, Training, Information and Public Awareness, Training and Information Networking and Technology Transfer.

VI.1- Research and Systematic Observation

VI.1.1- Systematic observation

Paragraph g) of Article 4 of the Convention reads as follows::

All Parties, taking into account their common but differentiated responsibilities and their development priorities, objectives and specific national and regional authorities should promote and cooperate in scientific, technological, technical, socioeconomic and other systematic observation and development base data on the climate system and intended to clarify and reduce or eliminate the remaining uncertainties regarding the causes, effects, magnitude and timing of climate change and the economic and social consequences of various response strategies;

In this context, the INM is the public institution responsible for systematic observation under the Climate provides the bulk of the observations and research on climate and climate change in the country. In addition to the INM, there are other institutions of the country, within its powers are involved in the process of research and systematic observation. This applies to the Directorate General for Natural Resources and Energy responsible for CIAT and national hydrological network responsible for agricultural research

VI.1.1.1 Land Observations

National Meteorological Network

The National Meteorological Network and managed by INM in its golden moments, was composed of two synoptic stations, 18 climatological stations, eight agro-meteorological stations and 40 udometer stations. Difficulties of different forms made the network to be reduced to two synoptic stations, 3 climatological and 1 agro-climatological in early 2000.

A donation of BADEA to the Ministry of Public Works, Infrastructure and Natural Resources permitted the INM to install its first automatic weather station and five classical climatological stations.

With the support of the Portuguese Cooperation through the iPad, represented by the Environment Institute of Portugal, the project, SICLIMAD – STP was implemented through which were installed three automatic weather stations with the ability to transmit real-time climatic information recorded.

The above synoptic stations, which by the way are registered under the numbers 61931 and 61934, contributing to the World Weather Watch program". Observations are made and records of hourly data that are transmitted during 24 hours a day for the regional center of Brazzaville. The meteorological

variables recorded at these stations are basically the following: temperature, atmospheric pressure, relative humidity, wind speed and direction, cloud cover, rainfall amount and intensity, duration of sunshine, and the global radiation.

As part of the contribution of Sao Tome and Principe to the global meteorological network, in addition to the information provided in each hour during 24 hours a day by synoptic stations, a monthly message containing climatological information and denominated CLIMAT, is produced and sent to the already referred regional center that is responsible for its dissemination worldwide.

In addition to the aforementioned contribution of stations 61931 and 61934, a meteorological station was installed in Rolas Islet which records local data and transmits it via satellite to the coordination of the draft study on the African Monsoon (AMMA).

Over the past 10 years, there has been some effort in the Saotomean State to improve the national meteorological network. To this end, under the Public Investment Programme of the Government of the DRSTP for 2010, the INM was included with the purchase of two classic weather stations which have been installed, despite the context of the economic crisis.

These acquisitions demonstrate the importance that the country's authorities give to the issues of climate and its changes.

Under the AAP Project funded by the Government of Japan and implemented by the UNDP National Execution Modality, is planned to install 8 weather stations i.e. 4 automatic and 4 classic, as well as 20 udometer stations.

Two of the agro-meteorological stations that make up the national meteorological network are under the jurisdiction of the IATTC, the institution of the Ministry of Planning and Development.

National Hydrological Network

In STP, the hydrological observations are the responsibility of the Directorate General of Natural Resources and Energy. After several years of inaction, some stations were installed and incorporated hydrological observations and hydrological data records.

VI.1.2 - Climate Modeling

Following the Draft Climate Information System to support the sustainable development of Sao Tome and Principe (SICLIMAD - STP), it was possible to use the Brazilian version of American Regional Model “BRAMS” for modeling and forecasting in STP. It is a regional model of limited area using early data from CPTEC - Brazil for the start of the model. For modeling and forecasting sea state, the SWAN model appealed to the INM, which is fed by the outputs of the BRAMS.

Although they are the only models used by the INM, they respond very accurately to modeling and weather in the islands. Considering the small size of the islands of Sao Tome and Principe, it is desirable that the INM could have other models to allow comparison of results and improvement of weather and climate modeling. For this, the acquisition of weather radar would be extremely useful to the INM.

In preparing the study on Vulnerability and Adaptation in Sao Tome and Principe, climate projections for the horizon 2040-2060 were made using the Group Climate System Analysis at the University of Cape Town - South Africa, using the local data weather station at the Saotomean International Airport. GCM global model, presented a projection on the behavior of temperature and precipitation on the islands for the period.

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VI.1.2.1- Education, Training, Information & Public Awareness

The information, training and public awareness play an extremely important role to raise awareness of stakeholders, especially the people affected by the severity of the problem of climate change and therefore the environment.

For this, it becomes necessary to have an understanding of what is planned in the Convention on climate change. Article 6 of the Convention states that, in fulfilling its obligations under Article 4, paragraph 1, subparagraph (i) of the Convention, the Parties shall:

a) Promote and facilitate at the national and, as appropriate, sub-regional and regional levels in accordance with their national laws and regulations and within their respective capacities:

   i) The development and implementation of educational and public awareness of climate change and its effects;

   ii) Public access to information about climate change and its effects;

   iii) Public participation in addressing climate change and its effects and developing adequate responses to, and

   iv) Scientific, technical and managerial training.

b) Cooperate at the international level and, as appropriate, through existing bodies, the following activities, and promote them:

   i) The development and exchange of educational materials and public awareness of climate change and its effects, and

   ii) The development and implementation of education and training, including the strengthening of national institutions and the exchange or recruiting of personnel to train experts in this field, particularly for developing countries.

In this context, Sao Tome and Principe benefited from the Project of Self Assessment of Capacity Building Needs on the Environment (NCSA), funded by GEF and implemented by the UNDP that has identified the country's needs in training in the areas of the Rio Conventions and on Persistent Organic Pollutants, and the synergy between them.

Several training sessions on different topics related to climate change were organized:

Climate change and health procedures for the preparation of national action plan for adaptation to climate change, the methodology for establishing the inventory of greenhouse gases (IGEE), Vulnerability and Adaptation, Mitigation, Integration Issues of climate change in the national development plan, the clean development mechanism (CDM).

The beneficiaries of these training were different technicians of various levels of the Central State Administration, NGOs and the Civil Society, many of whom subsequently contracted for the preparation of various reports that make up this communication.

In collaboration with the UNEP-RISO, training was held on the CDM and its prospects for the country.

Similarly, in collaboration with the Secretariat of the Convention, Sao Tome and Principe received in 2010, the workshop of the Expert Group of Least Developed Countries (LDCs) for Lusophone countries.

VI.1.2.2 – National & Regional Institutional Capacity Building

As observed in the exercise carried out under the NSCA Project, Sao Tome and Principe needs to strengthen its institutional and human capacities to deal with the problem of climate change.

In this chapter, we attempt to describe what has been the contribution of the country concerning the strengthening of national capacity. It has been basically external container experiments with emphasis on technical and scientific capacity in Brazil and Portugal, but has also participated in the initiatives of the Intergovernmental Panel on Climate Change (IPCC).

To build capacity, it had the support of technicians of the General Coordination on Climate Change in Brazil especially for training on:

- The methodological, practical and legal aspects on the Clean Development Mechanism in order to establish the Designated National Authority (DNA) of Sao Tome and Principe;
- The methodology for the inventory of emissions of greenhouse gases, in the preparation of the second national communication;
- Capacity building of national staff in the identification of mitigation measures in the preparation of the second national communication;
- Capacity building of national staff in identifying the country's vulnerabilities to the impacts of climate change and adaptation measures to the possible effects of these changes, as well as the needs of technology transfer for mitigation and adaptation, in the preparation of the second National communication .

In addition to the assistance of Brazil, the country had the technical support of Portugal, through the PROGRESS ECO, to:

- Review of the National Action Plan for Adaptation to climate change, on request of the World Bank;
- Training on the CDM, for the establishment of the National Commission on climate change including the Designated National Authority for the CDM;
- Support for the preparation of "Project Identification File" which was submitted to GEF.

VI.1.2.3 - Information and Education Network

The issue of climate change cannot be relegated only to the Ministry of Public Works and Environment, much less the National Institute of Meteorology. The issue directly or indirectly affects various sectors of national life so that its approach should be seen across the board and integrated.

In our approach, we will describe how the country participates in the process of research and systematic observation, its contribution and its integration into the global network of observation and different networks of exchange and knowledge sharing on climate change.

The institutions responsible for the study of climate in the Portuguese-speaking countries early on, realizing mainstreaming the issue of climate change, decided by the establishment of a coordinating institution of the issues of climate and environment.

This coordinating institution was named CRIA Agency (Climate and its Related Environmental Issues) and integrated as well as research institutions, all meteorological services of the Portuguese-

speaking countries such as Angola, Brazil, Cape Verde, Guinea-Bissau, Macau, Mozambique and Sao Tome and Principe were founding members. The Agency operates in a regular base funding projects and some training until mid-2003, when it went into hibernation for lack of funds.

With the CRIA Agency in hibernation, the members of the CPLP though not all from the Meteorological Services, decided for the creation of a broader process that would bring together representatives of the CPLP in the area of climate change. This process culminated in 2005 with the creation of Lusophone Network of Experts on Climate Change (RELATIONS), which aimed to promote cooperation in the area of climate change among its members. This cooperation was limited to a few meetings during the COP and the network has not played the role for which it was created. Bilateral cooperation between members continues to be at the expense of stronger than expected when in 2005 it was decided by the creation of relationship.

VI.1.2.4 - Technology Transfer

Although the country was not a potential issuer, in the light of the results of the last report and the overall picture of its increase, it is urgent that measures be taken to contribute to the mitigation of emissions at the national level.

The assessment of technology needs for identifying the technologies and procedures best suited for different sectors of national life.

In this context, after conducting a training workshop on vulnerability and adaptation to climate change in Sao Tome and Principe, a number of technological needs were identified, which would benefit the implementation of various orders, reduce vulnerability to the adverse effects of climate change and allow the emission reduction. Experts from various sectors of national life took part in this seminar, including Agriculture, Forestry, Health, Education, Fisheries, Energy, Water, Coastal Zone, Industry.

Transportation and Buildings.

This initiative falls within the guidelines for the preparation of National Communications on Climate Change. Countries are encouraged in the light of social and economic status, to provide information on activities relating to the transfer and access to technology and know-how environmentally sound development and improvement of skills, technologies and endogenous know-how and measures for improving the environment.

VI.1.2.4.1 - Agriculture & Forest Sector

In the field of agriculture and forestry, various actions should be developed as a way to help the agriculture and forest sector to reduce GHG emissions and to mitigate the effects of climate change among which stand out the signs of desertification and the decrease of agricultural production as direct consequences of reduced rainfall. With the contribution of technicians in the sector, we identified the needs for technology transfer to ensure implementation of techniques and procedures in some areas.

In this context, to ensure food security, rational use of the earth and control of the emission of greenhouse gases were the priority technologies to implement the actions listed in Table 1. It is worth highlighting the introduction of mixed farming techniques, aquaculture and techniques to increase the value-added production. It is also the need to refer to the country of transfer of technologies for processing animal by-products for fertilizer, irrigation system effective and profitable. For example, micro-sprinkler and drip irrigation technology, more clones crop grown (e.g. banana) and windbreaks.

Also in this sector, in order to avoid soil erosion, for the conservation of nutrients, it is still necessary (i) changes in the topography of land to improve water capture and prevent wind erosion, (ii) changes in agricultural practices to conserve moisture and soil nutrients, (iii) reduction of surface runoff and

reforestation in arid and semi-arid areas, (iv) crop rotation for conservation of soil properties and (v) concentration of irrigation in periods of growth.

The technologies identified in Table 34 are common to agriculture and forest. However, we identified some for agriculture and some for other forest (Tables 35 and 36)

Table 34- Technologies for agriculture and forestry sector

No	Technology Proposals
1	Polyculture Technic (crop-livestock integration-forest)
2	Changes in the topography of land to improve water capture and prevent erosion by wind
3	Changes in agricultural practices to conserve moisture and nutrients from the soil, reduce runoff and control soil erosion
4	Windbreaks
5	Protected and Hydroponics Agriculture
6	Methods of pest control including biological control
7	Techniques to increase value added production
8	Techniques to ensure food safety and quality
9	Conversion of sub-products of animals for fertigation
10	Effective and profitable Irrigation system, for example, micro-sprinkler and drip.
11	Clones Technology for most crops grown (e.g banana)
12	Aquaculture techniques
13	Crop Rotation for conservation of soil properties
14	Improving the use and availability of water
15	Change in the period of planting and harvesting
16	Development of new plant varieties adaptable to drought
17	Focus on irrigation during periods of growth
18	Reforestation in arid and semi-arid regions

Table 35- Technologies for the Agriculture Sector

No	Technology Proposals
1	Avoid deforestation of new areas to use the already open areas more intensively (intensification of agriculture technology)
2	Avoid using any type of fire as an agricultural practice for cleaning areas (such as the burning of sugar cane for harvesting and burning of crop residues)
3	Restore degraded areas that contribute to retrieve the content of carbon in the soil, prevent deforestation, for example, planting of riparian forests or legal reserve to contribute to the increase in organic carbon reserves
4	Adopt farming practices that increase the "stock" of carbon in soils, and reduce GHG emissions, such as direct planting and agro-ecology
5	To improve the techniques of application of nitrogen fertilizer, avoiding the emission of nitrous oxide
6	Increase of cattle feedlot
7	System capture of animal droppings for power generation
8	Improving the quality of the pasture to reduce CH4 emissions through the process of ruminating cattle
9	Promote bioenergy crops such as oilseeds (soybeans, sunflower, radish, forage, oil palm, etc.) for biodiesel and sugar cane for ethanol, cleaner energy sources
10	Encourage the exchange of agricultural fuel fleet of fossil fuels to biofuels
11	Introduction of fast growing species for charcoal production and firewood

Tabela 36 -ecnologias para o sector de floresta

No	Technology Proposals
1	Sawdust Technology (for upgrading)
2	Technology for the production of pulp and paper with appropriate species
3	Monitoring technology of forestry exploitation
4	Technology to monitor and evaluate savannization index
5	Technology to increase the tree density in different microclimates in the forest shade
6	Technology for mangrove rehabilitation
7	Technology to enrich the composition of savanna tree
8	Technology to improve the use of wood fuel by using improved stoves *
9	Techniques for improving the efficiency of transformation of logs into sawn timber
10	Technologies for restoration of degraded soils
11	Agro-forestry Technology on slopes
12	Technology for the improvement and enrichment of secondary forests
13	Low cost forest inventory technology
14	Technology monitoring and prediction of ecosystem degradation (bioindicators)
15	Techniques of using biomass (wood) in place of fossil fuels such as fossil fuel oil

VI.1.2.4.2 – Water Sector

This sector has been confronted with the pressure of ever-growing population to meet their needs in water increasingly scarce, due among other factors to lower water levels in rivers and removal of some springs. In this sector, in order to reduce the impacts of climate change, and the more rational use of water for human consumption, it is intended in the worst case, the use of desalination technique, through the use of technologies that use rainwater and storage of surface water, and technologies for the use of recycled water. The construction of dams and lakes for water supply and mini compact station wastewater treatment.

Table 37-Transfer of technology for the water sector

No	Technology Proposals
1	Compact wastewater treatment Station (impoundment due to oxidation at room temperature)
2	Construction of dams and lakes to supply mini-hydro
3	Techniques for the use of rainwater
4	Techniques of surface water storage
5	Use of recycled water and / or reused
6	Municipal or domestic
7	Increase in number and capacity of reservoirs
8	Desalination (reverse osmosis, more efficient techniques in terms of energy)

VI.1.2.4.3 - Energy Sector

The energy sector is one of the sectors on which one must act quickly to mitigate GHG emissions. The fact that a large percentage of electricity produced in Sao Tome and Principe is thermoelectric in origin (80%) and only an another insignificant part is of hydropower source (less than 20%), makes this sector one of that contribute most to the emission of greenhouse gases.

Hydropower is not sufficiently developed in accordance with the country's hydropower potential. It requires the implementation of projects of construction of mini hydro already identified as a significant contribution to reducing dependence on the outside of the country, as regards the import of fossil fuels. Were identified as most feasible alternatives technologies adapted in the field of electricity production from hydro and small-scale.

Technologies that enable the use of solar energy, photo-voltaic and solar thermal of low and high temperature were also listed as alternatives, as well as biomass gasification technologies.

VI.1.2.4.4 - Industry Sector

For the industry sector still in its infancy, its development and efficiency are also constrained by the capacity of the energy sector in the country to respond to real needs.

However, some industries (e.g. bakers) use as an energy source, fuel of vegetable origin (wood), others still use intensive electrical energy. In this sector, we propose some measures that also aim to mitigate the emission of greenhouse gases; in particular, construction of efficient electric ovens for bakeries, introduction of more efficient electrical appliances for end users, energy recovery in production processes, use of loop system combined recycling and material substitution processes.

VI.1.2.4.5 - Other Sectores

The assessment of technology needs in sectors such as transport, construction, fisheries, health and coastal areas also allow identifying technologies, practices and reforms that would reduce GHG emissions, vulnerability and adaptation to the effects of climate change. The construction sector is what stands out because of the fact that urbanization process can drag along with it, building of infrastructure underlying the effect of heat island which in turn contributes to global warming.

The tables presented below illustrate the need for technology transfer in the energy, industry, coastal zone, buildings and transport, health and fishing.

Table 38 - Transfer of technology for the energy sector

No	Technology Proposals
1	Small-scale Hydroelectric power
2	Photovoltaics Solar Energy
3	Thermal Solar Energy
4	Wind on shore and four turrets
5	Biomass Gasification

Table 39 - Transfer of technology to the industry sector

No	Technology Proposals
1	Efficient Electric Ovens for bakeries
2	Producing more efficient electrical appliances for end users
3	Combined cycle system
4	Recovering the heat and energy in production processes
5	Recycling of materials and replacement processes
6	Controlling GHG emissions in production processes
7	Industrial inventories (basis for CDM)
8	Energy Efficiency
9	Conservation of energy
11	Techniques of reforestation for industrial use

Table 40 - Technology transfer to industry of the Coastal Zone

No	Technology Proposals
1	A technology for building houses made of adobe (clay) to replace the sand
2	Computers and devices that enable the collection and processing of data processed by tide gauges
3	Technology for geospatial studies of sensitivity to coastal zone
	Protection
	Hard structures
4	Dykes
5	Containment Barriers
6	Wave Barriers
7	Breakwater
8	More resistant materials
9	Artificial Reefs
	"Light structures" "(*Soft structures*)
10	Restoration of dunes or wetlands
11	Recovery of beaches (including landfill)
12	Techniques applied the strategy of holding areas of indentation, for example, restoration of wetlands areas
	Adjustment
13	Early Warning System for evacuation
14	New agricultural practices with salt-resistant crops
15	Advanced Drainage Systems
16	Desalination systems
17	Modern techniques of zoning and occupancy in coastal areas
18	Management and removal of solid waste at sea (e.g. housing boats)
19	Management and removal of liquid waste at sea (e.g. oil spills, fossil fuels, etc.)
20	Treatment Techniques and storage of waste fuel

Table 41 - Transfer of technology for the transport and construction sector

No	Technology Proposals
	Construction sector
1	Architecture "green"
2	Buildings that favor the use of solar energy and improve energy efficiency
3	Reduce the area of pavement structures in construction, using vegetation to reduce the effects of heat islands and reduce the energy demand for air conditioning
4	Techniques to reduce the effects of urbanization of the "heat island"
5	Techniques for lighting time switches (or photocell) and appliances
6	Lamps economic
7	Effective device for protecting electrical appliances
	Transport Sector
8	Creation of residential and commercial areas, reducing the need to travel
9	Development of urban roads
10	Promotion of public transport mass
11	Technical planning of public transport
12	Use of integrated modal
13	Connection between urban transport and land use patterns

Table 42 - Transfer of technology for health sector

No	Technology Proposals
1	**Diseases caused by vectors**
2	Techniques for vector control
3	Vaccination Technique
4	Techniques of maintenance of water quality
5	**Diseases caused by water**
6	Genetic / molecular pathogens
7	Incineration Technology (treatment) of hospital waste
8	Technology of production of oxygen hospital
9	Transmission technology and image reading (imaging) satellite - Telemedicine
10	Construction of landfills
11	Geographic information system for health
12	Hemodialysis Technology
13	Solid waste treatment hospital (Lake macrophytes)
14	CT Scanner
15	Production of medicines

Table 43 - Transfer of technology to the fishing sector

No	Technology Proposals
1	A participatory management of fisheries resources
2	Construction of two new parks for parking of boats
3	Establishment of marine protected area
4	Creation of marine aquaculture
5	Techniques for the construction of semi-industrial boats
6	Zoning fishing techniques
7	Transfer of fisheries research techniques
8	Reflectors, radar on board fishing vessels
9	Training for use of techniques and ocean fishing vessels
10	Training of observers onboard fishing ocean
11	Technologies for tracking industrial fishing vessels and ocean
12	Techniques for handling and storage of fish to increase the value of fishing

Table 44 - Transfer of technology for the waste sector

No	Technology Proposals
1	Techniques of construction and maintenance of sanitary landfills in urban centers, to prevent the emission of methane
2	Recovery of methane from landfills in the form of biogas
3	Waste incineration for energy
4	Techniques of organic waste composting
5	Control of the treatment of domestic sewage and waste water industries
6	Recycling and / or recycling of household and industrial waste
7	Biodigesters for pigs and cattle droppings

CHAPTER VII - LAPSES, CONSTRAINTS AND STRENGTHENING OF INSTITUTIONAL CAPACITY BUILDING

Introduction

The possibilities for developing countries "Parties" have to provide information to the Secretariat (paragraphs 3, 5 and 7 of Article 4 of the Convention) are subject to the implementation of the developed countries "Parties" from its obligations to the Convention, concerning the allocation of resources and technology transfer.

It is therefore important to include information on constraints and gaps related to financing and technical needs and capacity building.

Some information provided in this chapter may already have been addressed in previous sections and chapters of the CN. However, it is essential to provide greater detail the specific constraints, gaps and needs identified.

VII.1 – Constraints

The major constraints encountered during the process of drafting the report to the SCN are:

- Lack of a centralized database on Climate Change with necessary information available;
- Difficulties of access to information and existing data;
- Difficulty in obtaining data necessary for the preparation of various reports;
- Insufficient technical capacity by national consultants in the field of different components that make up the development of the SNA;
- Poor coordination of sectors involved in issues related to MC;
- Insufficient availability of support manuals in Portuguese;
- Failure to meet the agreed deadlines for the preparation of reports by national consultants;
- Difficulties to find leaders for the working groups (Team leaders).

VII.2 – Lapses

Regarding lapses, include:

- Lack of appropriate expertise at the level of national consultants on specific subjects;
- Lack of institutions / cells assigned to the issues of Climate Change;
- Poor dissemination of information on MC;
- Low institutional ownership of the studies conducted on the MC;
- Low interest in the MC resulting from the fact of climate change are not included in the priorities of national decision-making centers.
- Lack of institutional arrangements that enable the creation of a permanent National Communications.

VII.3 – Strengthening Institutional Capacity Building

With regard to the needs of institutional of capacity building, human, public and techniques necessary for the preparation of National Communications, the following were considered:

a) From the institutional point of view:
   - Creation of an integrated database with information relevant to the preparation of CN;
   - Creation of mandatory legislation in providing credible data for the preparation of National Communications;
   - Allocation of technical and financial means necessary for a good performance of the Committee members and technicians involved in the drafting of the MC;
   - Promotion of awareness raising and advocacy to decision makers;

- Improved coordination, cooperation and collaboration between sectors;
- Accountability of the state to a greater articulation and coordination of actions.
- Designation of an institution under the Ministry of Public Works and Natural Resources which will deal with the problem of MC permanently and the production of CN;
- Institutionalization of a National Council / National Commission on the MC;
- Strengthening the technical capacity of institutions and actors operating in the collection, processing, dissemination and archiving of data;
- Advocacy with the Government to the need for integration of MC in general, and CN in particular, the development priorities;
- Greater involvement of the NSA when it comes to collection of specific data (it is suggested signing a protocol between the INE and the institution responsible for making the CN);
- Capacity building of members of the National Follow-up of CN to improve its performance.

b) <u>Human</u>

- Extend the duration of training of national consultants in accordance with the specifics / needs of different reports to be produced;
- To promote actions of capacity building / training, duly planned and systematic process of involved in the preparation of CN;
- Need for the appreciation of potential ,accumulated experience and knowledge acquired from different actors involved in the preparation of CN; overruns Administer technical staff to the various sectors that have accumulated experience in the preparation of various studies that make up the CN;
- Introduce matters related to the MC at pre-university and university training.

c) <u>Public</u>

- Creation of extension programs and awareness on issues including the CM CN;
- Develop campaigns and programs aimed at greater involvement of sectors, NGOs and Civil Society in the process of MC;
- Develop congregation policies of different sectors (NGOs, Local Authorities, Local Associations)
- Development of capacity building actions aimed at the NGO issue of MC.
- Encourage actions of information, education and communication on the MC through radio, television and newspapers and specific programs.
- Greater involvement of civil society (NGOs, religious institutions, media, etc..) In addressing the issue of MC.

d) <u>Technics</u>

- Training of technicians at the sectoral level;
- Promotion of research and research for development, regional and international exchanges to improve and better applicability of the knowledge acquired by participants;
- Training in the field of software;
- • Equip and equip institutions and services involved in order to efficiently monitor the progress of the project climate and its adverse effects on different sectors of national life;
- Intensification of research in the fields of software, etc...

VII.4 – Proposed Solutions

Regarding the constraints and lapses, the following proposals were made:

- Specialized training for trainers on the use of software for the production of CN (IGEE, Modeling Scenarios and Vulnerability Mitigation and Adaptation);
- Training for *Team Leaders* of the different sectors covered by the CN;
- Creation of an integrated database on issues of climate change at the level of sectors.

To imply a greater involvement of stakeholders in the preparation of National Communications, the following proposals were made:

- Creation of "Antennas" the level of local authorities and the Autonomous Region of Principe, which address the questions of the MC under the coordination of the Directorate General for Environment;
- Disclosure Program linked to climate change through the media;
- Seminars, lectures and other processes at the sector level on Climate Change.

CONCLUSIONS & RECOMMENDATIONS

General Conclusions

The lack of reliable data continues to be one of the most prominent problems in the preparation of National Communication on Climate Change.

As recommended in Article 4, paragraphs 3, 5 and 7 of the Convention, Sao Tome and Principe will continue to rely on the technical and financial assistance of the countries of "Annex I" to meet its technical and financial needs and overcome the constraints and lapses in order to fulfill its obligations as a member of "non-Annex I" of the Convention.

Sao Tome and Principe will pay particular attention to the establishment of cooperation agreements with developed countries in order to develop projects of Clean Development Mechanism (CDM). These include the mini-hydro, small hydro and landfill, to reduce its GHG emissions and also contribute to the reduction of greenhouse gases in third countries, using technology transfer.

Mitigation is one of the chapters of the SCN, as a step not to neglect this exercise.

The proposed legislation and organs in the context of climate change should be implemented to improve the quality of the next CN.

Sao Tome and Principe is a carbon sink country, despite its vulnerabilities arise from its status as small islands, for which adaptation and mitigation are unavoidable.

The report was produced in compliance with the IPCC recommendations, with regard to comparability, transparency, accuracy and standards of good practice.

Recommendations

1. Given the geographical discontinuity of the Autonomous Region of Principe (RAP), to its specific soil and climate, the abundance of marine biodiversity, among others, on the one hand;

   And the parameters recommended by the IPCC in the preparation of CN in relation to the aspect of comparison, on the other side;

It is recommended:

- To give a particular attention to the RAP, the level of the forecast overall budget.
- That the partial and sectoral studies within the CN take into account this aspect.

2. That the implementation of the national entities undertaking the systematic collection of data for the preparation of CN from the beginning to obey a decentralization through local authorities and RAP.

3. Making use of the multiplier effect of ongoing programs (outgoing national documents developed within the framework of climate change) to promote national development through the transformation of the districts and the Autonomous Region of Principe in centers of economic development, from solving environmental problems, such as:

   - Construction of mini-hydro and small hydropower (SHP) with an option to supply water to the population, through the CDM;
   - Use of rainwater for irrigation and domestic use, through the construction of large reservoirs;
   - Dissemination of improved stoves and use of the base buildings of mud brick and "black gravel" to reduce the consumption of wood and inert beaches;
   - Massive reforestation program;
   - Intensification of the teaching subjects friendly environment in school curricula at all levels;
   - Caressed, project monitoring and standardization of Lobata AAP, with a view to its perpetuation in the country;
   - Removal of communities of fishermen from the beaches, through the creation of communities that are less close to beaches, schools, gardens-schools, health facilities such as clinics and hospitals, small shopping centers and recreational facilities, among others, as an incentive to their attachment outside their normal places of residence;
   - Introduction to the brevity of the weather warning system and prevention of disasters and natural disasters.

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ANNEXES

Annexe 1: Vulnerability of sectors and possible adaptation measures

Table No. 1 - Agriculture and Livestock

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
Agriculture		Reduction in production	1. The existing cultivated areas will be reduced due to changing soil and climatic conditions. 2. It is expected an increase in the incidence of pest which will reduce crops yield.	- Develop Scientific and Technical reasearch on adaptation of new productive varieties with tolerance to broad spectrum to harmful effects of climate - Create a mechanism for subsidizind farms (agricultural funds to compensate for losses related to phytosanitary pests and diseases and natural disasters). - Establish a fund of agriculture for the renewal of old cocoa plantations, currently unprojductive areas of adequate rainfall and other crops. - Extend the irrigation system to needy regions of the country (E.g. Mesquita, Mesquita, Bom Sucesso, among others).
		Physico-Chemical change of the soil	1. The soil water reserve will which could negatively influence the practice of farming in certain soil types, especially in the black clay. 2. Negative changes in the dynamics of soil chemical organic matter. 3.Minor efficacy in the mobilisation of chemical elements in soil. 4.Salinication land located in coastal areas due to lack of drainage of sea water that penetrates the ground.	- Adopt the different regions of the country with water deficit, irrigation system. - Encourage the use of organic (manure). - Spread irigation system to the most needy regions. -Major spread of plant species adapted to certain zones. - Develop a policy of territorial cultures. - Supporting the best research and development services. - Implement the drainage system in areas needed.
	Reduction of rainfall and increase in temperature.	Reduction of income in rural areas.	1- Reduction of production and consequently reducing the income of farmers. 2- Crop conversion causes periods of minimum income.	- Promote studies of the profitability of small farms due to the different agro-ecological regions of the country. - Promote a program of technical and material support to farmers. - Develop a policy for processing and export of local products and surplus production.

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
	Increase in Rainfall and Increase in Temperature.	Reduction in production	1. The existing cultivated areas will be reduced due to changing soil and climatic conditions. 2. It is expected an increase in the incidence of pest which will reduce crops yield.	- Develop and implement a comprehensive monetisation plots according to the different agro-ecological regions of the country. - Create a mechanism for subsidizing farms *agricultural funds to compensate for losses related to phytosanitary pests and diseases and natural disasters). - Implement the applied research
		Soil physico-chemical change.	1. Loss of nuitriens to the soil surface by deep leaching process. 2. Loss of topsoil from agricultural areas. 3. Loss, especially to food crops and vegatables due to flooding on soils of low permeability.	-Promote actions to protect areas identified as high risks of erosion. - Provide technical advice to farmers with plots of land located in areas vulnerable to erosion. - Set up funds for food and nutritional security. -Implement drainage system for flood zones.
		Reduction in farmers incomes	1- Reduction of production and consequently reducing farmers income 2- Crop conversion causes peiods of minimum income.	- Develop a policy of teritorial cultures. - Promote studies of the profitability of small farms due to the different agro-ecological regions of the country. - Promote a program of technical and material support to rural farmers. - Develop a policy for processing and export of local products and surplus production.
Livestock	Reduction of Rainfall and Increase in Temperature	Reduction of Production.	1. The existing cultivated areas will be reduced due to changing soil and climatic conditions. 2. It is expected an increase in the incidence of pest which will reduce crops yield.	- Develop and implement a comprehensive monetisation plots according to the different agro-ecological regions of the country. - Create a mechanism for subsidizing farms *agricultural funds to compensate for losses related to phytosanitary pests and diseases and natural disasters).

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
		Soil physico-chemical change	1. The soil water reserve will which could negatively influence the practice of farming in certain soil types, especially in the black clay. 2. Negative changes in the dynamics of soil chemical organic matter. 3.Minor efficacy in the mobilisation of chemical elements in soil. 4.Salinication land located in coastal areas due to lack of drainage of sea water that penetrates the ground	- Adopt the different regions of the country with water deficit, irrigation system. - Encourage the use of organic (manure). - Spread irigation system to the most needy regions. -Major spread of plant species adapted to certain zones. - Develop a policy of territorial cultures. - Supporting the best research and development services. - Implement the drainage system in areas needed.
		Reduction of income in rural areas.	1- Reduction of production and consequently reducing farmers income 2- Crop conversion causes peiods of minimum income.	- Promote studies of the profitability of small farms due to the different agro-ecological regions of the country.. - Promote a program of technical and material support to rural farmers. - Develop a policy for processing and export of local products and surplus production.
	Increase Rainfall and rise in Temperature.	Reduction of income in rural areas.	1.Excess of moisture and increase in soil parasites. - Decrease of livestock animals, excess deaths from parasites in animals from pasture (ticks)	- Move the animals to more appropriate places, bathing them for ticks with products providing a better environment and a good return.
		Soil physico-chemical change	Loss in surface soil nutrients.	- Providing technical advice to famers with plots of land vulnerable to erosion.
		Reduction of the income of livestock farmers	Decrease of livestock animals; deaths from anemia and low consumption due to increased grazing in pastures of parasites (ticks)	- Providing technical assistance and modernize the system of raising animals and applying semi-intensive system with good management. - Improving the selection of pasture with grazind management by aplying the rotation of the plots.

Table nº2 - Forests and Soil

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
Forestry	**Rise in Temperature** **&** **Decrease in Rainfall**	1. Reduction of forest area in the event of prolonged drought	1.1- Shadow forest adapted to rainfail ranging from between 1200 and 2500 mm; 1.2- Secondary forest adapted to rainfall ranging from between 2000 and 3500 mm; 1.3- Forest fog confined to rainfall above 3500 mm	**a)** Reduction of the illegal and indiscriminate cutting of tress and bushes to the possible minimum; **b)** Development of a national program of reforestation and sustainable management of forest and agro-forestry ecosystem; **c)** Development of national forestry/planting of species resistant to drought and low rainfall.
		2. Increasing the length of the Savanah area in the NE of the Island of Sao Tome	2.1- Transition line from Savanah to the wetland coinciding with the 1000 mm; 2.2- Semi-arid and dry sub-humid areas conditions in the vicinity of the transition zone, 2.3- Practice of indiscriminate cutting of trees and shrubs and manuifacture of coal in the vicinihty and within the Savanas	**a)** Construction of a system of irrigation canals for the semi-arid and arid and sub-humid areas of North and NE; **b)** Planning of appropriate areas of the Savanah of the NE; **c)** Elimination of the manufacturing activities of coal in the Savanah area;
		3. Proliferation of insect predators in forest ecosystems	3.1- Continuity of moisture favorable to proliferation of insects in the area of Secondary Forest; 3.2- Rise in temperature by 2,2ºC will encourage the proliferation of insects in the fog forest zone.; 3.3- Existence of outbreaks of rubrocinthus.	**a)** Development of a national program of reforestation and sustainable management of forest and agro-forestry ecosystems; **b)** Development and implementaion of a National Plan for Forestry Development; **c)** Creation of a division of forestry research at the Center for Agricultural Research and Technology (CIAT).
		1. Proliferation of insect predators in forest ecosystem.	1.1 More arid zone with rainfall from 500 to 700 mm; 1.2- Forest ecosystems adapted to microclimates, arid, semi-arid to dry sub-humid	**a)** Development and implementation of a National Plan for Forestry Development; **b)** Development and implementaion of a National Plan for Forestry Development; **c)** Creation of a division of forestry research at the Center for Agricultural Research and Technology (CIAT).
			2.1- Shadow areas of forest located in the plains;	**a)** Introduction of suitable tree species in forest areas prone to flooding;

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
		2. Flooding of forest areas of flat terrain	2.2- Areas of Secondary Forests located in the plains; 2.2- Existence of forest areas prone to flooding.	**b)** Construction or rehabilitation of drainage system in forest areas prone to flooding, **c)** Development of a national program of reforestation and sustainable management of forest and agro-forestry ecosystems;
		3. Loss of forest cover by landslides	3.1- Above 9% of forest areas situated in hilly region; 3.2- Existence of many lands prone to landslide, 3.3- Centre-Southwest region and irrigated by many waterways.	**a)** Ban on logging in areas with slopes greater than 15%; **b)** Institutionalisation of the effective National ParKS Obôs; **c)** Creation of protected areas in potential sites outside the Park Obôs.
Soil	**Rise in Temperature** **&** **Decrease in Rainfall**	1. Reducing the water content of soil;	1.1- Black and brown soils of the Savanah already subject to water scarcity; 1.2- Fersialithic and black clay soils that sustain forest shade, predorminate in subhumid and semi-arid and dry. 1.3- Soils that predominate in the arid zones of micro, semi-arid and dry sub-humid, already having low water content.	**a)** Constructioin of a system of irrigation canals for the semi-arid, arid and dry sub-humid North and Northeast of Sao Tome & Principe; **b)** Elimination of the manufacturing activities of coal in then Savanah area; **c**) Planting of appropriate areas of the Savanas with species resistant to water scarcity;
		2. Progressive erosion of soil ,	2.1- STP, very roughed Island country; 2.2- Crop fields on slopes, hills and mountains; 2.3- Logging on steep slopes and mountains.	a) Ban on logging in areas with slopes greater than 15%; b) Development of a National Rural Extension and Technical Assistance; c) Establishment of agro-forestry systems of annual crops on degraded farmlands.
		3.Emergence of the phenomenon of hydromorphism"	3.1- Flood-prone lowlands; 3.2- Low permeability soils; 3.3- Lack of nowledge about the current state of soil.	a) Monitoring and systematic inventory of soil; **b)** Institutional capacity building of the Center for Agricultural Research and Technology (CIAT); **c)** Construction or rehabilitation of drainage systems on land prone to hydromorphism.

Table nº3 – Water, Energy & Fishing

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
Water	Reduced Rainfaill and Rise in Temperature	1. – Reduction of Groundwater: reserves of water, springs, irrigation of crops for agriculture, and extinction of some watercourses with lower flow.	1.1- 67% decrease in the volume of water; 1.2- The supply to the population in period of low rainfall was estimated at 50L/ INhabitant/day. 1.2.1- The volume indicator from 150 to 220L/Habitant. 1.3- Reduction of rainfall – in the dry season, reducing the volume of water in the Districts of Lobata and Lembá, more pronounced.	- Building large water reservoirs - Rationalize the use of water resources
		2. - Reduction of flow: low production and distribution of population, with higher incidence in the soil for agricultural production and livestock farming . 2.1- Increased mortality and migration of species (Fauna and Flora) 2.2- High rainfall, increased flow, flood, natural disaster .	2.1- Not meeting demand .	- Create and equip laboratory analysis of water
		3. - Reduction of Water-Quality: increase of microorganisms in surface waters . 3.1- High cost of water treatment .	3.1- High concentration of pathogenic microorganisms . 3.1.1 High contamination of diarrhea (fecal coliform). 3.1.2- High rainfall, low water quality. 3.1.2.2- High-contamination of waterborne diseases such as cholera, malaria	

ENERGY	Reduced Rainfall and Rise in Temperature	1- Reduced hydropower production	1.1- Reduction of low participation of hydro participation. 1.2- Weak demand satisfaction in the dry season (gravana);	1.1.1- Construction of new small hydro mini and micro hydros; 1.1.2- Construction of large reservoirs, lakes and prey to supply the dry period (gravana); 1.1.3- Identification of areas of natural reserve of non exhaustible water resources; 1.1.4- Management of water resources; 1.1.5- Preparation of studies on the potential of solar, wind and biomass; 1.1.6- Implementation of small-SHP plants, micro and minihydro;
		2- Residential Energy Consumption	2.1- Reduction of Residential Energy Consumption.	2.1.1- Replacement of incandescent light bulbs (CFL); 2.1.2- Reinforcement of the use of improved cooking in schools and low-income communities; 2.1.2- Code=architecture of buildings; 2.1.3- Use of more efficient air conditioning; 2.1.4-Implementation of improved stoves (biowaste, solar coorker, etc...) for low-income family;
		3- Small Industries	3.1- Reduction of energy consumption in small industries 3.1.2-Declining productivity of small industries	3.1.1- Custom Tax incentives to import high-output electric motors 3.1.2- Program for the rational use and energy saving.

FISHERIES	Rise in Temperature by about 2,2^{o}C up to 2040-2060, Decrease in Rainfall at about 85 mm	1.1. Biodiversity degradation due to diversion of water currents	1.1.2. Reduction by 50% dof artisanal fish production	- Establishment of mamrine protected areas, - Construction of artificial reefs
		1.2. Reduction of discharges of River Niger in th Atlantic Ocean	1.2.1. No National Studies to meet the national and regional impact.	- Transforming the Research Depahrtment at the Institute for Fisheries Development in the sector for Fisheries Research.
		1.3. Fishing activity (reduction of fishing efforts)	1.3.1. Introduction of equipment best suited for fishing and conservation for fish.	- Creation of workshops to build fishing boats for semi industrial fishing, - Protection of fishery areas, - Availability of dredit facility for fishermen, -Introduction of reflectors radars on board fishing vessels.
		1.4. Moving of the houses of the respective communities due to invasion of the sea.	1.4.1. Increase of 0,55 metres of the sea level.	- Construction of bariers of breakwaters, - Construction of new parks for canoes parking.

Table nº4 – Coastal Zone

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
Coastal Zone	1. Rising of sea level	1.1 Economic Losses	A high economic losses of 0.13m to 0.43m (SRES B_1) could afact about 15% to 20% of homes of Praia Melão, affact hotel infrastructure and homes and restaurants located on the coast, in the proportion and about 35% to 45% of the facilities from the main Port of S. Tomé.	• Greater dissemination of weather forecast and improve the management of tide gaudes installed, • Updating the plan of land use and urban planning and construction of barriers, • Increase education and awareness programs on climate change, • Updating and implementing legislation on fauna and floracas.
		1.2 Loss of habitats	A rise of 0,13m to 0,43m (SRES B_1) may cause the destruction of about 40% to 50% of reefs of the area of Lagoa Azul, from, from 25% to 30% of the endemic species that live in the magroves, 25% to 35% of wetlands and migration of 30% to 45% of sea turtles.	• Continue the program to protect sea turtles • Continue the television program on healthy environment. • Encourage the creation of radio programs such as the former "environmental aspect"
		1.3 Flooding of coastal villages	The elevation of sea level at 0.13m to 0.43m (SRES B_1) will reach 30% of homes in the coastal town of Malanza, 35% of Santa Catarina and 40% of houses in Ribeira Afonso, the beach of Água Izé and the bay of Santo António. The high quality of sea water of 0.8m to 0.5m (SRES A_2) may reach the low houses of the walkway from the hospital by 20%.	• Greater disemination of weather. • Construction of more bariers • Improve the management of tide gaudes installed • Introduce weather warning system.
		1.4 Coastal Erosion	Rise of sea level at 0,13m to 0,43m (SRES B_1) can cover about 30% of the beach of Diogo Nunes, 20% of Praia Pomba, 10% of the roads in coastal villages (Praia Lagarto, Neves, Ribeira Afonso, Santa Catarina, etc.) and 15% of the homes of Praia Lochinga.	• Intensifying the dredging of sand in the sea and develop architectural research aimed at finding alternative materials to sandy beaches, • Action of local communities to prevent extraction of aggregates and more active role of the chambers of the District and regional government actions to raise awareness about the changing attitudes in relation to the environment • Reforestation of coastal villages for protection against erosion.
		2.1 Flooding of the river banks due to flooding and flood	Abnormal rise in water level of waters of the rivers of (Ribeira Afonso, Papagaio) between 0.25 to 0.40m, about 25% to 40% of homes will be completely flooded	• Introduction of weather warning

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
			and assets lost\drawn	system
	2. Torrential Rains	2.2 Flooding of homes in the river mouths	Abnormal rise in water level of rivers (Iô Grande & Papagaio) between 0,16 – 0,53 m; about 30% to 45% of the homes in the mouths of these rivers are completely flooded.	• Continuous disclosure system of weather • Construction of more barriers • Building more dams • Introduction of evacuation system
		2.3 Landslides in coastal and inland regions located in the coastal zone	increases in rainfall forecast for the SON months, according to the GCM scenarios presented in the basic climatic conditions or extreme events of sudden increase in rainfall in the months of MAM, about 5% of rocky / clay of the coast (Neves) and 15% of rock / clay inside the ZC (Ribeira Afonso), would fall due to increased erosion in these parts.	• Introduction of permanent weather warning system • Building more dams • Introduction of evacuation system

Table nº5 – Population, Health & Education

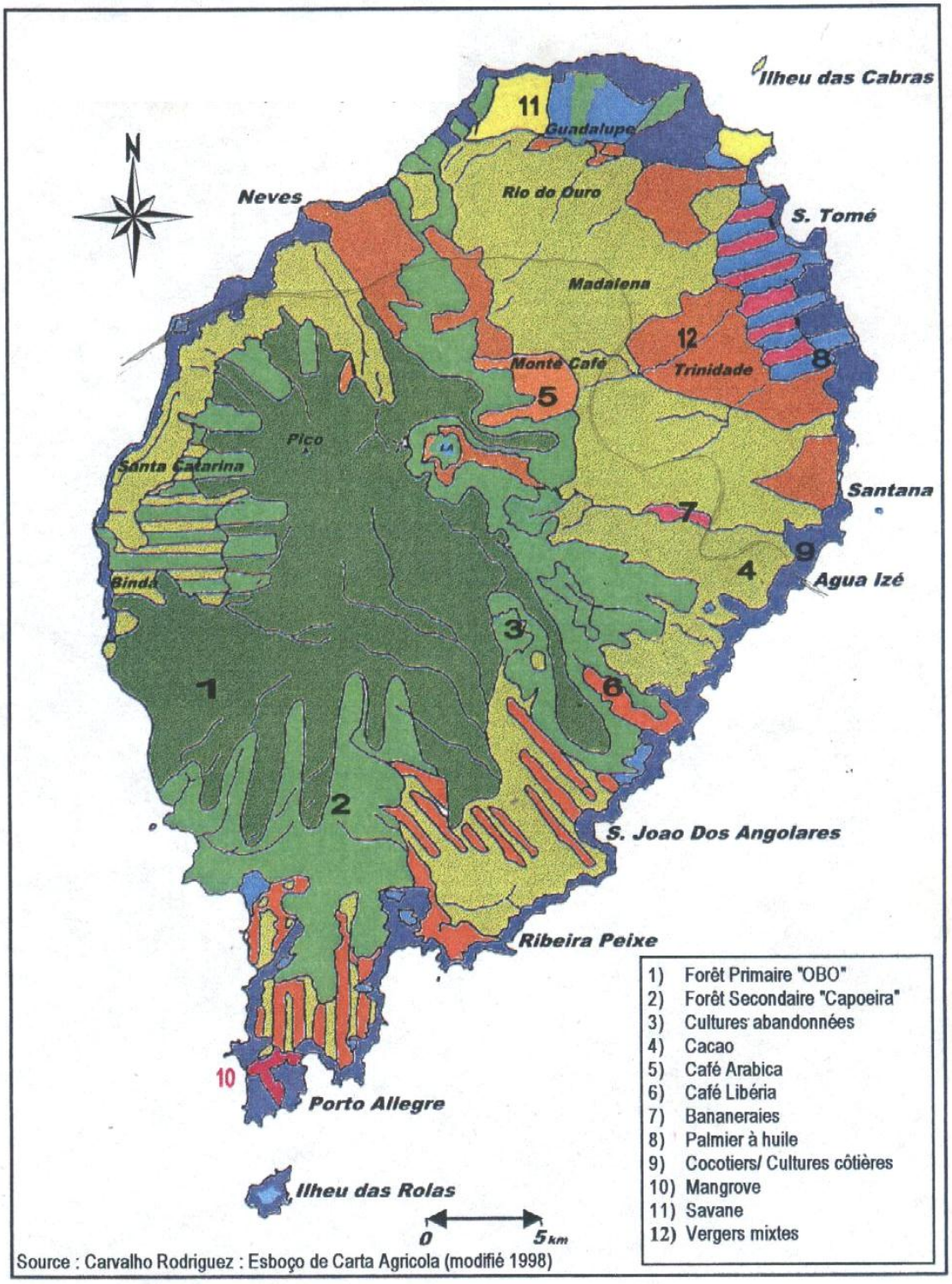
Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
Population	Increase Rainfall		1. Poverty • Incidence of poverty - 53.8% • Incidence of extreme poverty - 15.1% • Intensity of extreme poverty - 14% • Depth of poverty - 4.81% • GINI Index - 0.49%	1. Effective implementation of employment policy taking into account the demographic bonus.. 2. Technical, material and financial support to small and medium farmers.
			2. Migration More than 60% of the population is concentrated in only two of the seven administrative areas of the country, representing only 13.8% of the country: are the districts of Água Grande and Mé Zóchi,	1. Implementation Program of the Ministry of Agriculture to the hinterland and coastal areas. 2. Implementation of actions in order to establish people in rural areas. 3. . Develop a policy of mobilizing and allocating resources to sectors of socio-economic development and creation of jobs in areas vulnerable
			3. Change of eating habits . Decrease the consumption of bananas, cocoyam, cassava, and other local products Decrease the consumption of bananas, taro, cassava, and other local products	1. Implementation of a policy on production, marketing and consumption of agricultural products 2. Implementation of a policy on diet
Health	Decrease in Rainfall		1.Mal nutrition Decrease intake of animal protein and plant population	1. Enhancement of the fight against malnutrition 2. Strengthening of IMCI and exclusive breastfeeding during supplementation with vitamins. Insist on campaign production and diversification of animal and vegetable proteins
			2.Respiratory, Epidemal and Eye diseases Increased incidence of respiratory-borne diseases or acute respiratory infection that mainly affects children in the Autonomous Region of the Prince, and the District of Lembá	1. Strengthening the health information system and epidemiological surveillance, 2. Create services tailored to meet emergency situations 3. Institue a protocol of care and treatment of respiratory diseases Increased precipitation

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
	Increase Rainfall		4. Increase of waterborne diseases and degradation of environmental sanitation Increasing incidence of diseases like malaria, cholera and other diarrheal diseases Degradation of the living environment as a result of accumulation of rain water.	1. Develop protocols for care and treatment of all water-borne diseases 2. Improve the system of storm water runoff and sewage in general 3. Building stations collecting and processing medical and municipal waste Education
Education	Increased Rainfall		1. School failure o Decrease in the net enrollment rate in primary education, o Increase the dropout rate o Increasing the repetition rate in primary education, o Decrease the rate of permanence in a basic education	1. State Budget to ensure adequate funding for school retention. 2. Creating a warning system against natural disasters prevention education. 3. Activating the school access and retention in case of disasters
			2. The degradation of school infrastructure o Increase the number of schools at risk, o Increase the number of classrooms in a risk situation	1. Restructure the sector responsible for properly planning for natural disasters in education; 2. Persons who are sufficiently trained / coached to include MC in the planning of education; 3. School structures built taking into account the specific geographic location and the problem of climate change.
			3. Low level of information and training • Existence of a significant percentage of education professionals without adequate training; • Lack of guidance manuals or guides for	1. Strengthen organizations backers of reliable information on climate change 2. To sensitize national organizations of university / higher than do the following climatic data 3. Raise awareness among organizations / departments responsible for the dissemination of information

Sector	Impact	Adverse Effects	Awareness	Proposed Adaptation Measures
			teachers.	

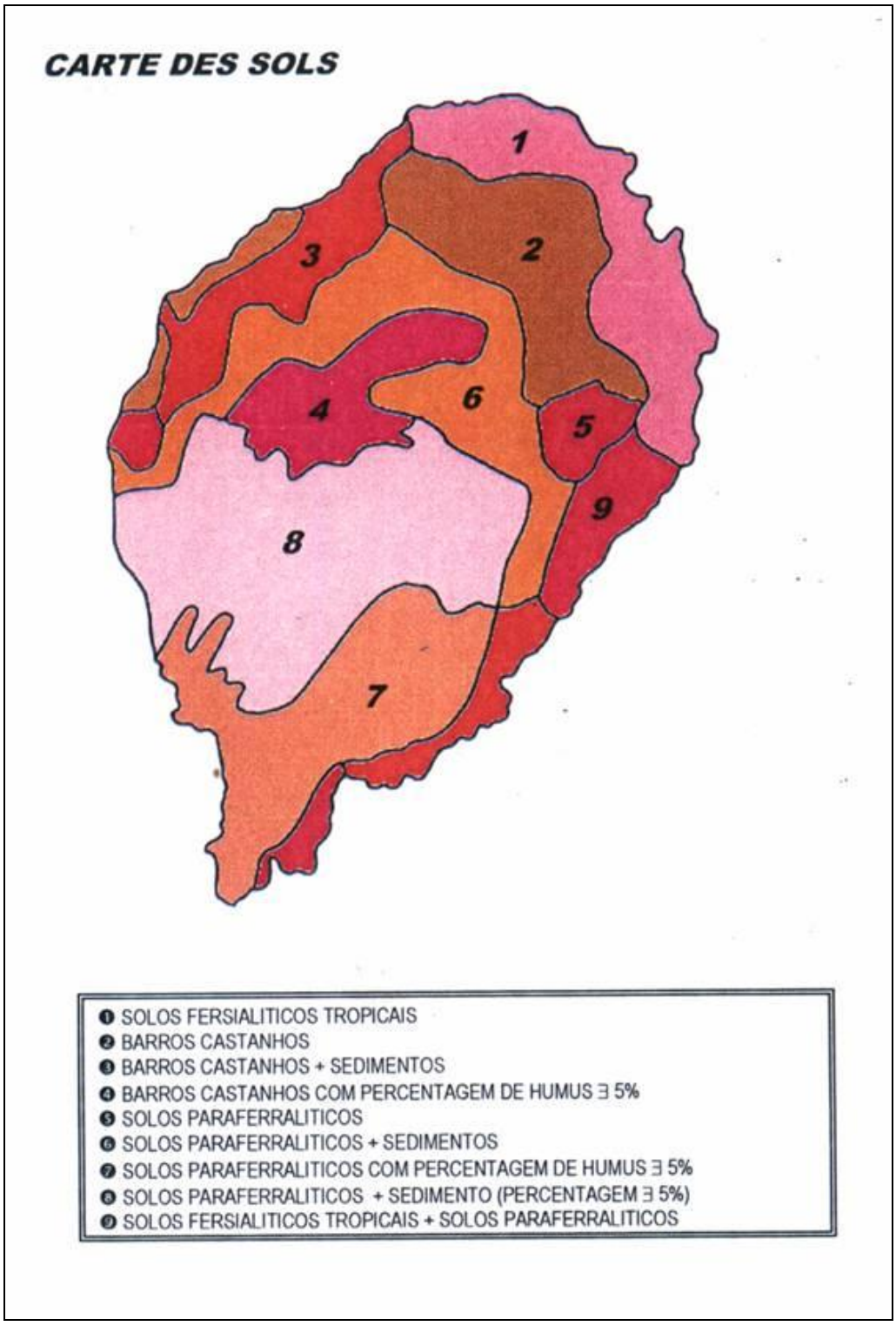
Appendix 2 – Soil Map of S.Tomé

Fig.nº1 – Map of Soil Occupation in S.Tome – Location of the Major Forest Ecosystems



Source: Propoed Management Plan of P.N. Obôs of S.Tome & Príncipe (1999)

Fig.nº2 – Soil Map of S.Tome & Principe



Appendix 3 – Some Endemic Organisms in the Forest Environment of Sao Tome & Prcncipe

Table No. 7 - Some Endemic Organisms in the Forest Environment in Sao Tome & Prcncipe

Group	Common Name	Scientific Name	Distribution	Usage and Local Knowledge	Observation
Plants	Macambrará	Craterispermum montanum	Altitude primary forest	Bark is used for preparing a fortification beverage	Vulnerablel
Plants	Quebra Machado	Hoamalium henriquensii	Forest altitude	Used for wood and coal	Not threatened
Plants	Pessegueiro de São Tomé	Chitranthus mannii	Lowland forest	Edible Fruit	Low risk Almost threatened
Plants	Pau esteira	Pandanus thomensis	Lowland forest	Leaves used to produce mats	Vulnerablel
Moluscs	Búzio d'Ôbô	Arcantathina-bicarinata	Forest Mountain	Food	Vulnerable
Anphibians	Cobra Bôbô	Schistometopum thomense	Widely distributed	Biological balance (bright yellow)	Not threatened
Birds	Galinhola	Bortrichia bocagei	Low altitude Forest, Southwest Zone	Hunted for food	Highly threatened
Birds	Pombo do mato	Columba Thomensis	Forest of mist	Hunted for food	Vulnerable
Birds	Truquí	Prinia molleri	Every where	Biological balance	Not threatened
Birds	Selelê mangotchi	Nectarinia thomensis	Forest altitude	Parasite plant	Vulnerable
Mammals	Chininha	Crocidura thomensis	Unknown	Biological balance	Highly threatened
Reptiles	Jita	Lamptornius linneatus	Widely distributed	feeds on rats, , kill by superstition	Not threatened
Reptiles	Suá suá	Philothamnus thomensis	Widely distributed	Tree species	Not threatened

Source: MARAPA, 2009